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Structural funds and the knowledge-based economy

a regional case-study (1999-2009)

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STRUCTURAL FUNDS
AND THE KNOWLEDGE-BASED ECONOMY
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Thesis Summary:

The research presented in this thesis investigates the nature of the relationship between the development of the Knowledge-Based Economy (KBE) and Structural Funds (SF) in European regions. A particular focus is placed on the West Midlands (UK) and Silesia (Poland). The time-frame taken into account in this research is the years 1999 to 2009.

This is methodologically addressed by firstly establishing a new way of calculating the General Index of the KBE for all of the EU regions; secondly, applying a number of statistical methods to measure the influence of the Funds on the changes in the regional KBE over time; and finally, by conducting a series of semi-structured stakeholder interviews in the two key case study regions: the West Midlands and Silesia.

The three main findings of the thesis are: first, over the examined time-frame, the values of the KBE General Index increased in over 66% of the EU regions; furthermore, the number of the "new" EU regions in which the KBE increased over time is far higher than in the "old" EU. Second, any impact of Structural Funds on the regional KBE occurs only in the minority of the European regions and any form of functional dependency between the two can be observed only in 30% of the regions. Third, although the pattern of development of the regional KBE and the correlation coefficients differ in the cases of Silesia and the West Midlands, the analysis of variance carried out yields identical results for both regions. Furthermore, the qualitative analysis' results show similarities in the approach towards the Structural Funds in the two key case-study regions.

Key words and phrases:

Knowledge-Based Economy,

Structural Funds,

regional development,

West Midlands,

Silesia

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List of Abbreviations

ANOVA – Analysis of Variance

CP – Cohesion Policy

DG Regio – Directorate-General for Regional and Urban Policy

DG RTD – Directorate-General for Research and Innovation

EPO – European Patent Office

EU – European Union

GERD – Gross Domestic Expenditure on Research & Development

GI – General Index

HRST – Human Resources in Science and Technology

ICT – Information and Communication Technologies

KBE – Knowledge Based Economy

NUTS – Nomenclature of Units for Territorial Statistics

OECD – Organisation for Economic Co-Operation and Development

RDA – Regional Development Agency

R&D – Research and Development

SF – Structural Funds

TKIS – Employment in Technology and Knowledge-Intensive Sectors

Introduction

The major objective of this study is to answer the following question: what is the relationship between the Knowledge-Based Economy (KBE) and the Structural Funds (SF)? The thesis investigated this issue in a regional dimension, with a particular focus placed on two of the European Union regions: the British West Midlands and Polish Silesia (*Śląskie*).

The thesis is structured in the following way. This section provides a brief introduction to the topic and explains the significance of this study. The thesis then proceeds to presenting the research background by reviewing the existing literature and identifying the gaps in the current research state. The first part of Chapter One contextualises and analyses the concept of the Knowledge-Based Economy and discusses numerous methods of measuring it. The second part examines Structural Funds, focusing on the means of assessing their impact. The research design presented in Chapter Two outlines the research questions, formulates three hypotheses, defines key terms, and provides rationale for using two regions in a specific timescale as a case study (the West Midlands and Silesia, 1999-2009). In addition, the chapter contains a robust description of the methodology applied to conduct the study. Both qualitative and quantitative methods were used for the purpose of the research, and an original set of indicators and a new technique of calculating an innovative composite index were utilised for quantitative assessment of the Knowledge-Based Economy on a regional level. Chapters Three and Four present comprehensive findings of the quantitative and qualitative stage of the study. The final Chapter includes the results of testing the three hypotheses and offers conclusions, including further reflections on the broader issue of regional economic development and methodological implications of the research undertaken in this study.

Why is this study important?

In the European Union (EU), the spotlight has been cast on the concept of the Knowledge-Based Economy since March 2000 when the European Council announced a very ambitious political initiative. EU was to become "the most competitive, dynamic, Knowledge-Based Economy by year 2010" (European Council, 2000, point 5). The initiative known as the 'Lisbon Strategy' or 'Lisbon Agenda' included a range of policies and regulatory measures to achieve this goal and has attracted considerable attention.

At the time when Lisbon Strategy was proclaimed, the European Union was starting to experience a decline in its relative economic prosperity and an increase in unemployment rates (Borrás, 2009:105). It was becoming increasingly apparent that in the new environment created by technological developments, globalisation and aging societies, the EU was lagging behind not only the then-booming economy of the United States (Johansson *et al.*, 2007:4) but also behind the rapidly developing economies of Asia (Kok, 2004:8). Awareness of these lags led to an almost unanimous consensus in the political and economic debates at that time (see e.g. Soete, 2001; Rodrigues (ed.), 2002) that the future economic growth was very much dependent on the ability to adjust and take advantage of the transformations brought forward by the new economy in which, as observed by Castells, knowledge became the main source of wealth and power (1996:77). It was becoming very clear that Europe cannot compete on price alone against states that benefited of having lower labour costs and less developed welfare systems, such as China or India. The most successful companies and, by extension, economies, would be the ones to focus on the most value-added production (Rodrigues, 2002), delivering projects and products which would no longer be mass-produced, but tailored to the customers' specific requirements. Such tailoring requires constantly expanding know-how, and the capacity for continuous innovation based on knowledge was clearly becoming the only option if Europe wanted to gain competitive advantage in the globalised economy. In this climate it is

unsurprising that a new outlook at how to increase the EU's competitiveness was very desirable and new goals needed to be set.

Since the announcement of the Lisbon Strategy there has been a growing emphasis put by both policy-makers and academics on how the regional investments and knowledge-based regional development could be enhanced, (see e.g. Technopolis, 2006; Mendez, et al. 2010) and within this a particular focus was placed on the role of Cohesion Policy, of which the Structural Funds are undoubtedly the key component (Bachtler& Wren, 2006; Dąbrowski, 2012). Notably, the year of the Lisbon Strategy's announcement was also the first year of the 2000-2006 Financial Perspective.

The scholarly attention to this field takes two key directions. Whereas some researchers focused on the issues of high-level pan-EU policies, e.g. investigating the alignment of the Cohesion Policy as a whole with the Lisbon Agenda (Mendez et al., 2010: V.), there has also emerged a considerable group of scholars who underline the importance of the role regions play in implementing the Cohesion Policy and fulfilling the Lisbon Agenda's key objective (Musyck& Reid, 2007; Bachtler& McMaster, 2008). The importance of development on the regional level has also been recognised by the European Commission in its Cohesion Report (European Commission, 2004) where it has been emphasised that it is the disparities in regional development that pose significant challenges for the Lisbon goal.

With the European Union making a very public declaration in the form of the Lisbon Agenda of its attempt to significantly increase the competitiveness of its Knowledge-Based Economy (European Council, 2000 point 5), and also spending one-third of its budget on the Cohesion Policy with this proportion still growing (see e.g. European Parliament, 2008a), it seems particularly interesting to verify such an ambitious claim about these substantial sums. Furthermore, given that the new programming period (2014-2020) is approaching fast, and bearing in mind the "disappointing delivery" of the Lisbon Agenda, as it was put in Wim Kok's Report (Kok, 2004:6), it becomes ever more important to learn from past experience. The need

for an effective EU Cohesion Policy becomes even clearer and examining the relationship between the Structural Funds and the extent to which an economy in a region becomes "knowledge based" is undoubtedly an undertaking of crucial importance.

Before returning to the question of why the relationship between the Structural Funds and the Knowledge-Based Economy is of vital importance for European regions, it is necessary to discuss the existing literature on the aforementioned two key issues: the Knowledge-Based Economy and the Structural Funds. This is of particular importance as it demonstrates why the research adds to the sum of academic knowledge in the areas of regional development and Cohesion Policy, and it explains the position of this research in relation to what has already been published.

Chapter One: Research Background

The background to the research encompasses the review of literature focusing on two dimensions which are pivotal to full comprehension of the subsequent research and its context: the Knowledge-Based Economy and the European Structural Funds.

The first section of the following literature review establishes how the concept of the Knowledge-Based Economy developed over the past decades and contextualises the growing importance of KBE against the broader economic development of Europe, notably de-industrialisation, regional disparities and globalisation; it also critically discusses previous attempts at measuring the KBE. The investigation into the hitherto most notable attempts aiming at defining and measuring the Knowledge-Based economy allowed the author of the thesis to create a working definition of the KBE as a composite index of its indicators, as presented on page 50 and further discussed in the Methodology section (p.71-80).

The second section focuses on the European Funds: the background of their existence, the expectations placed on them by the EU, and the various ways of measuring their impact. Both sections are further divided into sub-sections dedicated to particular issues within the discussed problem. The outline of the subject literature presented below allows for conclusions to be drawn, based on which the research questions and hypotheses together with the new original methodology of the research are set out and presented in the following parts of the thesis.

Understanding the Knowledge-Based Economy concept

This subsection presents, compares and evaluates the various approaches to and definitions of the concept of the Knowledge-Based Economy (KBE). It describes the evolution of the idea of the KBE from the 1960s to the present breaking the concepts into pre- and post-2000, which is the year of the Lisbon Agenda's announcement. The section also takes into consideration the way the concept of KBE is used by the EU and OECD. Importantly, this subsection remains in the realm of more theoretical approaches presented in the literature; the overview of various methods proposed for measuring the KBE is made distinct in a separate section.

Evolution of the KBE concept

Although the Knowledge-Based Economy is a concept that has gained significant popularity since naming it as the aim for EU development and the goal of the Lisbon Strategy (European Council, 2000, point 5), it should be noted that the idea of the KBE was introduced much sooner than the turn of the 21st century. Concepts such as *knowledge/information economy/industry*, *information society* etc. which were existent prior to the KBE yet denote roughly the same idea, have long ago confirmed the importance of defining the role which is played in contemporary societies by products requiring significant knowledge input (such as technologies and information needed for aerospace engineering, pharmacy, defence, advanced manufacturing etc.), leading to the development of economies on local, regional and national level.

In 1962 Fritz Machlup, an Austrian-American economist, introduced the concept of knowledge industry (Machlup, 1962). While at that time "*industry*" was clearly defined, it was the idea of knowledge and its possible influence on changing the production process, which lacked sufficient research. Machlup categorized knowledge into five sectors: education, research and development, mass media, information technologies and information services. Every

industry which included one of those components was defined as a "knowledge industry" (Machlup, 1962:44). Based on this distinction it was possible for him to calculate that in the late 1950s almost 30% of the USA's GNP was produced in knowledge industries. It can easily be realised that such a concept is not the most exhaustive in terms of describing the influence knowledge-rich production has on society, as the term "industry" itself is not broad enough. It was not surprising that a need for more complex concept emerged very soon after Machlup's publication.

The first person to use the phrase *"knowledge economy"* and swiftly afterwards-*"knowledge-based economy"* was Peter Drucker. He used the latter concept as the title of Chapter 12 in his book *The Age of Discontinuity* (Drucker, 1969). He distinguished the KBE from *knowledge economy*, in which he distinguished knowledge as a product, unlike KBE where knowledge was understood as a tool for obtaining economic advantages and benefits. This distinction seems to be particularly worth remembering, in the light of more recent publications, which appear to ignore this distinction completely and use the terms *KBE* and *knowledge economy* interchangeably (e.g. see Huggins & Izushi, 2007; Room, 2005).

Drucker also described differences between the manual and the knowledge worker; the first working with his hands, producing goods and services, the latter working with his head and producing ideas, information and further knowledge. Whereas the division of labour according to specific skills is one of the milestones of progress, and was noted as early as the 1920s by an American economist, Allyn Young (Young, 1928:529), the distinction made by Drucker has a significant weakness, caused by the fact that in modern developed economies simple manual work is often substituted with machine production, and more complex manual work does require specified knowledge and skills; what is more, most of the work in present-day service sectors requires extensive knowledge and therefore workers in this sector can in fact be named "knowledge-workers".

It is worth noticing that economists were not the only ones interested in the subject of knowledge's impact on the economy. Jean-François Lyotard, a French philosopher and literary theorist believed that knowledge has become the principle force of production and that in few years' time knowledge would become a commodity (Lyotard, 1984). He argued as well that through the development of information technologies society would make knowledge accessible to anyone. The subject was also of interest to sociology scholars, such as Nico Stehr, for whom the economy of a *knowledge society* (society highly influenced by scientific and technological knowledge) is driven not only by material inputs, but also by inputs which are knowledge-based. He has also foreseen that in time we would find a larger number of professions that involve specific knowledge and the number of jobs in manufacturing would decline but not disappear altogether (Stehr, 2001:28), which can be observed in the present in almost all of the EU Member States' economies.

In the early 1990s Alvin Toffler, an American futurist and a Board member of the International Institute for Strategic Studies, declared that knowledge had become the key resource in the advanced economies (Toffler, 1990:96). Other scholars seem to have supported this idea. For example Lester Thurow argued that in advanced economies knowledge and human capital have replaced natural resources as the primary resources to create wealth (Thurow, 1996). Similarly, B.-Å. Lundvall, a Danish economist, together with launching the ideas of *learning society* or *learning economy* in his book on National Systems of Innovation stated that ''the most fundamental resource in the modern economy is knowledge" (Lundvall, 1992:1). What has also been emphasized is that whereas knowledge is indeed becoming the main source of wealth and power, it is also the source of differences between nations, regions, companies and people (Castells, 1996:77). Bearing this is mind it is not surprising that at the break of the century the notion of knowledge's importance was incorporated into one of the EU's political initiatives: the Lisbon Agenda.

The European Union and the KBE

As already stated, it was the late 1990s and the start of the 20th century that brought increased interest in the idea of the *knowledge-based economy*. One of the most considerable manifestations of this was surely the announcement of the Lisbon Strategy in the year 2000 (European Council, 2000).

The Lisbon European Summit in March 2000 took place while the EU was faced with falling further behind not only the economy of the United States, but also the rapidly developing economies of Asia (Kok, 2004:8). However, it must be noted at this point, that there were different reasons behind the growth of Europe's competitors: much of US growth was based on the size and the rise in population number and in Asia, e.g. China, the 60 per cent GDP increase in the years 1999-2004 was caused mainly by the increase in production's effectiveness by about 40%, while the employment has increased just by 5%; in many other Eastern Asian countries, the unemployment has in fact increased since the beginning of 1990s (International Labour Organization, 2000).

The researchers engaged in the development of the Lisbon Agenda, most notably Maria João Rodrigues who served as an advisor to the Prime Minister António Guterres during the Portuguese Presidency of the European Union, recognised the challenges brought forward by globalisation, technological change and an aging population (see e.g. see e.g. Archibugi, D., Lundvall B.-Å. (eds.), 2001; Rodrigues (ed.), 2002). The key problem which required addressing on the European level was identified as the situation when "with globalisation nations are competing to attract investment, which, on the one hand, depends increasingly on the general conditions supporting business competitiveness. On the other hand, business competitiveness depends increasingly on the capacity to answer just in time to the specific needs of the customer" (Rodrigues, 2002:2). It has become clear that competitiveness on a global scale no longer relied simply on trade in goods and services or flows in investment, but they key determinant of economic success also included the people and their creative, innovative skills.

For an economy to function efficiently in these circumstances, managing ever-increasing amounts of knowledge was required.

The European Council itself recognised a number of weaknesses within the EU: a relatively low employment rate among women and older workers, structural and regional unemployment, underdevelopment of ICT (Information and Communication Technologies) in the service sector and a widening skills gap in the ICT sector itself (European Council, 2000, point 4). Although the European Council also identified particular strengths of the EU such as a healthy balance of payments, largely completed single market, generally well-educated work force and stable social protection systems (European Council, 2000, point 3), it became overly clear that a new route to development needed to be formulated.

Devising the strategy for development required a definition of a new strategic goal, and consequently the aim was set for the EU to become:

"the most dynamic and competitive knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion, and respect for the environment by 2010" (European Council, 2000, point 5).

What is extremely important is that at no point in the Lisbon Agenda did the Council provide a clear definition of what the Knowledge-Based Economy is. The definition of the KBE which could be regarded as the "official" Commission's stand was introduced a few year later, albeit not in the obvious official documents such as directives, treaties etc. To the author's best knowledge the only definition of the Knowledge-Based Economy which can be acknowledged as the EU's official stand is the one presented in the Glossary of the Eurostat database (Eurostat, 2005). The legitimacy of this definition can be assumed based on the fact that the Eurostat is a Directorate-General (DG) of the European Commission which fulfils the role of the statistical office of the European Union (Eurostat, 2010a). According to Eurostat's Glossary:

[the Knowledge- Based Economy] "...describes trends in advanced economies towards greater dependence on knowledge, information and high skill levels, and the increasing need for ready access to all of these by the business and public sectors" (Eurostat, 2005).

What deserves emphasis is that the above cited definition is exactly the same as the one included in the OECD's (Organisation for Economic Co-Operation and Development) Oslo Manual (OECD, 2005:15), which is in turn an expansion of the definition included in the OECD's 1996 publication, naming the Knowledge-Based Economies:

"economies which are directly based on the production, distribution and use of knowledge and information" (OECD, 1996:7).

The two approaches received certain scholarly criticism pointing out conceptual problems. What should be noted, however, is that the critique focused more on the concept of KBE itself, rather than strictly on the definitions adopted by the OECD and, later, the EU. While some of the scholars (e.g. Sokol, 2004) focused their critique on theoretical abstract-level interplay between knowledge and socioeconomic systems, others perceived it only as a metaphor "often used in a superficial and uncritical way'' (Smith, 2002:5). The KBE concept was also referred to as "fuzzy" (Godin, 2006:23), and substantial critique for the OECD's definition was provided based on the conviction that conceptualising and defining the KBE is nothing more than "a fertile strategy for rapidly producing new papers and discourses" (Godin, 2006:24).

Despite the criticism by some scholars, the 2005 definition used by both EU and the OECD remains of paramount importance for this research. The first reason for this is the territorial spread of the research undertaken for the purposes of this thesis: the territory of the European Union divided into particular regions (as further defined and explained in the Research Design on pages 50-52). Because the research focuses on territorial units within the EU, the author decided to conceptualise the key matter, the KBE, in a manner which is tightly linked to the definition proposed by the EU. Secondly, the 2005 definition includes the concept of a

"trend" implying changes occurring over time, which feeds directly into the research's First Hypothesis (see page 54 for more details).

In the years subsequent to the announcement of the Lisbon Agenda, the concept of the Knowledge-Based Economy still remained, and remains to this day, of interest for a number of researchers. Examples of recent scholars focusing on the concept of the knowledge-based economy and related ideas are Huggins and Izushi (2007). In order to fully understand the notion of KBE, they introduce two more concepts: the *"weightless economy"* and *"information economy"* (Huggins & Izushi, 2007:14). The former brings together similar arguments to the ones already mentioned in the previous part of the chapter - in modern developed economies a significant part of GDP comes from commodities that have little or non-physical manifestation at all (such as financial services). The latter concept underlines the revolutionary change that was made in developed economies by information and communication technologies (ICT). It is reasoned that the idea of the KBE includes both of the mentioned "economies", as it covers not only "weightless" products but also the ones which are created by means of advanced technology, and most often – products (e.g. spacecrafts) which need at the same time both the "weightless" and the "ICT-rich" components (Huggins & Izushi, 2007:15). However, in this these two concepts the great emphasis put on the low costs of information production and the incredibly fast pace at which information might be passed on can be the concepts' main flaw. Yet as it can be easily observed in the modern world, there are circumstances in which the transfer of knowledge faces severe obstacles and is not as effortless as the information economy concept presents it to be. The examples of reducing the likelihood of successful knowledge transfer can include different cultural backgrounds of the recipient and provider of knowledge (Chen *et al.*, 2010) or the fact that when the knowledge transfer takes place in virtual environment the richness of knowledge tends to be lost in the transfer process due to the lack of face-to-face meetings (Cummings & Teng, 2003:60).

In conclusion it is necessary to point out that in the social sciences there is no universally accepted concept of what the information society and knowledge(based) economy are. Table 1 and the short summary on the following pages synthesize the findings of the previous paragraphs and present the development of KBE- related concepts in a chronological order.

Table 1. Development of KBE-related concepts in a chronological order

Concept	brief definition	year	author
knowledge industry	Every industry which includes education, research and development, mass media, information technologies and information services.	1962	F. Machlup
knowledge economy	Economy, in which knowledge is the basic product	1967	P. Drucker
knowledge worker	One who works with his head rather than hands and produces ideas, information and further knowledge	1967	P. Drucker
knowledge-based economy	An economy in which knowledge is as a tool for obtaining economic advantages and benefits	1969	P. Drucker
learning society	A society in which the most fundamental resource is knowledge and, accordingly, the most important process is learning	1992	B.-Å. Lundvall
knowledge-based economy	An economy which is directly based on the production, distribution and use of knowledge and information	1996	OECD
knowledge-based industry	Industry, which features high investment in innovation, intensive use of newly-developed technology and a highly educated workforce	2000	C. Webb
knowledge society	A society highly influenced by scientific and technological knowledge; driven not only by material inputs, but also by inputs which are knowledge-based	2001	N. Stehr
knowledge-based economy	Describes trends in advanced economies towards greater dependence on knowledge, information and high skill levels, and the increasing need for ready access to all of these by the business and public sectors	2005	OECD & European Commission
weightless economy	Economies in which a significant part of GDP comes from commodities that have little or no physical manifestation at all (e.g. financial services)	2007	R. Huggins and H. Izushi
information economy	Economy that was subject to the revolutionary change that was made in developed economies by information and communication technologies (ICT)	2007	R. Huggins and H. Izushi
investment in knowledge	Expenditures directed towards activities with the aim of enhancing existing knowledge and/or acquiring new knowledge or diffusing knowledge	2009	OECD

The idea of an *Information society* is perceived as the broadest one, as in it the economy is treated as a part of society's activities. The *information economy* and *knowledge economy* put greater emphasis on the information/knowledge being the object of a possible trade. *Knowledge industry* is the narrowest idea, underlining the significance of knowledge use in just a fragment of the economy, while *knowledge-based economy* takes into consideration all the sectors functioning in the modern developed countries, in which know-how is treated as one of the most important commodities.

While most scholars agree that economies and societies have significantly changed since the mid-1970s, information technologies keep evolving and new areas of knowledge are perceived as necessary for modern economies. Some scholars follow the distinction made by Drucker (1969) and characterize the information society and knowledge-based economy as simply one in which majority people's labour is non-material (i.e. "producing" further knowledge or cultural objects). As noted above, in the social sciences there is no universally accepted concept of what a Knowledge-Based Economy is and although all of the above mentioned concepts relate to a similar designate, a number of them represent different aspects of the constantly changing and developing economical order.

The fact that there is no universally agreed definition or a theoretical concept of the Knowledge-Based Economy is generally acknowledged in the subject literature, yet at the same time over the last years there has been a shift in research emphasis from trying to conceptualise the idea of the KBE, to investigating what impact does the departing from industrial and manufacturing based economies have on economic development.

A widely known comment comes from Castells (1996) who observed that productivity and competitiveness are, by and large, a function of knowledge generation and information processing. Following up on this issue and investigating into the territorial spread of knowledge-based productivity and competitiveness a focus was put on development on a regional scale, as

knowledge economies became understood as "localised and regionalised" (Cooke, 2002:187) and more and more researchers agreed that knowledge is crucial for developing competitiveness of regions (see e.g. Huggins & Izushi, 2007; Malecki, 2010). There have also been a number of recent studies focusing on the performance of particular European regions with regards to fulfilling the Lisbon Agenda's Objective through the development of the Knowledge-Based Economy (e.g. Cooke & Leydesdorff, 2005; Musyck & Reid, 2007; Huggins & Strakova, 2012), however they have been different in their methodology or spatial range from the research presented in this thesis.

However, the relatively recent regional focus of literature remains of particular importance from the point of view of this thesis, as it presents research carried out with a distinct focus on the regional dimension. Further conceptualisation of the research design is presented in Chapter Two, yet before this is fully demonstrated, it is first necessary to complete the review of the existing literature in the fields of the Knowledge-Based Economy and the Structural Funds, and the ways of measuring them.

After showcasing the multiple perceptions of KBE-related concepts and briefly reflecting on the recent focus on the KBE's regional dimension it is necessary to analyse the number of ways the subject literature proposes for measuring the KBE. The gaps and inconsistencies identified in this and following subsections of the literature review feed into the development of the research methodology presented in the next parts of the introductory chapter.

Measuring the KBE

As the previous section of the literature review demonstrated, despite being acknowledged as a key element for modern regional economies' development, the idea of the KBE varies both among researchers and organisations. What is more, it is not only the concept itself that is not commonly agreed upon – the literature also suggests multiple ways of measuring it.

It seems that the only existing general consensus is that measuring the KBE can be made using various "indicators", i.e. quantifiable economic and social data. However, the exact number and type of indicators varies from researcher to researcher and also between specialised organisations. Therefore in order to review the various proposed methods of measuring the KBE, it is necessary to review a number of its proposed indicators' sets.

The choice of means of measurement of the Knowledge-Based Economy by international organisations such as the OECD ("*Indicators for the knowledge-based economy*", OECD, 1999) or the World Bank (*"Knowledge Economy Index"*, World Bank, 2005) [1] is subject to discussion and scholarly criticism (e.g. Peters, 2001; Godin, 2006). As the OECD defined almost sixty such indicators, it might be argued that the statistical evaluation of the KBE began to have "nothing to do with numbers and everything to do with politics" (Godin, 2006:17). In order for the KBE not to remain just an insubstantial idea, the OECD defined related indicators to make it more tangible. However, as the number of indicators increased, it was noted that the idea of the KBE became nothing more than a label, an "umbrella concept", allowing the gathering of existing concepts on knowledge, science and technology together with the statistical indicators into an "all under one roof" conceptual framework (Godin, 2006:24). Most of those remarks can also be applied to the World Bank's "Knowledge Economy Index".

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[1] The lists of the indicators for measuring the KBE proposed by the OECD and the World Bank, together with other sets of indicators discussed in this section can be found in Appendix 1.

Yet besides the scholarly criticism of OECD's indicators, the key critical problem from the point of view of this thesis is that for the purpose of this research the sets proposed by either the OECD or the World Bank cannot be used, as they require data which are only obtainable on a national level and would not suffice for exploring the KBE in particular regions.

The OECD and the World Bank's proposed KBE indicators are not the only attempts undertaken by international organisations to measure the Knowledge-Based Economy. There are also other sets of indicators proposed, and these, as well, vary significantly among themselves. Even within the European Union itself there is no common set of KBE indicators, as these vary for example between the sets proposed in the 2006 *Synthesis Report to DG Regio*, the *European Innovation Scoreboard* (preparation of which was ordered by the European Commission) and the *Knowledge Economy Indicators*, which were the outcome of the Universität Trier's project funded by the 6th Framework Programme (a part of European funding scheme for research).

Another important piece of work is the *European Regional Innovation Scoreboard* which is the closest solution to the one proposed in the thesis. Nevertheless it has a number of limitations which make it unsuitable for the purpose of this research: it takes into account only recent years and many of the indicators considered (which, again, differ from the ones proposed in the *European Innovation Scoreboard*) are unobtainable for the period which is to be examined in the thesis for reasons further elaborated upon in the Methodology section.

What is more, it is not only the sets proposed by various organizations that differ. There are also significant differences in the choice of KBE-influencing factors and indicators among individual researchers in the subject literature. The main three approaches could be broadly defined as: "human-oriented", "technically-oriented" and "innovation-oriented", where each of the following approaches builds on the findings of its predecessor.

The examples of the first approach are de la Fuente and Ciccione (2002) who state that the crucial role in what they refer to as "knowledge-driven-economy" is played by human capital, as it is an important determinant of productivity and hence – economic outputs. At the microeconomic level they single out indicators such as school attainment and on-the-job training, which both have an impact on individuals' wages; on the macroeconomic level they quote an estimate that, *ceteris paribus*, an additional year of average school attainment increases the level of aggregate productivity by around 5 % on impact and by a further 5 % in the long run (although, as must be noted, the authors do not give any information as to how such numbers were calculated).

Other authors, who despite still considering the role of human capital as important, add to it another significant determinant, namely the information and communication technologies (ICT) are e.g. Antonelli (1998) and Chatziparadeisis (2006). Whereas the former divides the ICT variable further into "diffusion" and "implementation" in service industry, the latter focuses on ICT's role in production, distribution, transfer, and absorption of knowledge and seemingly reduces it to a number of variables relating to the use of the Internet and World Wide Web. Another example of the "technically-oriented" approach is the work of Powell and Snellman (2004) who believe that KBE can be measured based on the number of patents and new technologies in a given state, and these are derivatives of the number of people completing their higher education and the organisation of workplace preferred in a given company.

The third, "innovation-oriented" approach can be represented most of all by Cooke and Leydesdorff (2006). In their paper they state that systemic innovations are one of the determinants of the trajectory of a region's evolution. They also give a comprehensive list of where the innovations should take place for the economy to be truly knowledge-based. These are: the economy (regionalization of economic development; 'open systems' inter-firm interactions; integration of knowledge generation and commercialization; smart infrastructures; strong local and global business networks); the governance (multi-level governance of

associational and stakeholder interests; strong policy support for innovators; enhanced budgets for research; vision-led policy leadership; global positioning of local assets); knowledge infrastructure (universities, public sector research, mediating agencies, professional consultancy) and community and culture (cosmopolitanism; sustainability; talented human capital; creative cultural environments; social tolerance) (Cooke & Leydesdorff, 2006). All of these factors led to Leydesdorff's key concept, namely the "Triple Helix model", which evaluates the KBE based on wealth generation (industry); novelty production (academia), and public control (government) (Leydesdorff & Meyer, 2006).

Castells (1996:17) created a working definition of the KBE as the one in which productivity is a derivative of the interaction of "knowledge upon knowledge" rather than upon raw materials. Following this understanding the KBE could be understood as share of high technology manufacturing and 'knowledge-intensive services' employment in total employment. Calculating the KBE index based on those two factors is a viable action, as it was proven by Cooke and De Laurentis (2002).

As visible from the above paragraphs, there are many factors considered to have an influence on the shape of the KBE and many indicators, allowing the calculation of a particular index, which could be used in order to compare the general level of how much a given regional economy is knowledge-based. A significant issue which needs to be taken into account is the availability and comparability of the data used for calculations, and what is of particular importance is whether the data are obtainable on regional level. This problem will be further addressed in the Methodology section.

What is also of importance regarding the Thesis' topic is that the development of the Knowledge-Based Economy was not only named as the objective of the Lisbon Agenda, as already mentioned in the previous sections, but it has also been included as a priority theme of several EU funding streams, including *inter alia* the European Regional Development Fund (ERDF) and the European Social Fund (ESF). Therefore the next section focuses on reviewing how the issues of European Funds and various ways of measuring their impact are presented in the subject literature, contributing to setting the research question and hypotheses as presented in the next Chapter.

European Funds and their impact

The EU is often credited for its success in developing central policies and the progress achieved in reducing regional disparities, especially by the implementation of its Cohesion Policy (CP) (Martin & Tyler, 2006; Musyck & Reid, 2007; Bachtler & McMaster, 2008). The CP, and the Structural Funds which are its key financial components (Bachtler & Wren, 2006:143) are generally considered to be a powerful tool in reducing disparities among European regions (Begg, 2003; Bachtler & Mendez, 2007:537), although prior to 1989 the extent of their effectiveness was perceived as only of minor importance and influence (Armstrong & de Kervenoael, 1997). The aim of this subsection, therefore, is to present the findings of a literature review on the influence of the Structural Funds on tackling economic disparities between EU regions and various ways of measuring their impact, which feed into the Research Design presented in the subsequent Methodology section.

By discussing the evolution of the Structural Funds, this subsection also aims at identifying the time in the history of Structural Funds when the notion of Knowledge-Based Economy became one of the main focuses of the EU's Cohesion Policy.

There is a consensus between researchers, political scientists and sociologists that one of the main rationales behind the existence of the European Union is to deliver economic integration (Tsoukalis, 1991; Swann, 1992; Armstong & de Kervenoael, 1997; Puigcerver-Peñalver, 2007) as tying countries together economically can be used as a way of consolidating democracy and thus resolving one of the causes which lead to conflicts between states in the past (Dinan, 2005:2).

An argument central to the rationale behind the need of furthering economic integration is that regional socio-economic disparities across the Union are still wide (Martin & Tyler, 2006:202) and that the Union has a responsibility to reduce the extent of the variation,

mainly through regional economic restructuring (Michie & Fitzgerald, 1997) and aiming at general regional development.

As proven in the research by Ederveen, de Groot and Nahuis (2006), European integration itself tends to contribute to growth; yet despite several decades of tackling regional economic differences, the EU remains a long way from achieving full integration of its Member States. This problem is very often expressed as the *"core-periphery"* (a term coined by Krugman, 1991: 483) nature of the EU, where in geographical terms, the Union consists of a core of wealthier ("highly privileged" as per Cooke & Leydesdorff, 2005:9) states and regions and a less developed periphery, be it on a national or regional scale.

There are studies which confirmed that across the history of the EU, it seemed to be the more central regions that had benefited most from the integration process (Armstrong & de Kervenoael, 1997; Michie & Fitzgerald, 1997) although some scholars argued that the division was rather North-South (Neven & Gouyette, 1995). However, more recent research seems to point towards a polycentric pattern of development, rather than focusing on a simple core-periphery divide (Copus, 2009); nonetheless it was also observed that while EU integration and the implementation of the Cohesion Policy have in recent years promoted overcoming the core-periphery problem by increasing inter-national convergence, sub-national inter-regional inequalities have tended to increase (Farole *et al*., 2011: 1092).

As this research focuses on the regional level of EU's spatial division, the issues of possible core-periphery or otherwise uneven patterns of development remain of particular interest from the point of view of this thesis and are further discussed on page 225.

Evolution of the Structural Funds

The research presented in this thesis implies the assumption that the EU did expect the Structural Funds to have a positive impact on the regional KBE. This reveals the background to this assumption by providing an overview of how the Funds and their priorities developed over the last decades and clarifies the basis for the EU's "great expectations".

The issue of regional development became important for the European Commission as early as 1957. It was at this time that the Treaty of Rome was signed, requiring the Community to ensure "harmonious development by reducing regional differences and the backwardness of less-favoured regions" (Treaty Establishing European Economic Community, 1957, hereafter TEEC; Mydral 1957). This treaty also established the first fund – the European Social Fund – which aimed to "render the employment of workers easier and to increase their geographical and occupational mobility within the Community, and to facilitate their adaptation to industrial changes" (TEEC, article 146). It was not until almost twenty years later however, that specific measures and parts of the budget were allocated specifically to address the issue of regional development. Closely related with this step was the establishment of European Regional Development Fund (ERDF) in 1975. The ERDF has as one of its key objectives to correct "the principal imbalances within the Community resulting in particular from agricultural preponderance, industrial change and structural under-employment". Its main purpose was to "finance investments in industrial, handicraft or services activities, thereby creating new jobs or protecting those already existing" (European Commission, 1975).

The new ERDF guidelines issued in 1984 sought to redefine the objectives of the ERDF and to emphasize the need for development, structural adjustment and the conversion of declining industrial parts of the member States, however it was not until the 1988 reform that the focus was placed on regions, that since this date which have gained a key role in the design and implementation of Cohesion policy.

Following the accession of Greece in 1981 and Spain together with Portugal in 1986, the Single European Act was signed, and shortly after that the Reform of Structural Funds took place. This reform is still widely perceived as the most important in the whole history of Structural Funds (e.g. Armstrong, 2001; Bailey, De Propris, 2002) because of establishing the four interlinked principles: *concentration*, *programming*, *partnership* and *additionality*.

The first principle was established at the end of 1988. It was intended to provide focus funding by promoting a limited number of priority Objectives, designed for spatially defined areas and aiming to tackle the most severe problems in given thematic areas. One of the practical manifestations of this principle was the naming of the areas to be addressed by Objective 1, determined by the Council for the period from the 1988 reform up to 1999 as areas, whose GDP per capita was less than 75 per cent of the EU average. In addition to funding being divided between different Objectives, the Structural Funds support was required to become a part of multi-annual programmes (or "programming periods", often named also "financial perspectives"). This was the main purpose of the *programming* principle, introduced at the beginning of 1989. The 1988 reform also established the *partnership* principle which required close cooperation in the policy-making process between public authorities and bodies at all three levels: European, national and regional. The final principle – *additionality* – also known as *co-financing* stated clearly that financial aid from the Structural Funds cannot be used to replace, either in part or fully, the Member States' own funds and investments.

Until 1988 the ERDF was providing funding on a national quota basis and with the Commission's power limited it was the Member States who decided on the use of funding. The change introduced in 1988 seemed somewhat drastic (Bailey, De Propris, 2002) mainly due to the Structural Funds need to make a significant impact on the less developed regions, to enable them to catch up with the more wealthy ones and to compensate for the imbalance caused by the introduction of the Single Market (Bliss, de Macedo 1990). This change was to some extent

imposed on certain regions. A considerable amount of official literature from the late 1980s and early 1990s (e.g. European Commission 1992, 1993a; Padoa-Schioppa 1987) describes the changes in structural policy in terms of "solidarity", "equity" and "cohesion". This was also the reflection of the gathering support for the concept of the Single Market and there is particular emphasis throughout on the consensus reached by the then weaker Member State, often perceived as potential losers in the new competitive European-wide market.

Through its new principles, the reform of 1988 was clearly aiming at stimulating regional self-governance, but (as noted by Hooghe, 1998) not all regions were ready at once to become active partners in policy-making process. A number of regions had no experience of dialogue with any of the European institutions, and in some cases, the regions have not even interacted with national governments regarding their own domestic policies (Bailey, De Propris, 2002). It is therefore to be expected that the level of regional governance varied significantly between EU regions: the differences were clear in the administrative roles the regions have had, in their autonomy of making decisions, and their policy making capacities.

The extent of these disparities was well known to the Commission. Soon after the 1988 reform it proved that it was aware that the regions of almost a half of the Member States were able to fully participate in the new allocation procedures. While the Commission recognized that some new states e.g. Portugal were able to become "regionalized", it gave no clear definitions or finite timelines for this to happen.   In the same time it was acknowledged that Member States like Denmark, Greece, Ireland, Luxembourg, Netherlands and the UK could be practically perceived as "de-regionalized" (European Commission, 1992), meaning lacking the capacity in terms of their regional administrative resources. The inability of some regions to be active partners in the processes of policy making and Structural Funds' implementation was the reason, as argued by D. Bailey and L. De Propris (2002), that the poorest regions of the then European Community were prevented from accessing and fully implementing the allocation of

Structural Funds destined for them. It was feared that the same situation may take place because of the 2004 Enlargement, mostly due to the fact that majority of the Central and East European (CEE) states have just recently undergone decentralization changes (Poland, Czech Republic, Slovakia, Hungary). A simple matter of extending the hitherto system of the Structural Funds was likely to face similar obstacles as the 1988 Reform and this problem was recognized both by the scholars and the European Commission (1999). The question to which extent the commitment to cohesion and convergence – which was subsequently the main milestone set in the Reform – can be maintained, is still subject to discussion between scholars (see e.g. Bailey, De Propris, 2002). Nevertheless, over twenty years later, there was no doubt that the 1988 Reform was a revolution in the process of Structural Funds' implementation and allocation (Allen, 2000).

The regulations regarding Structural Funds which were introduced by the 1988 reform have been revised on several following occasions.

The first occurred in 1993, when the new seven-year financial perspective was decided. The regulation of this reform provided for the re-affirming of central government control over Structural Funds. A second revision took place in 1999 when the Council of the European Union adopted another set of Structural Funds' regulations following the meeting of European Council in Berlin, where the *Agenda 2000* package was agreed. The regulations introduced in 1999 required that the four main principles of the Structural Funds (concentration, programming, partnership and additionality) should remain the basis for distribution within the new programming period, i.e. the years 2000-2006. However, the principles would not remain intact. First of all the number of priority objectives was reduced to three: Objective 1 was to promote development and structural adjustments of poorer regions, i.e. those with GDP per capita lower than 75% of EU-15 average; Objective 2 was designed to support regions facing economic and social conversion and to focus on the changes in "declining rural areas, urban areas in difficulty

and depressed areas dependent on fishing" (Council of the European Union, 1999); Objective 3 was simply to cover all the regions not subject to Objective 1, which were seeking to adapt their systems of education, training and employment.

The second change related to the Community Initiatives, whose number was reduced from the thirteen in the years 1994-1999 to four in the new programming period.

The final change in the regulations regarding Structural Funds took place in 2006, before the current financial perspective (2007-2013) came into force. This amendment was necessary to take account of the significantly increased number of Member States and the fact that 17 of the new EU States had considerably lower GDP then the "old states" – hence qualifying for more financial aid from the Structural Funds.   For the period 2007-2013 the Objectives of Structural Funds were re-defined and their total budget increased to €347.41bn. The *Convergence* objective, which succeeded the "Objective 1" from the former financial perspective (2000-2006), applies to regions with a GDP per capita below 75% of the EU average. The priorities under this objective are human and physical capital, innovation, knowledge society, environment and administrative efficiency. The allocated budget for *Convergence* is €282.855bn at current prices, made up of contributions from each of the ERDF, ESF and the Cohesion Fund. A special ERDF funding is allocated to the outermost regions of the EU (Council of the European Union, 2006). The former "Objective 2", in the period 2007-2013 was named *Regional Competitiveness and Employment,* and aims to reinforce the competitiveness, employment and attractiveness of regions, across the remainder of the EU territory not already covered by the *Convergence* objective. The main themes of this objective are the promotion of entrepreneurship and environment protection. In this objective the funding (€54.965bn) is secured by ERDF and the ESF (Council of the European Union, 2006). The successor to the former "Objective 3" is the *Territorial Cooperation* Objective. It is built upon the INTERREG initiatives from the previous years, which had originally been intended to be incorporated into the two main Objectives. The

third Objective aims to promote cooperation between European regions on different levels. It is divided into three strands of cooperation: cross-border, transnational and interregional (Council of the European Union, 2006).

Great expectations

When analysing the evolution of the Cohesion Policy, it becomes clear that the EU expected the Funds to have a positive impact on the creation and improvement of European Knowledge-Based Economy. Certain elements aimed at developing the European KBE were foreseen as an element within the Structural Funds from early on, and the assumption that the Funds were to contribute to the development of the KBE were made almost verbatim, by either explicitly mentioning it in the policy documents or in the naming of particular Measures, Priorities and Objectives.

The earliest example was the STRIDE Community Initiative launched for the 1990-1993 period, with the aim, in Objective 2 areas, to "*reinforce collaborations between the research community and* industry" and hence "*expected to contribute to the development*" of what became known as the Knowledge-Based Economy (Thematic Evaluation RTDI in Objective 2 Synthesis Report, p.3).

During the subsequent programming period, based on Article 10 of the Regulation on the European Regional Development Fund (European Council, 1999) so-called "*innovative actions*" in the years 1994-99 supported over 350 operations relating to eight different Strategic Themes which included promotion of technological innovation and the information society.

For the programming period 2000-2006[2], the Commission decided to reduce the number of Strategic Themes to three (European Commission, 2006) with the fist Theme being called "*Regional economies based on knowledge and technological innovation*". Importantly, those Themes were based on the new Structural Fund guidelines adopted by

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[2] For the states that joined the EU in 2004, this programming period only covered the years 2004-2006.

the Commission for the programming of Structural Fund assistance in 2000-06 whose working title was "*The regions and the new economy*" (European Commission, 2001). Point 4 of those regulations recognised and emphasised the fact that that due to progressive globalization processes the "knowledge-based economy and the promotion of the use of new technologies in regional economies [in the EU] are (…) becoming priorities".

Looking at the Member-States it can be found that the KBE was called upon verbatim in certain strategic documents guiding the Fund's implementation. A prime example of this was the Polish National Development Plan (NDP) developed based on the Community Support Framework. One of the strategic goals of the NDP was to: "develop the competitive *knowledge-based economy* and entrepreneurship-based economy, able to long-term harmonized development to ensure employment growth and improvement of social, economic and spatial cohesion with the European Union at regional and national level" (NDP, 2003:66), and this was then reflected in e.g. the Structural Operational Programme *Human Resources Development*, in which the whole Priority 2 was named: "*Development of knowledge-based society*" (SOP HRD, 2004).

The following financial perspective for the Structural Funds covered the years 2007-2013. As already mentioned, during this period what was previously named as Objective 2, received a new name: the Regional Competitiveness and Employment Objective. One of its key themes was, again, "innovation and knowledge-based economy" meant as "strengthening regional capacities for research and technological development, fostering innovation and entrepreneurship and strengthening financial engineering notably for companies involved in knowledge-based economy" (Regulation (EC) 1083/2006).

Based on the above described examples of the EU focusing on the theme of Knowledge-Based Economy in strategic documents guiding the implementation of SF in all programming periods since the beginning of the 1990's, it can be seen that the Funds were most certainly expected to be a significant contributing factor to the development of the European KBE. It is, therefore, particularly interesting to verify whether the 'great expectations' placed on the Funds in terms of increasing the KBE, were in fact fulfilled.

Measuring the impact of the Structural Funds

This subsection outlines the various approaches towards measuring the impact of Structural Funds in the subject literature, putting an emphasis on the hitherto proposed methodologies and its limitations – summed up in the final paragraphs of this section. The review of literature allowed the thesis' author to develop her own methodology, which will be applied to the research on the European Funds and their possible impact on the Knowledge-Based Economy as further discussed in the next section.

Although the literature on analysing the impact of Structural Funds and Cohesion Policy in general on regional economic disparities seems to be vast – as demonstrated in the following paragraphs – there are only a few empirical verifications which various scholars adapt for the purpose of measuring their impact, mainly on regional and national development (see e.g. Bachtler & Wren (eds.), 2006). Another vital observation is that most of the literature focuses on the impact of the Funds on the convergence between the regions (e.g. Neven & Gouyette, 1995; Boldrin & Canova, 2001; Midelfart-Knarvik & Overman, 2007; Dall'erba & Le Gallo, 2008) or on the issues of general economic growth in particular groups of regions (Cappelen *et al*, 2003; Rodriguez-Pose & Fratesi, 2004; Puigcerver-Peñalver, 2007), or takes into account only a small number of regions (e.g. Huggins & Strakova, 2012).

For this reason, the study undertaken in the thesis, which looks into the impact of Funds on a very particular issue such as the Knowledge-Based Economy but does that across all of the EU regions before focusing on a chosen few, is a novelty in this field. Nevertheless, the author of the thesis believes that some of the methods used and described in this section may be used to assess the impact of the Funds on the Knowledge-Based Economy within the regions. Therefore this subsection allowed the thesis' author to review the already proposed methods of measurement and introduce her own Methodology on pages 81-84.

The two basic concepts which need defining before exploring the existing research are *β-convergence* and *catch-up:* The first term was introduced by Barro and Sala-i-Martin[3] (1991) for measuring the convergence between the states of the USA; and in the simplest terms, the *β* type of convergence occurs when poor states (or regions within states) tend to grow faster than rich ones. The *catch-up* effect is strictly linked to the concept of *β-convergence*, for it implies that less developed economies are capable of increasing their level of technology and know-how faster than the advanced ones, due to the fact that it is far easier to copy already existing technologies than to invent new ones. These concepts are of paramount importance for the research presented in this thesis and their role is evoked again on pages 45 and 219.

A significant part of the subject literature is concentrated solely on the issue of convergence but often with varying opinions, particularly regarding the convergence speed, as shown in the following paragraphs. Discussions between scholars reach back to late 1980s and early 1990s. Some of the scholars, especially from that time, do not focus directly on the impact of Structural Funds on the growth process, rather just on the process itself.

Most controversies have arisen regarding the empirical assessment of convergence. In the works of the already mentioned Robert Barro and Xavier Sala-i-Martin it is argued– according to the neoclassical paradigm – that liberalization, such as occurred after the accession of Spain and Portugal in 1985 and subsequent introduction of an internal market programme, are factors which in the process of convergence would increase production output, but not always income (Barro, 1991; Barro & Sala-i-Martin, 1991). Opposite views, as presented by Krugman and Venables (1990) and Baldwin (1989) state that trade liberalization in the presence

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[3] Barro and Sala-i-Martin also introduced the concept of *σ-convergence*. This relates to the various measures of dispersion or variation in the distribution of income per capita during a given period of time. Σ-convergence occurs when the dispersion of income per capita across a group of economies falls over time. When the partial correlation between the growth of income over time and its initial level is negative, the convergence is of β- type (Barro & Sala-i-Martin, 1992).

of increasing returns would not accelerate convergence, although it may in fact increase average growth.

Some authors associate the concept of convergence with the idea of cohesion rate (e.g. Bailey & De Popris, 2002). In economic terms the latter means reducing regional disparities between the Member States and their regions, measured by the GDP per capita and unemployment rate; regional disparity is measured as the standard deviation of the regions' GDP per capita normalized to the European average.

One of the approaches considered recently by some scholars (e.g. Puigcerver-Peñalver, 2007) as particularly appropriate for the measurement of the Structural Funds' impact is the "growth" approach, based on the neoclassical Solow growth model, in which the implementation of Structural Funds increases the level of physical capital and hence corresponds to a higher steady state income. At the same time, because of the decreasing marginal product of capital, the investment rate declines towards the steady state income and the stock of capital per capita is constant. Therefore, a higher investment rate in poorer regions can increase the pace of convergence, but this is only transitional since it does not raise the growth rate in the long run (Puigcerver-Peñalver, 2007). However there are also empirical studies which present somewhat contradicting findings. For example, García-Solanes with María-Dolores (2002) found that the absolute β-convergence between the regions which were recipients of structural finding in the period 1989 − 1996 was 2.5% comparing to 8.6% β-convergence between states in the years 1989-1996. Yet if taking into account the Structural Funds they received the speed of convergence reached respectively 3.8% for regions and 15.18% for states (García-Solanes & María-Dolores, 2002).

The second group of theories are the endogenous growth theories, which grant an important role in determining the growth rates in the long run to public policies. For example it is predicted by Aschauer (1989) and Barro (1990) that if the production function is to take account of public expenditure then policies which finance new public infrastructure will increase the marginal product of private capital and through that foster the accumulation of capital and growth.

Another different approach aims to analyse the contribution of the Structural Funds towards economic convergence by estimating conditional convergence equations (e.g. before mentioned García-Solanes & María-Dolores, 2002; Cappelen *et al,* 2003). In this aspect the research of Cappellen, Castellacci, Fagerberg and Verspagen yields particularly important results, as its findings suggest that whereas regional support has had a generally positive impact on the growth of regions, economic benefits of such support tend to be much stronger in the economies which are already more developed (Cappellen *et al*, 2003: 640). This stands in opposition to the already described concepts of *catching-up* and *β-convergence* and serves as a point of discussion with regards to the findings of this thesis, as presented in the Conclusion chapter (p. 219).

Although, as demonstrated, there are a considerable number of studies which confirm the positive impact of the Structural Funds on regional growth, it has to be said that not all scholars agree with this and the empirical studies' evidence remain ambiguous.

Considering the research on non-positive effects of the Funds, authors who need to be mentioned are Michele Boldrin and Fabio Canova. Their research (Boldrin & Canova, 2001) focused on the period 1982-1992 and included examination of changes in the statistical distribution of different factor productivities and income per capita in European regions. They concluded that the economic progress of regions receiving structural funding did not differ much comparing to the rest of the EU and that regional and structural policies and subsequent

allocation of Structural Funds mostly serve a redistributional purpose, but have little relationship with fostering economic growth.

Authors who also present a rather critical point of view regarding the Structural Funds' effectiveness are Sandy Dall'erba and Julie Le Gallo, whose research focuses on the spatial econometric analysis of the Funds' impact (Dall'erba & Le Gallo, 2008). They believe that exclusion of significant spatial statistical and econometric features (such as β-convergence, technology spillovers and migration effects) may lead to unreliable results in measuring the Fund's impact. The authors argue that since the majority of Structural Funds in the period they measured (1989-1999) was to finance transportation infrastructure they induced industry relocation effects, and the research and econometrical tests they conducted proved such a distribution of the Funds to be ineffective – at least in its current form.

The ambiguous results produced by the literature may be partly due to the specific nature of the data used for the analysis. It must be noted that there is no complete multi-annual (i.e. prior to 1990s) dataset of Structural Funds at a regional level – mainly because of changes in administrative borders within the Member States and enlargement of the EU. There are also no historical regional financial data, because EU spending was subject to regional classification only from the mid-1990s. What is more, studies refer to programmed and/or committed amounts, not the quantity of money actually spent by given regions (see e.g. Boldrin & Canova, 2001; García-Solanes & María-Dolores, 2002). These limitations of timeframes and used data apply to this research as well; they feed into the Research Design presented in the next chapter and are also revisited and discussed in more detail in the further part of the thesis, which deals directly with this research's limitations (p.233-234).

In order to proceed to presenting the Research Design, two things need to be taken into account. Firstly, the various methods of measuring the Funds' impact proposed in the literature, and secondly, the already stated intended novelty scope of this research, i.e. measuring the impact of the Funds on one particular phenomenon in the EU (the Knowledge-Based Economy) instead of rather ambiguous "growth" which the literature approaches in various ways. Considering the two issues it was decided that the methodology of the research – its quantitative part – will loosely follow the one proposed by Martin and Tyler (2006), who evaluated the impact of European Union regional policy on cumulative job creation in the least prosperous Objective 1 regions not by "formal econometric model building" (Martin & Tyler, 2006:204) but using more straightforward statistical methods, such as time-series analysis and correlation.

The author acknowledges that as useful as econometric models can be, devising models works best in the cases of multiple variables, as demonstrated in the prior review of existing literature. Such methods seem fit for addressing the issues of "convergence", "growth" etc. but in the case of measuring the relation between two clearly defined variables: the KBE and the volume of Structural Funds allocation (as per Research Design), using straightforward statistical methods seems more appropriate.

Chapter Two: Research Design

This chapter presents the research design for the thesis based on the analysis of the gaps in the sum of human knowledge in this field gleaned from the previously presented literature review. After addressing the gaps, the section gives reasons for the thesis' focus, followed by explaining the understanding of the terminology used in the research: the *Knowledge-Based Economy*, the *European (Structural) Funds,* and *regions*. This is followed by the presentation of the research questions - one main and two sub-questions – which the research aims to answer, and the hypotheses which are tested in the thesis. The subsequent methodology outline gives reasons for the chosen case-study regions, the adapted timescale of the research and remarks regarding the research ethics. A separate section is dedicated to presenting in great detail the methodology of quantitative research, including the introduction of the new set of KBE indicators and the new, original way of calculating KBE's General Index which is later used in the quantitative analysis (presented in Chapter Three). The final part of the Research Design thoroughly describes the methodology of the quantitative research, including reasoning behind the choice of expert interviews as the most appropriate method for obtaining data needed for qualitative analysis (demonstrated in Chapter Four), the key issues discussed during the interviews and the coded list of interviewees.

The number of gaps in knowledge identified through the precedent literature review allows for structuring the focus of the thesis, as follows:

First, despite a significant amount of studies regarding the KBE both in the scholarly environment (e.g. Castells, 1996; Cooke, 2002; Godin, 2006), and official publications of the EU and the OECD (e.g. OECD, 1996; European Council, 2000; OECD 2005; Eurostat 2005), there is no commonly agreed definition of the Knowledge-Based Economy and how it could be measured. In light of the preceding literature review it becomes clearly visible that although the

Knowledge-Based Economy is a concept that has gained significant popularity since naming it as the aim for EU development (European Council, 2000), the initial idea of the KBE was introduced much more recently than the last two decades. Concepts of *knowledge/information economy/industry*, *information society* etc. have confirmed the importance of defining the role which is played in contemporary societies by knowledge-rich products, leading to the development of economies on regional and national level.

Second, there is no common agreement as to the methods used for measuring the KBE (see pages 26-30), with individual scholars as well as various organisations proposing their own measurements and indicators for evaluating the Knowledge-Based Economy.

Furthermore, most of the literature on European Funds concentrates on Structural Funds and does that in a particular way – focusing on assessing the impact of Structural Funds on the development of the whole economy, be it its national or regional aspect - not on chosen topics "within" the economy, a notable exception being the work of Tyler and Martin (2006). However, in most cases issues such as patterns of employment or changes in the proportion of population in education are taken into account, but only as macroeconomic factors, i.e. parts of assessing the changes in economy as a whole (e.g. Dall'erba & Le Gallo, 2008). What is more, despite there being studies focusing on comparing regions within the EU (e.g. Sinn & Westermann, 2000), what has most often been taken into consideration was the general macroeconomic performance of given regions.

Taking into consideration all of the above mentioned points, this is an original study which reviews the impact of Structural Funds on a very particular issue: the development of the regional Knowledge-Based Economy. The uniqueness of the study stems firstly from devising the original methodology which allows quantitative assessment of the Knowledge-Based Economy for all 273 regions of the European Union; secondly the study not only provides a comprehensive overview of the KBE-Structural Funds relation across all of the EU regions, but

pays special attention to comparing two EU regions which have not been compared before (i.e. the Polish Silesia and UK's West Midlands) and does it in a particular time-scale: the years 1999 to 2009.

The reasoning for such focus is presented in the following parts of the thesis, and the outcomes of the study presented in Chapter Five significantly contribute to the sum of knowledge in this area.

Terminology

In the thesis the Knowledge Based Economy is understood as a phenomenon which can be measured by creating a composite index taking into account a number of chosen indicators for a given region, as reasoned in greater detail in the following Methodology section (pages 71 to 75); these include: Human Resources in Science and Technology (HRST), Employment in Technology and Knowledge-Intensive Sectors (TKIS), Pupils and Students in the Whole of Education (EDU), Total Intramural R&D Expenditure (GERD), and Patent Applications to the European Patent Office from the areas of hi-tech, ICT and biotechnology (EPO).

The concepts "European Funds" and "Structural Funds" are used interchangeably and denote the aggregated European Regional Development Fund (ERDF) and European Social Fund (ESF), unless explicitly stated otherwise.

The Cohesion Fund will be deliberately excluded from the research. The main reason for this is that although in some reports it is included in the group of Structural Funds, its aid aims only at the field of the environment and trans-European transport infrastructure networks (see e.g. MRR, 2007) and is not managed in any way on a regional level. Despite the fact it might be argued that the development of road infrastructure networks might contribute towards improving the Knowledge-Based Economy, because better roads may facilitate communication, the author decided against this argument favouring the fact that it is not a Structural Fund *per se*, and for this reason the Cohesion Fund will not be included in the group of European Funds taken into account in this research.

The final concept which needs to be defined for the purpose of this thesis is the idea of a 'region'. As made clear by Loughlin (1996:154) this word can be used in many different ways meaning either 'global' regions, i.e. collections of countries (e.g. Central-Eastern Europe), or particular territories within or across countries. The second approach to the concept can be

divided even further; a comprehensive attempt to classify the various ideas of regions *within/across* countries was undertaken by Keating and Loughlin (1996) who distinguish four types of possible understanding of a term 'region': economic, historical (ethnic), administrative (planning), or political. It is not often that all of the four ways of determining a region overlap (Loughlin, 1996:156) and for this reason, as pointed out by Mathias (2006:214), the scholars within the field of regional studies tend to adopt various definitions of a region, depending on their research objective.

Following this observation, the nature of this research topic makes it logical that henceforth "regions" would be understood best by using the European NUTS nomenclature.

NUTS (Nomenclature of Territorial Units for Statistics) is a tool designed and used for statistical purposes by the European Commission via the Statistical Office of the European Union (Eurostat). It was developed initially in the late 1970s to provide a uniform, hierarchical, consistent division of territorial units of all the Member States and since then was regularly updated to reflect the enlargement of the Union (Regulation (EC) NO. 1059/2003). The NUTS-level spatial units are also considered as allowing collection of the most coherent and recognisably consistent time-series data which can be used in academic research (Martin & Tyler, 2006:204). Therefore, this classification of regions is of paramount importance for this thesis as it is not only essential for collection of regional data which feed into the quantitative analysis included in this research, but also it is the NUTS classification that served the framing of the EU Cohesion Policy and the implementation of the Structural Funds on the NUTS-2 level.

However, there is an important point that needs further consideration; whereas for the majority of the EU states using the NUTS-2 level data is perfectly logical, in some cases the use of NUTS hierarchy presents a more nuanced issue. The NUTS nomenclature was created adopting the regional units of the Member States (Loughlin, 1996:156) and did not always take into account the fact that in some of the states, the regions and their administrative functions

have been reformed over and over again by changing governments (Mathias, 2006:215). Such is the case for the UK, where in 1999 the Labour government created 9 regions for regional development, corresponding to the classification of the NUTS-1 level, instead of NUTS-2 (Sanford, 2006:175). The problem of the UK's regional division is further elaborated in the section explaining the choice of case-studies and timescales (pages 59-60). Yet it must be stated, again, that for the purpose of answering the research questions and testing the hypothesis presented in this thesis, the "regions" are understood predominantly as corresponding to the NUTS-2 division of the Member States.

Research questions and hypotheses

As already articulated in the very first part of the introduction, this thesis aims to investigate the relationship between the Structural Funds and the development of the Knowledge-Based Economy. Therefore the thesis' main research question is: ***what is the nature of the relationship between the development of the Knowledge-Based Economy and the Structural Funds in European regions?***

The author acknowledges that the thesis cannot give a complete answer to this question, but it extends the boundaries of what is known within the field in an unprecedented way. Examining the relation between the two phenomena on a regional level across all of the EU regions in a time frame of a decade is a large endeavour, and therefore the main research question is broken down into two following sub-questions:

First, ***what is the relationship between the amounts of European Funds allocated and the changes in the Knowledge Based Economy calculated as a composite index of its indicators?*** Whilst the author recognizes that correlation of those values may not immediately suggest causation, the study will allow for some helpful conclusions to be drawn. By putting emphasis on the qualitative part of the research, the thesis will give the fullest possible practical picture of the relationship between the use of European Funds and the KBE.

Second, the study will focus on the case studies of the regions of the West Midlands (UK) and Silesia (Poland) for the reasons explained in the section on case-study selection, therefore the next sub-research question is: ***what is the difference in the KBE development and the approach towards the Funds in regions from different Member States?*** This question will be answered by performing both qualitative and quantitative research in order to give the fullest possible picture.

The hypotheses for these questions are presented on the following page and the results of the hypotheses' testing are demonstrated in Chapter Five (p.216-232).

H1: The Knowledge-Based Economy expressed by the values of KBE General Index (GI) increased in European regions over time;

This hypothesis stems from the EU's objective to have become "the most competitive KBE in the world", as expressed in the Lisbon Agenda in the year 2000 (European Council, 2000). The hypothesis sets out to investigate whether there has been any increase in the values of the KBE since the goal was announced, and the issue is addressed foremost by the quantitative part of the research. The testing of this hypothesis is made possible by firstly, calculating the new, original General Index of the Knowledge-Based Economy according to the original methodology presented in the following sections of this chapter and secondly, analysing the performance of the GI in European regions over the time-frame assumed on the grounds explained on pages 67 and 68. Particular attention was paid to the British region of West Midlands and Silesia in Poland, as per justification presented in subsequent sections of the Research Design.

H2: There is a statistically significant relationship between the amount of European Funds allocated to the given region over time and the changes in the value of the region's KBE.

The second hypothesis assumes a relationship between the two variables on a statistically significant level and the testing of this hypothesis stems from an investigation into the matter of possible changes of the KBE over time even deeper than the one needed for the first hypothesis. The results feed more into the main research question and aim at giving a partial answer from the quantitative perspective. The value of KBE is understood in terms of its General Index and a significant part of the quantitative research is dedicated to exploring the possible statistical relationship between the two variables using two types of correlation coefficients and the analysis of variance (ANOVA).

H3: The performance of the Knowledge-Based economy and the approach towards the Structural Funds are substantially diverse in the two case-study regions.

This hypothesis is set as a partial answer to the second sub-research question. It stems in part from the literature review which points towards the importance of institutions and governance, and also from the expected results of the quantitative analysis of both performance of the KBE and its particular indicators across European regions, and the relationship between the KBE and the Structural Funds allocation. The testing of the third hypothesis is carried out by using a mixed-method approach, due to the fact that although the quantitative analysis may provide a seemingly objective answer, it is the qualitative part of the research that sheds more light on the possible differences in the approaches towards the Structural Funds in the West Midlands and Silesia.

Outline of the methodology

This part of the thesis describes the methodology which is used to gather and process the data that will be used to find the answers to the research questions and verify the hypotheses outlined in the preceding parts of the section. Also the reasoning behind the particular choice of case studies and timescale of the research is given. The chosen methods and techniques are described in great detail and their appropriateness is demonstrated.

The research is mainly based in the field of regional studies, as the predominant interest of the thesis lays in the broad field of regional development (both in terms of developing the regional KBE and investigating into the Structural Funds as a potential source of this development). The discipline of Regional Studies has also been credited as rich in quantitative comparative techniques (Markusen, 1999:872), which this study indeed includes to a significant extent. The research also draws elements from the field of political economy which can be understood as an interdisciplinary approach, joining economics with political science (see e.g. Alesina, 2007). What is more the scope of the research also takes into account other disciplines, e.g. statistics, international relations, EU jurisprudence and elements of sociology, and hence the research can be defined as one of a multi-method approach.

Choice of case studies and timescale

The main aim of the thesis is to assess and compare the influence that European Funds have on developing the Knowledge-Based Economy on a regional level in all of the EU member states. For reasons outlined further on, the predominant focus of the thesis rests on the UK's West Midlands Region (WM) and Polish Silesia (*Śląsk*).

Yin (2003:5-7) argued that the case study method is specifically suitable for answering 'how' or 'why' questions that concern events over which the researcher has no control, i.e. events which are not a result of an experiment conducted by the researcher. This is exactly the nature of the two phenomena (the Structural Funds and the KBE) whose relationship is examined in this thesis. Moreover, Yin provided a definition of case studies as empirical inquiries that investigate a contemporary phenomenon within its real-life context (2003:13) and this is what the thesis set out to investigate.

Conducting the case-study significantly contributed to answering the thesis' main research question, especially with regard to the second sub-question (p. 53). Focusing on just two regions allowed gaining particularly valuable and detailed insights concerning the approach towards the Funds and verifying certain statements of the interviewees against national and regional strategic documents guiding the implementation and management of the funds. Understandably, undertaking the case-study was also crucial for testing the third hypothesis (p. 55).

The author acknowledges the potential danger of drawing general conclusions solely from evidence base derived from a limited number of case-studies. This potential threat is mitigated by the fact that the overall conclusions of this study are drawn not only from the case-studies' findings, but also from the robust analysis of vast datasets covering all of the EU regions. The more detailed theory and reasoning behind applying such triangulation in this thesis is further discussed on p. 69.

When considering the impact of European Funds on economic development it is interesting to review the best- and worst- practice scenarios from different regions from the EU which have already been widely discussed in the subject literature. A juxtaposition of "fail" and "success" regional scenarios is of particular interest, as the study presented in this thesis is itself of a comparative nature. The two regions which received significant scholarly attention when it comes to assessing the impact of SF on regional development and are widely commented in the literature are the Italian region of *Mezzogiorno* and Ireland[4] (see e.g. Chenery, 1962; Mack Smith, 1969; Smyrl, 1997; Piattoni, 1997; Milio, 2007) Whereas the two regions are not the primary case-studies of the thesis, the existing literature suggests potential causes of the various patterns of the Funds' impact on the regional level. Most researchers agree that the reasons due to which Ireland was considered very successful, and *Mezzogiorno* failed, in taking advantage of the Structural Funds lied in the administrative capacities of the two regions.

This confirms that when researching the impact of the Structural Funds on particular regions what deserves interest is not only how much in terms of the SF was allocated to a given region, but also what was the behaviour of the institutions involved in managing and distributing the funds on the regional level. Deeper understanding of regional differences in approach to the SF, along with the assessment of the regional performance of the KBE over time, is the key element of the research puzzle of the KBE-SF relation; the subsequent section presents the methodologies applied to investigating this issue.

Before providing a brief description and comparison of the regions chosen for this case study, a few points need emphasis, relating back to the definition of "regions" as presented in the Terminology section on pages 50 to 52.

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[4] For the purposes of the Structural Funds allocation and implementation the country was treated as one region until the year 2000. After that date the Irish government opted to create two regions in order to preserve the entitlement for future funding.

For Silesia the NUTS-2 division is an adequate spatial measurement as it is in accordance with Silesia's present administrative, not historical or ethnic borders. The historical region of *Śląsk* (incorporating both Upper and Lower Silesia) consists of areas lying in what is contemporarily south-eastern Germany, south-western Poland and northern Czech Republic. The administrative region (also called voivodeship – "*województwo*") of Silesia was created on January 1, 1999, out of the former Katowice, Częstochowa and Bielsko-Biała voivodeships, pursuant to the Polish local government reform adopted in 1998 (Ustawa o wprowadzeniu zasadniczego trójstopniowego podziału terytorialnego państwa, 1998). The reform introduced a new three-level division of local authorities. A *powiat* is part of a larger unit – *województwo* ("voivodeship") and in turn a *powiat* is usually subdivided into *gminas* ("municipalities"). However some of the towns and cities function as separate counties in their own right, with no subdivision into *gminas*. These are called "city counties" (*powiaty grodzkie*); other powiats are called "land counties" (*powiaty ziemskie*).

Therefore henceforth "Silesia"/ *Śląsk* will be used solely as the name of the Polish administrative region ("*województwo*") corresponding to the NUTS-2 region coded as PL22 (Eurostat, 2010b).

However, for the West Midlands the issue is far more nuanced.

The term "West Midlands" can be used as a name for both a *metropolitan county* (corresponding to NUTS 2: UKG3; Eurostat, 2010b) and a *whole region* (NUTS 1: UKG; Eurostat, 2010b). What is more the issue of defining administrative "regions" in the UK and especially in England requires further attention. In 1946 the Treasury attempted to achieve a territorial measure of standardisation (Mackintosh, 1968:72) and nine "standard regions" were set up, in which central government bodies, statutory undertakings and regional bodies were expected to cooperate. From the mid-1960s some elements of regional development and economic planning activities were carried out by the newly-established Economic Planning Councils and Boards, which were then abolished by the Conservative Government in 1979 (Balchin & Sýkora,

1999:89-100). In April 1994 the John Major government created a set of Government Offices for

the English Regions (within the boundaries of the nine standard regions, plus London) (Sanford,

2006:175) but it was not until the structural reform of 1997 introduced by New Labour when the

regions gained more say in regional development affairs (Wilson & Game, 1998:362). Labour

introduced the *Regional Development Agencies Act* (1998) which established the RDAs in the

nine regions from April 1999[5]. The RDAs were defined by the needs of regional development

(Keating, 2006) and one of their key objectives was to take over the responsibility from

Government Offices for administering the European Funds (Wilson & Game, 1998).

Therefore, due to the fact the RDAs were established on what is ultimately NUTS-1

level, the quantitative analysis for all of the UK will be presented based on the data derived

from the information provided on the NUTS 2 level, however, aggregated to represent NUTS 1,

that is English standard regions. Another reason supporting this choice is that, as explained

further on in the section, the time-frame taken into account in this research will only consist of

the years 1999 to 2009, which are ultimately the years of RDAs functioning.

In the particular case of the West Midlands this has two implications. Firstly, the data

for the West Midlands region will consists of aggregated data from Herefordshire,

Worcestershire and Warwickshire, Shropshire and Staffordshire, and West Midlands (county)

(according to NUTS codes: UKG1, UKG2, and UKG3, respectively; Eurostat, 2010b). Secondly, the

terms "West Midlands" and "the West Midlands Region" will henceforth mean the West

Midlands standard region, unless explicitly stated otherwise.

The West Midlands and Silesia appear to be similar in many background

characteristics, as it is further explained in the subsequent paragraphs, and for this reason they

can be used as examples for the two "most similar systems design" (MSSD) (Anckar, 2008:389-

390). The key feature shared by the West Midlands and Silesia is the historical reliance on coal

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[5] In June 2010, the Coalition Government announced its intentions to abolish the Regional Development
Agencies, with part of their roles being taken over by the Local Enterprise Partnerships (Department for
Communities and Local Government, 2010). The RDAs were effectively abolished as of 31 March 2012.

and iron ore extraction, heavy industry and subsequent development of manufacturing, which in the more recent times – involved car manufacturing in particular (see e.g. Pollard, 1980; Wiedermann, 2010). The author acknowledges that an argument could be made that there are other regions in the EU with historical economic dependence on coal extraction and heavy industry, the prime example being the German the Ruhrgebiet in North- Rhine Westphalia. However, it should be noted that Germany is a federal state and as such its administrative structures of managing and implementing the Structural Funds are by far different from the ones in the UK and Poland. What is more, the area of Ruhrgebiet is not classified as a NUTS 2 region. For these reasons, it would not fulfil the criteria required for the MSSD on which the choice of the case-study regions is based.

Figure 1. Location of the West Midlands Region and Silesia respectively within England and Poland
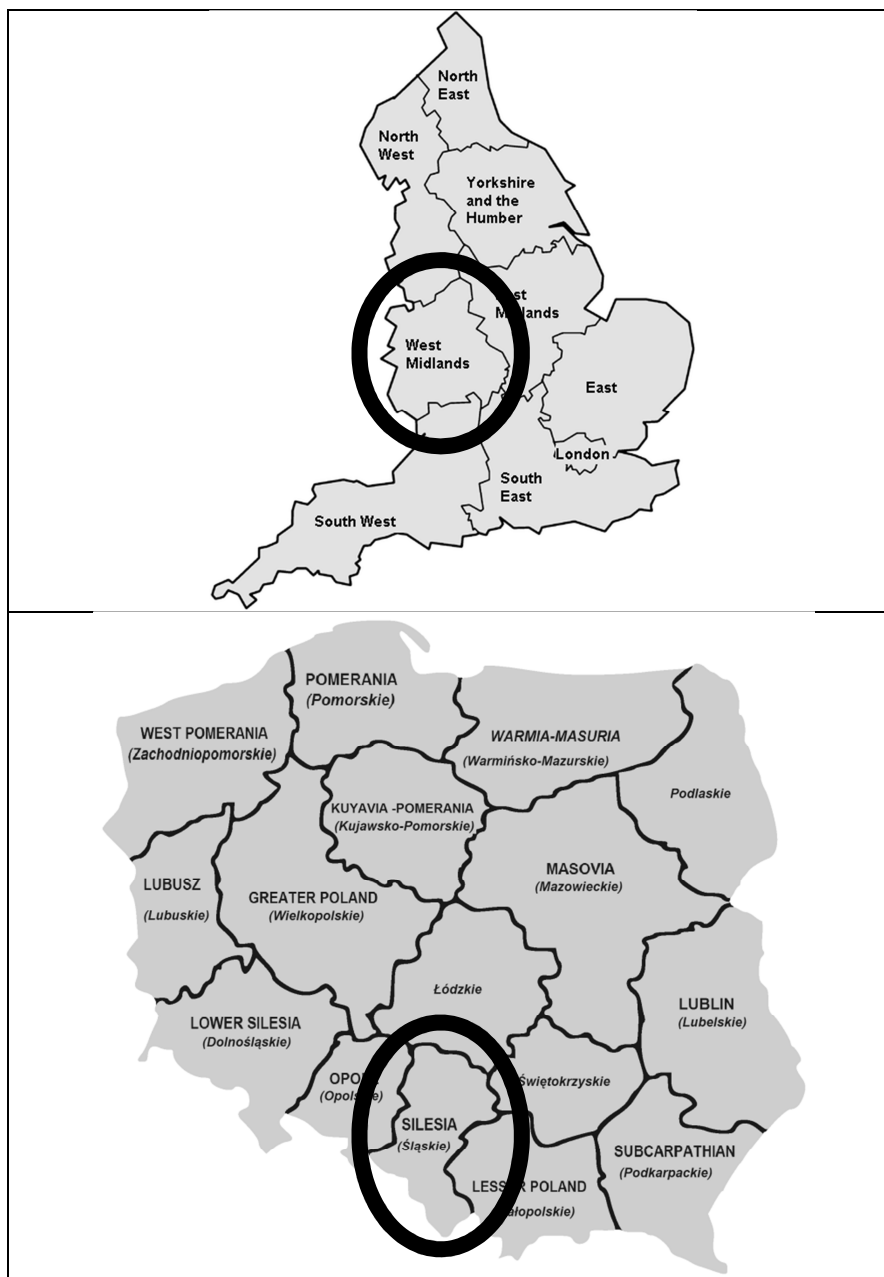
The West Midlands is a region populated by over 5 million people and contains the second most populated conurbation in the UK, which includes the cities of Birmingham and Wolverhampton and the large towns of Dudley, Halesowen, Solihull, Stourbridge, Walsall and West Bromwich and also parts of the surrounding counties of Staffordshire, Warwickshire and Worcestershire. This conurbation is inhabited by 43% of the region's population. Nevertheless

the region also consists of remote countryside in areas of Shropshire and Herefordshire, which

border Wales (West Midlands Observatory, 2009).

Figure 2. Map of the West Midlands region

Aston University

Illustration removed for copyright restrictions

Source: West Midlands Observatory, 2009.

The region is quite often referred to as "the workshop of industry" and the "industrial

heartland" of the UK (Spencer *et al,* 1986) as in the late 19th century it had become one of the

most industrialized regions in the country, mainly because of its coal mines, steel mills and iron

foundries. During most of the 20th century, employment in the WM was strongly dominated by

manufacturing, which included famous car manufacturing most notably at the Longbridge Plant

producing Austin, British Layland, Morris and Nash Metropolitan cars up until 2005. Other

brands' factories included Land Rover (Solihull), Jaguar (Coventry and Castle Bromwich) and BMW engine plants (in North Warwickshire). West Midlands-produced brands also include for example JCB (Staffordshire) and Cadbury (Birmingham). In more recent years, manufacturing has declined dramatically in importance and in 2009 it accounted for only around 13% of jobs, which still situates the region amongst the highest proportions of people employed in the manufacturing sector in England (West Midlands Observatory, 2009).

The Silesia region accommodates four major agglomerations, which also constitute Silesia's four Sub-regions. The biggest one is *Górnośląska* (Upper Silesia), which includes 14 cities and towns with the status of a "*powiat*" (Bytom, Chorzów, Dąbrowa Górnicza, Jaworzno, Gliwice, Katowice, Mysłowice, Piekary Śląskie, Ruda Śląska, Siemianowice Śląskie, Sosnowiec, Świętochłowice, Tychy, Zabrze); it is the Polish area with the most concentrated urban population, inhabited by over 2 million people (ca. 40% of the population of the voivodeship). Three other agglomerations are the Agglomeration of Bielsko-Biała, formed by a city county of the same name and a population of 180,000; Agglomeration of Częstochowa formed by a city county and a population of 260,000; and the Agglomeration of Rybnik formed by three big cities with the status of a county: Rybnik, Jastrzębie Zdrój, śory and a county town of Wodzisław Śląski as well as adjacent townships: Pszów, Radlin and Rydułtowy (GUS, 2010).

Figure 3. Map of the Silesia voivodeship

Source: http://rpo.slaskie.pl/index.php?grupa=3&szukaj=mapa

The region is rich in natural resources which contributed to the development of coal and steel-based industry in the 18th and 19th century; until the present day Silesia plays a decisive role in the Polish fuel and power supply balance (ROP for Śląskie Voivodeship for the years 2007-2013, 2007). However at present, with the slow yet steady decline of coal-based industry, considering the investment volume what is becoming more and more important is the

car manufacturing; such as the plant of FIAT Auto- Poland S.A. in Bielsko-Biała and a car factory opened by GM Opel in Gliwice (ROP for Śląskie Voivodeship for the years 2007-2013, 2007).

The chosen geopolitical factors of the two regions are listed in the Table 2. and the similarities and contrasts between the regions are further discussed below.

Table 2. Chosen geo-political factors of the West Midlands and Silesia (2007)

Factor	West Midlands	Relative to the whole of the UK	Silesia	Relative to the whole of PL
Area	12,998 sq km	7th	12,334 sq km	14th
population	5,267,337	8.4 %	4,676,983	12.0%
population density	405 / sq km	5th	379 / sq km	1st
unemployment	8.3%	+ 1.2%	9.2%	- 3,5%
GDP per capita	24,800 €	85.2%	14,400 €	105.8%
Number of public universities[6]	9	Out of 115 (7.8%)	13	Out of 131 (9.9%)

Sources: West Midlands Observatory (2009), GUS (Główny Urząd Statystyczny) (2010), Universities UK (2010), PARP (Polska Agencja Rozwoju Przedsiębiorczości) (2008a).

As visible from the table, both of the regions have comparable area in sq km; the West Midlands is ranked 7th out of 9 regions in England, Silesia is 14th out of 16 voivodships in Poland. The WM population slightly exceeds 5 million, accounting for just over 10 per cent of the UK population, and 4.5 million inhabitants of Silesia equate to 12 per cent of the whole population of Poland. What also seems significant is that the population density in both regions remains similar, and oscillates around 400 people per sq km. Another factor which is similar in the regions is the number of universities located within them (9 and 13 respectively) and the percentage they contain in comparison to both whole countries. The regions also have a similar unemployment rate, but what is worth noticing is that the WM's rate is 1.2 per cent higher than the average UK rate, whereas the slightly higher value of the unemployment rate in Silesia is 3.5

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[6] This set of data excludes university colleges (UK) and private universities (Poland).

per cent lower than the Polish average. Yet the most significant difference between the two regions occurs in the GDP per capita, with the West Midland's average being almost twice as much as the one of Silesia (in real values). However, when comparing the regions' GDP with the average GDP of the whole of their respective countries, Silesia is standing in a more favourable position than the WM, as its GDP exceeds the Polish average, while the WM's GDP does not reach the national UK average.

What is also worth pointing out is the already mentioned fact that both of the regions share "industrial heritage" - until recently they were reliant on manufacturing (as opposed to agriculture and services) and in the last two decades they both needed to face significant changes and a decrease in the traditional manufacturing industry (Spencer *et al*, 1986; Wiedermann, 2010) and the transition towards a Knowledge-Based Economy.

The author has decided to compare the two above regions in a specific timescale: from 1999 to 2009. This is for several reasons. 1999 was the year in which significant legislative changes with respect to the regional division took place in both the West Midlands and Silesia: in England the Regional Development Agencies took over the roles of administrating the European Funds in the nine English Standard Regions; and in Poland the administrative reform came in force, substituting the hitherto 49 regions for new 16 units. Furthermore, the Lisbon Agenda was announced just a year later (European Council, 2000); therefore the year 1999 seems a convenient baseline, a starting point for further analysis.

The choice of the time scale's ending year was also made because of number of reasons. Firstly, 2009 was the second year of the 2007-2013 perspective, and according to the "*n+2*" rule[7], this is when the evaluation of the already funded projects needs to be completed. Secondly, the year 2009 constitutes the span of 10 years, which is long enough for conclusions to be drawn. Also, at the time of collecting the data for the purpose of the quantitative analysis, the year 2009 was the last year for which comprehensive regional data were available.

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[7] The de-commitment rule ("n+2") is set out in Article 31 of Council Regulation 1260/1999 and is a financial control designed to encourage sound management of the programmes and avoid end-loading of activity. It requires de-commitment of any funds not spent by the end of the second year following the year to which they were allocated.

Applied methods and data sources

The section outlines the basic reasoning behind choosing the methods applied for the research and the sources of the data used for the study. Due to the complexity of the methodology adopted for the research, the detailed discussion and description of the quantitative methodology and the qualitative methodology are presented in two separate subsections which follow this introduction. These include the explanation of the appropriateness of the two methods and specific information on the sources of data and the ways in which they were analysed.

The literature on the research methods in social sciences has a long and distinct tradition of endorsing the use of multiple methods (Todd, 1979). The multi-method approach in methodology is often referred to as "triangulation" (Webb *et al.*, 1966), which is a metaphor derived from navigation, when multiple reference points are used to locate an exact position of an object (Smith, 1975:273); and following the definition proposed by Denzin (1978:291) denotes a "combination of methodologies in the study of the same phenomenon". The method of triangulation is still advocated in more recent years by a number of scholars originating in different sub-disciplines of social sciences (e.g. Patton, 2001; Read & Marsh, 2002; Downward & Mearman, 2007).

The triangulation is recognised as possible to obtain both *between* methods, i.e. by using both quantitative and qualitative approaches (Patton, 2001:247) as well as *within* the methods (Read & Marsh, 2002:237).

The research presented in this thesis includes triangulation in both aspects. As presented in greater detail in the following section, the quantitative part of the study uses three different statistical approaches – Pearson's product-moment correlation, Spearman's rank correlation and Analysis of Variance to analyse the data (triangulation *within* the method); the research also includes a qualitative study (triangulation *between* the methods).

Following the typology of methods' combination made by Creswell (1994) into: i) a two-phase design, ii) a dominant/less dominant design; iii) a mixed methodology design, the thesis' author has decided to apply the first approach; therefore the research was conducted in separate qualitative and quantitative phases, with an emphasis put on the former.

The combination of the two methods is in itself rather a novelty in the field of research into European Funds; as outlined in the literature review (pages 41-46), most of the studies undertaken previously focused on assessing the impact of various Funds solely by constructing various econometrical models (see e.g. Puigcerver-Peñalver, 2007; Dall'erba & Le Gallo, 2008). It has to be admitted that the two-method approach has been used recently by Huggins and Strakova (2012), yet on a much smaller scale, as the study focused solely on the regions within the Balkan Peninsula. Therefore using the combined quantitative and qualitative methods for investigating into the relationship between the Knowledge-Based Economy and the Structural Funds is an original methodological attempt, which can shed unique light on the study's key issues.

Methodology of the quantitative research

As mentioned in the previously presented outline of the methodological approach, after careful consideration reinforced by scholarly literature, the author decided on performing the quantitative and qualitative research in separate stages. This section presents the methodology chosen for the quantitative investigation, the most important part of which is choosing particular KBE indicators and creating a new approach towards measuring the KBE as a composite index. This is followed by an outline of the statistical methods used for exploring the relation between the KBE and Structural Funds in quantitative aspect.

The various indicators and ways of measuring and calculating the KBE presented in the review of existing literature in conjunction with the accessibility of data allow for making an informed judgment and as a result – creating a new synoptic set of KBE indicators and the general KBE index based on them, which will be used in the quantitative analysis presented in Chapter Three.

The new set of indicators

The literature review already demonstrated that there already exist a number of sets of KBE indicators. Nonetheless, in the light of previous sections (p.26-30), none of the aforementioned indicators seems to be comprehensive enough and fit into the desired research structure.

Therefore, based on the previously discussed scholarly theoretical approaches and cross-referencing the lists of practical indicators (see Appendix 1), for the purpose of the thesis the following indicators are proposed:

- Human Resources in Science and Technology (HRST),

- Employment in Technology and Knowledge-Intensive Sectors (TKIS),

- Pupils and Students in the Whole of Education (EDU),

- Total Intramural R&D Expenditure (GERD),

- Patent Applications to the European Patent Office: hi-tech, ICT and biotechnology (EPO).

All of the indicators are scaled to relative values, i.e. expressed as either: the percentage of active working population (i and ii), all population (iii), the percentage of the GDP (iv), or per million inhabitants (v). Detailed description and analysis of the indicators, including their possible shortcomings, is included in the subsequent paragraphs.

Because the data (values) of the above indicators are taken from the Eurostat database, this database remains the main source of indicators' definitions and units of measurement adopted for the purpose of this research. As the data available via Eurostat are based on data submitted by individual EU Member States and regions, the author considers them a reliable source of information.

The first indicator, Human Resources in Science and Technology (HRST), is defined as persons fulfilling at least one of the following two conditions: they are individuals who have successfully completed university level education; and individuals who are employed in a science and technology occupation as 'Professionals' or 'Technicians and associate professionals'. A few concrete examples of different types of HRST include a computer system designer with a degree in computer science (qualified and employed as HRST); an engineer staying at home to raise his/her children (qualified as HRST but not employed); a language teacher with high school ('secondary') level education (Employed as HRST but not qualified at university ('tertiary') level).

As stated earlier, the values of HRST in this research are presented as a percentage of the whole active population. The data are based on the *Manual on the Measurement of Human Resources devoted to Science and Technology ("Canberra Manual"),* written jointly by the OECD, UNESCO, the International Labour Organization, DG Research and Eurostat (OECD, 1995). This manual describes highly-skilled human resources as essential for the development and flow of knowledge and as forming the most important link between technological progress, economic growth, social development and environmental well-being (OECD, 1995:3).

This indicator is supplemented by the second one, Employment in Technology and Knowledge-Intensive Sectors, presented as a percentage of total employment in a given EU region. The data derived from Eurostat on this indicator include high-tech knowledge-intensive services and high-tech manufacturing. The high-tech knowledge-intensive services include motion picture, video and television programme production, sound recording and music publishing activities, programming and broadcasting, telecommunications, computer programming and related activities, information service activities and research and development. High-tech manufacturing covers production of pharmaceutical products and pharmaceutical preparations, and of computers and electronic and optical products (Eurostat, 2010c).

The third indicator takes into account the number of people in the whole education system (i.e. primary, secondary and tertiary) expressed as a percentage of the whole population in the given region. It has been chosen instead of comparing the numbers to the population under 18, due to the fact that some EU states provide primary and secondary education for people over the age of 18 (e.g. *licea dla dorosłych* in Poland, *folkuniversitet* in Denmark); it also allows to take into account mature students, i.e. people who decided to pursue their tertiary education at a later stage in life.

The fourth indicator is the Gross Domestic Expenditure on Research and Development (GERD). GERD includes R&D performed within a country and funded from abroad but excludes payments for R&D performed abroad. This measure is constructed by adding together the intramural expenditures of the four performing sectors which include expenditure on research and development by business enterprises, higher education institutions, as well as government and private non-profit organizations. Eurostat's statistics on R & D expenditure are compiled using guidelines laid out in the *Frascati manual* (OECD, 2002). For the purpose of this research and to make figures more comparable, GERD values are given as a percentage of a given region's gross domestic product (GDP), what is otherwise known as "R & D intensity".

The final, fifth, indicator is the number of patents submitted to the European Patent Office (EPO). European patent applications refer to applications filed directly under the European Patent Convention (EPC) or to applications filed under the Patent Cooperation Treaty (PCT) and designated to the EPO (Euro-PCT). Patent applications are counted according to the year in which they are filed and are assigned to a region according to the inventor's place of residence, using fractional counting if there are multiple inventors (Eurostat, 2011a).

This research takes into account patents from the area of Information and Communication Technologies (ICT), biotechnology and high-technology. In order to make the data more comparable on the regional level, the number of patents was re-scaled to be expressed as per million inhabitants.

The most obvious aim of patents is to protect R&D output, but they are also a significant source of technical information, which can help to avoid unnecessarily reinventing and redeveloping ideas. A count of patents can be one of the measures of a region's inventive activity and also can show its capacity to exploit knowledge and translate it into potential economic gains; however it does have certain limitations. Firstly, not all inventions are systematically patented. Furthermore, not all patents have the same intrinsic value and in the

end only a small proportion of them lead to significant technological breakthroughs (Eurostat 2010c).

Nevertheless, this indicator was chosen because patents, being a particular form of intellectual property rights, can provide a link between innovation, inventions and the market; what is more, the number of patents is not a sole indicator taken into account in this research and it should not be omitted. Bearing in mind all of the indicator's limitation an important point relates to the mathematical *weight* assigned to the indicator (see pages 79-80 and Appendix 2): it has been assigned the lowest value.

A valid issue is the positioning of this new methodological approach within the methods of KBE measurement proposed by other scholars and presented in the previous chapter. To the author's best knowledge the previous approaches were never focused on one particular aspect within the economy and therefore they consisted of creating complicated econometric models which would take into account multiple economic variables. This research focuses predominantly on the KBE – SF relation, therefore the use of two proposed correlation coefficients (Pearson's *r* and Spearman's *ρ (rho)*, as explained in further details in the subsequent parts of this chapter) and two-way ANOVA (Analysis of Variance) as the key quantitative analytical tools is due to a conscious limitation of other economic variables. Because, as explained in the following subsections, the weights of particular KBE indicators are taken into account when calculating the General Index, the KBE GI is then used as an aggregate.

The General Index

The analysis of the Knowledge-Based Economy in European regions is performed by assessing their performance on the basis of a general KBE index. This includes calculating the indexes of the KBE in all of the 273 European regions, according to the indicators presented on the previous pages and using the statistical methodology for composite indicators as presented in the following paragraphs. After calculating the general KBE index in real values, totals for each region (NUTS 2) and each year from the previously assumed time-span are normalised to a coefficient where the mean will be equal to 100 and each score is transformed into a value >100 or <100 as this will allow for a good comparison between the regions.

The singular index for each of the regions in real values will also be used in the further part of the thesis; because the ultimate goal of the thesis is to examine the relation of the Knowledge-Based Economy and the Structural Funds (as an aggregate), it was decided that at that stage of the research, the KBE index should also be used in its aggregated form.

An important issue at this point is the choice of methodology for calculating a composite index out of several indicators (presented above). There are various attempts at calculating general indexes relating to the Knowledge-Based Economy (an example being the World Bank's *Knowledge Index* (KI)) or the evaluation of the "Performance in the knowledge-based economy" (by Directorate General for Research and Innovation, henceforth DG RTD).

In the KI proposed by the World Bank there are three key variables, which serve as proxies for what is referred to as "Knowledge Economy Pillars". These are: Economic Incentive and Institutional Regime; Education; Innovation and Information & Communications Technology (ICT); what are also included in the index are two variables for the overall economic and social performance. The World Bank's methodology measures both the *Knowledge Index*, which is based on the three last pillars as well as the *Knowledge Economy Index*, which assesses performance on all four pillars. The resulting scorecards of indexes demonstrate the

comparative performance - the variables are normalized on a scale from 0 to 10 relevant to the possible Comparison groups – all countries, regions (understood differently than as NUTS 2, as previously explained in the Terminology section) and income groups (World Bank, 2009).

This study part derives from achievements of both DG RTD and the World Bank, yet what must be noted is that the originality of this study will lie in a number of reasons: firstly-choosing a different set of indicators, secondly – operating in different timescales and thirdly, calculating the general index for regions, not nations.

An excellent overview of possible methods for creating composite indexes is given in "Exploratory Research Report: The Integration of Thematic Composite Indicators" (Saisana *et al.*, 2003). The methods vary significantly, both in terms of their complexity and in their relevant application.

One end of the complexity scale is represented by the method of simply summing the rankings of territories (countries/regions) based on ordinal levels. Its main advantage, apart from simplicity, is the independence to outliers. The disadvantage of this method is that it loses absolute level information. The other end of the complexity scale is the method of calculating re-scaled values, where the obtained general index is based on the standardised scores for each indicator which equal the difference in the indicator for each country and the EU mean, divided by the standard error. This method introduces the problem of increasing the range for indicators with very little variation (Saisana *et al.*, 2003:5-7).

Based on the list of possible methods, for the purpose of this research a decision was made to focus on the method of *Ratio or percentage differences from the mean* which when adapted to the needs of this research takes the average of the ratios (or percentages) around the EU mean for each indicator, for each year. The ratios for all regions are then summed and divided by the number of indicators (multiplied by their respective weights). The advantage of

this method is that it can be used for calculating changes in the composite indicator over time

(Saisana, *et al*. 2003:5), which is exactly what is the intention and desire of this research.

When adapted to the requirements and data of this research, the mathematical

formula for the chosen method presents as follows:

$$GI_r^t = \frac{\displaystyle\sum_{i=1}^{N} w_i\, y_{ir}^t}{\displaystyle\sum_{i=1}^{N} w_i}$$

where:

$$y_{ir}^t = \frac{x_{ir}^t}{x_{iEU}^t}$$

and:

GI denotes the "General Index", which is the composite indicator value for

the region *r* at time *t*;

x_{ir}^t is the value of indicator *i* for the region *r* at time *t*;

x_{iEU}^t is the value of indicator *i* for the EU mean at time *t*;

w_i is the weight assigned to the indicator *i*.

The final significant issue is assigning the weight to the indicators. As noted by Saisana

et al. (2003), it is not possible to know (or estimate) the *real* weights since this would require a

dependent variable (in the case of this research this is the KBE General Index). On the other

hand, if there were a satisfactory dependent variable there would be no need for a composite

indicator.

For the purpose of this research it was decided to assign the weights depending on cross-referencing the indicators, i.e. the frequency of consideration of the indicators in the main indicators lists presented in Appendix 1. The assigned weights are then used in calculating the KBE General Index following the methodology presented below.

Taking into account the fact that the significance of chosen indicators among the analysed organisations is diverse, what needs to be calculated first is the *absolute weight coefficient (α_i)* for a single indicator within each of the lists of indicators of each of the organisations listed in Appendix 1. This will be defined as a reciprocal of the number of indicators (*m*) considered by each one of the analysed organisations for evaluating the KBE.

$$\alpha_i = \frac{1}{m_i}$$

where:

m_i is the number of indicators used by a given organisation to evaluate the KBE.

After obtaining the results of the *absolute weight coefficients,* in order to assign weights to the indicators chosen for calculating the KBE General Index (according to the formula presented on previous page), it is needed to calculate the *relative coefficient of weight* (t_i) for each of the five indicators. This coefficient will consist of the ratio of sum of weight coefficients for a given indicator taken into consideration by various organisations dealing with the KBE (*n*) to the maximal value of the coefficients' sum for this indicator, i.e. the situation if the indicator was used by all of the analysed organisations (*k*).

This can be presented using the formula:

$$t_i = \frac{\sum\limits_{j=1}^{n} \alpha_{i,j}}{\sum\limits_{j=1}^{k} \alpha_{i,j}}$$

where

$\alpha_{i,j}$ is the absolute weight coefficient

i is the number of indicator, $i=1,...,5$

j is the number of organisations taking the given indicator into consideration,

$j = 1,...,n,...k.$

k is the total number of analysed organisations which deal with the KBE

The obtained values of the relative coefficients of weight (t_i) for each of the indicators will have weights assigned according to the rule that maximal value of the relative coefficient will be assigned weight = 5. The other weights will be assigned proportionally to the obtained numerical values of the relative coefficients of weight of the other indicators.

The results of the weight calculations are presented in Appendix 2.

The obtained weights ultimately lead to calculating the KBE General Index and through that allow for close examination of the performance of regional KBEs over the assumed timescale in all of the EU NUTS 2 regions.

Statistical analysis

The statistical analysis of the relation between the KBE and the Structural Funds applied in the quantitative stage of the research took into account three methods. The first of them is calculating the Pearson product-moment correlation coefficient (*r*) of the volume of Funding allocated to a given region (x) and the region's KBE GI (y) for each of EU's NUTS 2 regions. This particular correlation is a measure of linear dependence between two variables and is considered to be highly informative regarding this type of dependence between variables, especially within vast datasets, even if their distribution is not normal (Rodgers & Nicewater, 1988).

The used formula for Pearson product-moment correlation coefficient is:

$$r = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sqrt{\sum (x - \bar{x})^2 \sum (y - \bar{y})^2}}$$

where $\bar{x}$ and $\bar{y}$ are the respective sample means.

This measure, however, has certain limitations which make it necessary to include also other methods of assessing statistical relations. Firstly, as already mentioned, the Pearson's product-moment correlation coefficient measures only the linear association between the variables; its values are not informative regarding any possibly existing curvilinear relationships. Secondly, any outlying points in the dataset (outliers) may have a disproportionate effect on the calculated *r* value and may lead to misleading conclusions (Rees, 2001). Therefore, to assure further examination of the relationships between the KBE and the Funds, a second correlation coefficient was used as well: the Spearman's rank correlation coefficient ρ (rho).

Spearman's ρ measures monotonic relationship between two variables and is robust to outliers (unlike Pearson's *r*, which measured only linear dependencies). It also does not require the data to be normally distributed. Because in the dataset of KBE and allocated Funds' values

no "tied ranks" were found, i.e. none of the sample values for the same region were equal nor as a result they were given the same rank, the ρ was calculated using the following formula:

$$\rho = 1 - \frac{6 \sum d^2}{n^3 - n}$$

where $\sum d^2$ denotes the sum of the squares of the differences in the ranks of the *n* observations, i.e. years in the assumed time-frame.

An important issue arising here is the problem of interpretation of the magnitude of obtained correlation coefficients, be it Pearson's or Spearman's. Several authors offered different levels of interpreting the value of correlation coefficients (e.g. Cohen, 1988; Smithson, 2000) and there is no overall consensus regarding the criteria and values unequivocally defining what constitutes a "strong" correlation.

Therefore for the purpose of this research the author assumes the following interpretation:

Table 3. Interpretation of correlation coefficients' values

Correlation	Coefficient values
None	$|0.00| < r, \rho < |0.09|$
Small	$|0.1| < r, \rho < |0.39|$
Medium	$|0.4| < r, \rho < |0.59|$
Strong	$|0.6| < r, \rho < |0.79|$
Very strong	$|0.8| < r, \rho < |1|$

In order to avoid confusion with 'statistical *significance'* (denoted throughout the thesis as "α") the author decided to designate the power of correlation coefficients by using the term '*meaningful'*. Therefore, henceforth the term "meaningful correlation" will be used to cumulatively describe correlation values as presented in Table 3. ranging from medium to very strong.

What is also of great importance for the analysis follows the observation by Martin and Tyler (2006:206), that what should be taken into consideration when performing quantitative analysis of the Structural Funds' impact is the lag between the funding commitment and its measured expected output, as a certain amount of time is required "for the resources to be drawn down and for there to be project implementation on the ground". Therefore both of the coefficients taken into account in this research are calculated in three different time series: t, $t+1$ and $t+2$. Time t implies that the strength of correlation is calculated for the same time spans of Funding allocation and KBE GI, i.e. it is examined whether the Funds allocated in 1999 are correlated with KBE GI value in 1999, the Funds allocated in 2000 are correlated with KBE GI results of the year 2000 and so on up to 2009. The second time series is $t+1$, which takes into account the correlation of funds from year t and KBE GI from the following year; for example Funds from the year 1999 to the KBE GI from the year 2000 and so forth. The final time series is $t+2$, in which case the funds from the year 1999 are compared to KBE GI from the year 2001 etc. The time series $t+1$ and $t+2$ were chosen to be calculated due to the fact that the allocation in a given year might not bring results (in terms of KBE GI change) until next financial year, and "n+2" rule of European Funds' spending requires all of the projects to be completed within 24 months[8].

The next statistical method used was the Analysis of Variance (ANOVA). Here the possible problem of non-normal distributions which would prevent using this analysis technique can be solved by recalling the *Central Limit Theorem* (CLT). In simplest terms it states that when the number of the sample is sufficiently large (most often exceeding 100 is sufficient, see e.g. Rice 1995:168) the means of variable will be approximately normally distributed, even if the variable in the whole of population is not distributed normally.

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[8] Please refer to the footnote on page 68.

Because of the results yielded by the analysis of Spearman's ρ - as presented and discussed in depth on pages 150-153 - the ANOVA was calculated separately for four groups of regions organised according to the allocated average level of annual funding: up to 10 million Euros, between 10 and 99 million Euros, between 100 and 499 million Euros and above 500 million Euros. The range of groups was chosen due to discrepancies between the volumes of funding allocations occurring between the regions. ANOVA was calculated as a two-factor one as not to neglect the potential effect that may occur on the KBE not only because of the volume of the allocated Funds but also due to specific circumstances of given regions (see pages 154-157).

All the above described statistical calculations were performed using Microsoft Excel and the SPSS Programme. Combined with the previously described new methodology of devising the Knowledge-Based Economy General Index, the chosen statistical methods allowed for in-depth quantitative analysis of the relations between the KBE GI and the allocation of Structural Funds in each of the 273 regions throughout the 1999-2009 period.

The findings of this analysis - presented in great detail in Chapter Three– allowed testing elements of all three hypotheses (as per pages 54 and 55): the possible increase of KBE values in regions over time, the relationship between the KBE and the volume of SF allocated on a statistically significant level, and the differences in the performance of the KBE across the regions.

Methodology of the qualitative research

The following section explains the chosen research methodology firstly by giving reasoning for choosing "stakeholder interviews" as the most appropriate method and qualifying the interviews within the thesis' broader setting; secondly, introducing the interview questions, and finally, presenting the interviewees who were chosen for this research and who provided the data needed for performing the qualitative study as presented in Chapter Four.

The author conducted semi-structured interviews in the two case-study regions in order to allow the interviewees to express more ideas which consequently lead to obtaining more diversified and flexible opinions on the explored topics, and by that shed more light on the conclusions of the quantitative part of the research presented on pages 158-163. This research approach was decided on based on a number of factors, as explained in the paragraphs below.

Stakeholder interviews in the case-study regions

According to McNabb (2004:359) a *case study* approach in qualitative research can be used for identifying conditions that contributed to a phenomenon or when the researcher wants to establish the relative importance of those contributing conditions. Furthermore, the qualitative case study research presented in this thesis is of an *instrumental* type (as per McNabb's division of case studies into *intrinsic, instrumental* and *collective*), i.e. serves the researcher for gaining greater insight into a specific issue (McNabb,2004:369). As already said in the initial paragraph of this section, this is exactly the case: the results of the qualitative part of the research serve as a deeper explanation of the quantitative findings.

The case-study interviews were semi-structured, because this type of questioning is open-ended, encourages free expression of the interviewees and offers a rich source of descriptive information. It can be argued that this is also the case in unstructured interviews, but as noted by MacQueen and Knussen, the use of the technique of purely unstructured interview

makes it almost impossible to categorise narratives (2002:36) and would make it impossible to apply the analysis techniques chosen by the author of the thesis and described in the paragraphs below.

Flick (2006:165) quotes an observation made by Meuser and Nagel (2002) that a particular form of applying semi-structured interviews is the expert interview. As noted by Dorussen et al. (2005:315), the use of expert interviews as an instrument to collect data is a rather common tool in political science and, in particular, in studies of the wide spectrum of issues relating to the European Union (see e.g. Hooghe, 1999). The expert interviews technique is based on "critical cases" (Patton, 2002), i.e. the research aims investigating at those cases in which the relations to be studied become especially clear i.e. opinion of experts in the particular field; the interviewees are of less interest than a whole person than their capacities of being an expert for a certain field.

However for the purpose of this thesis the particular fields in which the interviewees have expertise are varied: they are either directly engaged with management and distribution of European Funds, have experience consulting various companies and institutions in applying for the funding, or have themselves successfully bid for and managed EU-funded projects in fields which have a KBE-relating aspect. Therefore in order to emphasise the various positions from which the interviewees were engaged in the issues of European Funds and the Knowledge-Based Economy, from now on the author proposes using the term "*stakeholder interviews"*. This type of expert interviews has been applied before to research involving the issues of the Knowledge-Based Economy, with a recent example being the study by Huggins and Strakova (2012).

Agreeing with the argumentation of Dorussen *et al*. (2005), the thesis' author believes that for this particular research, stakeholders may provide a unique source of inside information about the practical application of European funding streams in relation to enhancing the regional KBE and especially to point out various problems and flaws in those relations.

The analysis of the interviews was carried out in five stages, following the recommendations of McNabb (2004:434-437). The first stage consisted of *data reduction*, which was necessary to cope with the large amount of data obtained during the interviews and reducing the data to a manageable size: this was made by disregarding all unimportant digressions and the small-talk contained in the interviews; the stage also included coding the interviewees, as presented in Tables 4 and 5. The second stage included *clustering*, i.e. grouping the interview data into two classes: interviews held in the West Midlands region and the interviews in Silesia. This was followed by *identifying salient themes in the data*, which meant categorising reoccurring themes and presenting the most note-worthy quotes of the interviewees regarding the highlighted issues. The subsequent stage was the *comparative analysis* of the similarities and contrasts both within the two clusters and between them. The last stage included *drawing conclusions* from the data, i.e. interpreting the results of the study. The comparative analysis and conclusions of this part of the research are presented in Chapter Four.

The interviews were expected to deliver results which would be comparable and serve as grounds for answering parts of the research question and testing the hypotheses as outlined on pages 54 and 55. Additional particular expectations relating to individual interview questions are outlined in the next section.

At the same time the author was mindful of a few limitations that may have occurred during the interviews, which the literature commonly associated with this type of data gathering methodology. The most obvious one seems to be that the interviewees may be influenced by the interview situation and because of an unconscious bias they may become an unreliable source for information (see e.g. Diefenbach, 2009:880). Alvesson argued that interviewees tend to follow "cultural scripts about how one should normally express oneself" (2003:169), however on the other hand it was observed by Patton (2002:343-344) that the semi-conversational style

of semi-structured interviews helps to encourage the interviewees to reveal their views and beliefs, while still remaining systematised and focused on the pre-determined key issues. Therefore the interviewer attempted to mitigate this risk of the interviewees' being overly influenced by the situation by firstly, conducting the interviews in spaces familiar to the interviewees (the premises of the interviewee's organisations) and secondly, by starting the interviews with a set of "scene-setting" questions (p. 90) intending to 'open-up' the interviewees.

The second potential limitation can be the conscious and deliberate attempts to mislead the interviewer, not necessarily due to mischievous character of the interviewee but because he or she tries to provide information or comments that appear to be plausible, appropriate and sufficient (Diefenbach, 2009: 881). The interviewer mitigated the risk of being consciously misled by triangulating the statements against official documents where this was applicable (see e.g. p. 194) and taking into account the fact that this 'tactical answering' (Diefenbach, 2009: 881) can itself be treated as evidence of prevailing thinking and opinions regarding given issue.

The last limitation of semi-structured interviews is that they can face the accusation of not being generalisable. As pointed out by Boyce & Neale (2006:4), generalisations about the results are usually not able to be made because small samples are chosen and random sampling methods are not used. However, at the same time they observed that interviews may provide valuable information when they are supplementing other methods of data collection, and this is exactly the case for this research.

The qualitative analysis included in this thesis is based on forty interviews which were carried out over the period of six months: twenty interviews in Silesia took place in August and September 2011 and January 2012, and the twenty West Midlands' interviews took place in October and November 2011, and January 2012. The number of the interviews was a result of reaching a point of theoretical saturation (Boyce, Neale, 2006:4; Corbin, Strauss, 2008:263) i.e.

the same stories and almost identical statements were repeated by a number of interviewees and no new data were emerging. It was decided that further gathering and analysis of data would add little to the conceptualisation, although the author acknowledged that variations could still be discovered.

The interviews were performed face-to-face. All of the interviews were intended to be recorded, however in five instances the interviewees did not agree to recording and in two cases the external circumstances made the recording impossible. The list of experts chosen for this research and organisations they represent is further presented in the following parts of the section in Tables 4 (for the West Midlands region) and 5 (for Silesia). It should also be noted that because the interviews took place in two different EU Member States and were carried out in Polish (in Silesia) and English (in the WM), the direct quotes from the Polish interviews, which will be found in the Chapter Four, are the translations into English made by the author.

Issues raised during the interviews

Following the main research question of the thesis, the two main focuses of the expert interviews were the Knowledge Based Economy and its relation to the European funds. Therefore each of the interviews focused mainly on the two groups of questions relating to those two issues. Yet what has also been taken into account were the different origins in terms of organisation of the stakeholders chosen to be interviewed, therefore in some cases the author included a group of secondary questions, which were diversified and asked respectively depending on the type and level of organisation which the stakeholder represented. What should be kept in mind is that most of the interviewees were also successful beneficiaries of EU funding, i.e. had bid and received European Funding for the organisations they had represented at that time; even if at the point of interviewing they have moved on to positions of consulting and managing the distribution of the Funds.

Before investigating into the core matter, the interviewees were asked for short introductory comments on two topics in order to "set the scene" and establish a common ground of understanding. These were:

a) Do you consider it appropriate to call the EU as a whole a "Knowledge-Based Economy"? Why so (why not)? and

b) What are the biggest challenges your region faces when it comes to becoming a fully-functioning Knowledge-Based Economy?

However it should be noted that those were secondary to the main focus of the qualitative research and will not be discussed in greater depth in the following parts of the section nor in Chapter Four, since their aim is purely introductory.

The main issues discussed explored the problems of EU Funds and the KBE on both "macro" and "micro" levels, i.e. relating to the whole of the EU and in the two case-study regions:

1. Do you think that European Funds are a useful tool for fostering the KBE in European Union and do they play that role also in your region?

With this question the author intended to explore the various phrasing, and hence perceptions, of the possible degree to which funds are believed to have particular relations with the KBE in the two regions. This was crucial for exploring in greater depth the findings of the quantitative chapter. The question also allowed observing varying degrees of enthusiasm towards EU financial support.

2. What do you believe attracts KBE-related beneficiaries to apply for European Funding? What are the greatest obstacles they face?

3. What are the biggest flaws one sees in the European Funding? If you had the power to do that, what would you change in the broad aspect of EU funding?

These were intended to find the greatest perceived flaws of EU funding when it comes to enhancing the EU's innovation drive and research activities. Also, because the question is designed to be as broad as possible, it allowed for exploring all the aspects of Funds' functioning: from programming, through allocation, implementation and issues with their spending on particular projects. To author's surprise it emerged that the flaws identified were relatively similar in the two case-study regions (see pages 206 and 229).

4. What was your organisation's motivation to apply for European funding? What sort of funding did it apply for?

Special attention was paid to the motivation behind pursuing EU funding in order to provide a wider context for the subsequent issues relating to the European funds. Because of the nature of the experts chosen for the interviews all of them had experiences in applying for EU funding to varying degrees, therefore they could also answer this question from the point of view of beneficiaries[9].

5. Would your organisation have been able to pursue this particular type of activity without the EU financial support?

Similar to the pervious question, this one identifies a very practical aspect of using the European Funds and sheds light on the perceived "usefulness" of such means of obtaining funding. It also allows exploring the possible relationship between the Funds and the KBE from a different perspective.

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[9] In the European funding programmes the term "*beneficiary*" is understood as denoting the entities receiving a financial grant; this is different from the "*final beneficiary*" who is an individual or an organisation directly positively influenced by the project outcome. The "*final beneficiaries*" do not necessarily receive a financial grant, or are not directly involved in the project (European Commission, DG Education and Culture, 2011)

Additionally, as means of *triangulation within a method* and to confirm the reliability of particular statements made by the interviewees, the qualitative analysis takes into account documents such as Operational Programmes and official calls for funding applications.

Interviewees in the case-study regions

The qualitative research consisted of performing forty interviews (twenty in the West Midlands region and twenty in Silesia). The interviewees had vast experience in dealing with EU Funding in various stages of their implementation: from representative of the Marshall Office of Silesia and Representative of the Regional Development Agency in the West Midlands to freelance Funding Advisors and innovative and awarded entrepreneurs in both regions. As already said, all of the interviewees had "hands-on" experience, i.e. they have successfully applied for EU funded projects in their past. There was also a conscious choice made to include only the stakeholders which on a daily basis dealt with issues the author believed to be related with the Knowledge-Based Economy (i.e. education, research and development and innovation).

The interviewees and the organisations which they represent are presented in Table 4 (for the West Midlands region) and Table 5 (for Silesia). The interviewees' names are coded and listed in alphabetical order. The codes assigned to each speaker will henceforth be used in the analytical part of the thesis (Chapter Four).

Because overall nine interviewees decided either not to be identified by name or withdrew their consent for identification after the interview was already recorded (two from the WM region and seven from Silesia), whereas they are included in the tables and in the maps above, the codes do not represent their initials; however they explicitly gave their consent for identifying the type of their organisation, as long as no location details are given. In 5 cases

(referred to as: Mr B, Ms C, Mr D, Mr E, and Ms F) the interviewees refused for the interview to be recorded and did not agree to be identified by name. However they did give consent for taking notes during the interviews. In addition, in two cases of the West Midlands' interviews, the external circumstances (namely overwhelming noise form a near-by construction site) made the recordings attempts futile.

The last columns of both tables include the abbreviation of the particular sector the interviewees represented: *EDU* – education, *PRIV*- private, *PUB* – public, *SME* – small and medium sized enterprise sector, as defined by the Commission recommendation 2003/361/EC, p. 36–41.

A vital point must be made here: in the Polish higher-education system the universities are either public (i.e. state-owned, where the fees for full-day-time students are paid by the government) or private (where students pay their own tuition fees and the universities operate on company-like basis). Therefore in the case of Poland when a given educational institution belonged to the private sector, this is indicated by adding "*PRIV*"" in the sector column.

Table 4. List of interviewed experts from the West Midlands Region

Interviewee's code	Position / Organisation	Sector
EB	EU National Contact Point for Eco Innovation, Technology Strategy Board	*PUB*
JnB	Former Head of European Policy at Advantage West Midlands - West Midlands Regional Development Agency	*PUB*
GD	Owner and director of Contented Ltd, an SME providing learning and development services	*SME*
PE	Pro-Vice Chancellor (Business Partnerships & Knowledge Transfer), Aston University	*EDU*
JF	Project Manager for Climate KIC at Birmingham Science Park Aston	*PUB*
SF	Rural Bidding Champion, West Midlands European Service	*PUB*
MH	European Funding Advisor	*PUB*
AH	Director of the European Bioenergy Research Institute	*EDU*
HL	Partnerships Director, Advantage West Midlands	*PUB*
TM	Project Manager, European Bioenergy Research Institute (also involved in KIC)	*EDU / PUB*
TP	Research Development Officer, University of Birmingham	*EDU*
MS	Head of European Services at West Midlands Councils	*EDU*
SS	Marie Curie Programme Research Fellow in School of Engineering and Applied Science at Aston University	*EDU*
KS	EU Funding officer Marchers Energy Agency / Birmingham Chamber of Commerce	*PUB*
AV	ERDF Team Leader Programme Delivery Team: West Midlands	*PUB*
PW	Head of the Regional European and International Division at Birmingham City Council	*PUB*
AW	Director of Centre for Learning Innovation and Professional Practice	*EDU*
AQ	Project Manager at Newman University College	*EDU*
XX	EU funding officer in one of the councils in the WM, who wished not to be identified by name	*PUB*
YY	Innovative SME entrepreneur (micro-enterprise) from the WM region, who wished not to be identified by name	*SME*

Table 5. List of interviewed experts from Silesia

Interviewee's code	Position / Organisation	Sector
AA	An SME-sector entrepreneur (micro-enterprise) from Żywiec who wished not to be identified.	*SME*
BB	SME-sector entrepreneur (micro-enterprise) from Żory who wished not to be identified by name	*SME*
JB	Administration and Investment Director of Reducers and Motoreducers BEFARED	*SME*
CC	SME-sector entrepreneur (small-enterprise) from Pszczyna who wished not to be identified by name	*SME*
DD	SME-sector entrepreneur (medium-enterprise) from Tychy who wished not to be identified by name	*SME*
AD	Vice Chancellor of the Humanitas University in Sosnowiec	*EDU – PRIV*
EE	SME-sector entrepreneur (small-enterprise) from Myszków who wished not to be identified by name	*SME*
FF	SME-sector entrepreneur (small-enterprise) from Gliwice who wished not to be identified by name	*SME*
ZG	Director of the Entrepreneurship Incubator, Bielsko-Biala Entrepreneurship Centre	*PUB*
AK	Mayor of Czernichów municipality	*PUB*
BK	Employee of the Department of Economic Development, Marshall's Office in Rybnik	*PUB*
JbK	SME-sector entrepreneur (micro-enterprise) from Bielsko-Biała	*SME*
JK	Silesian Entrepreneurship Centre, Intermediary Agency for EU Funding	*PUB*
AM	Owner of an SME sector enterprise (medium): Malachowski Alpine workshop	*SME*
AO	Dean of the Administration Department, School of Administration in Bielsko-Biala	*EDU – PUB*
PP	Research and Development Centre of Electrical Machines KOMEL	*PRIV*
RR	Chairperson of the Board of the M. Rej School Society Foundation	*EDU – PRIV*
ES	Innovation and Technology Transfer Centre	*EDU*
KW	Marshall Office of the Silesian Voivodeship, Department of Regional Development	*PUB*
ZZ	Secretary General of a rural municipality who wished not to be identified by name	*PUB*

Research ethics

The data collection and processing procedures did not raise serious ethical issues.

All of the numerical data needed for the quantitative stage of the research were derived from the Eurostat database and statistics collected by DG Regio; for those reasons they can be understood as remaining in the public domain and hence ethically-neutral.

The qualitative stage of the research was carried out following the Research Ethics Guidelines of Aston University (REG/11/204(2)) and because of its form and content, it raised no ethical concerns: there was no inherent risk to the subjects (interviewees) (point B.a. of the Regulation) and the research was not of a nature which could bring adverse psychological consequences to the interviewees (p.C.2). Also, all interviewees were informed that they are free to withdraw consent to participation at any time.

Chapter Three: Quantitative Analysis

This chapter focuses on the quantitative investigation of the extent to which a Knowledge-Based Economy (KBE) was developed in European regions and the possible statistical relationship between the KBE and the European Structural Funds.

This part of the thesis presents and analyses in detail the changes over time in the values of particular indicators used for calculating the KBE General Index in all of the EU regions, and the changes over time in the KBE GI value itself. This is followed by the analysis of the volume of annual SF allocation in the regions. The final stage of the quantitative research consists of statistically analysing the relationships between the European Funds and the Knowledge-Based Economy (defined by the General Index); in other words, it attempts to measure the influence of the Funds on the changes in the KBE using the Pearson product-moment correlation coefficients (r), Spearman's rank correlation coefficients (ρ) and two-way ANOVA (as defined on page 154). The application of several methods for quantitative investigation into the KBE-SF relationship serves as a *triangulation within methods*[10] and adds more validity to the findings.

As explained in great detail in the Research Design chapter, the analysis and the resulting detailed descriptions of the situations in the regions are of vital character, as they are subsequently used to test elements of all the thesis hypotheses:

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[10] For more detailed information please refer to page 69.

H1: The Knowledge-Based Economy expressed by the values of KBE General Index (GI) increased in European regions over time;

This hypothesis is tested by the analysis of the multi-annual performance of particular indicators used for calculating the KBE General Index, and by examining the KBE GI in European regions in the time-scale taken into account in the thesis.

H2: There is a statistically significant relationship between the amount of European Funds allocated to the given region over time and the changes in the value of the region's KBE.

The hypothesis of the SF and KBE relationship is tested by calculating two independent correlation coefficients for all of EU regions and performing a two-way Analysis of Variance.

H3: The performance of the Knowledge-Based Economy and the approach towards the Structural Funds are substantially diverse in the two case-study regions.

The analysis presented in this chapter serves testing this hypothesis from a quantitative angle by not only including the discussion of the WM and Silesia, but placing significant emphasis on the two case-study regions in all stages of the analysis; the third hypothesis is also further tested using qualitative methods as presented in Chapter Four.

The findings of this chapter were obtained using the particular and detailed methodology as presented in the Qualitative Methodology section on pages 71 to 84. The conclusions of the quantitative analysis and their implications are further developed in Chapter Five of the thesis.

KBE Indicators in European regions

This element of the analysis contributes to testing two of the thesis' hypotheses:

H1: The Knowledge-Based Economy expressed by the values of KBE General Index (GI) increased in European regions over time; and

H3: The performance of the Knowledge-Based Economy and the approach towards the Structural Funds are substantially diverse in the two case-study regions,

as it provides a detailed description and analysis of the performance of the chosen indicators used for calculating the Knowledge-Based Economy General Index; the differences in particular indicators' performance are key for understanding the differences in the regional KBE GI and as such are vital for testing the two hypotheses and answering the thesis' main research question. The importance of the detailed analysis of the particular indicators becomes apparent in the thesis' conclusions (p. 219-221).

The analysis is carried out across all of the regions of the European Union: NUTS-2 level for all states excluding the UK, for which the NUTS-1 level is taken into account, as per explanation presented on pages 59-60. Whereas the general analysis takes into account all of the EU's regions, a particular focus is placed on the West Midlands Region and Silesia (PL: *Śląsk*), as these two regions were chosen to become key subjects of a case study undertaken in the thesis and will also serve as a sample for the qualitative part of the research.

As per assumptions described already in the Methodology section, the numerical data were extracted from the Eurostat's online database of National and Regional Statistics (Eurostat, 2011a) and the period taken into account was the years 1999-2009.

Human Resources in Science and Technology (HRST)

As mentioned in the methodology section regarding the choice of the indicators (particularly p. 72-73), the HRST is considered as one of the key components of the European Knowledge-Based Economy. This indicator takes into account the number of individuals who either have completed their education at university level and/or are employed in a science and technology occupation. Examples of such individuals are presented in the previous sections of the thesis which tackled the issue of choosing the indicators for calculating the KBE General Index.

For the purpose of this research the HRST indicator was calculated in relation to the whole volume of active population in a given European region.

The first stage of presentation and analysis of the HRST in EU regions is to look into the percentage of HRST across the regions. In order to picture the regional disparities within EU member states, Figure 4 presents only the regions with the highest and lowest rate of HRST, per every EU state. The values presented are the average values of HRST ratio over the examined period.

To have a better picture of the position of the chosen case-study regions (i.e. Silesia and WM) in relation to the general overview of HRST values, the figure also includes the two regions, denoted in the darkest shade and placed accordingly between respective Polish and UK regions with the highest and lowest rate of HRST (marked in darker grey).

Figure 4. Regions with the highest and lowest rate of HRST, per every EU state.
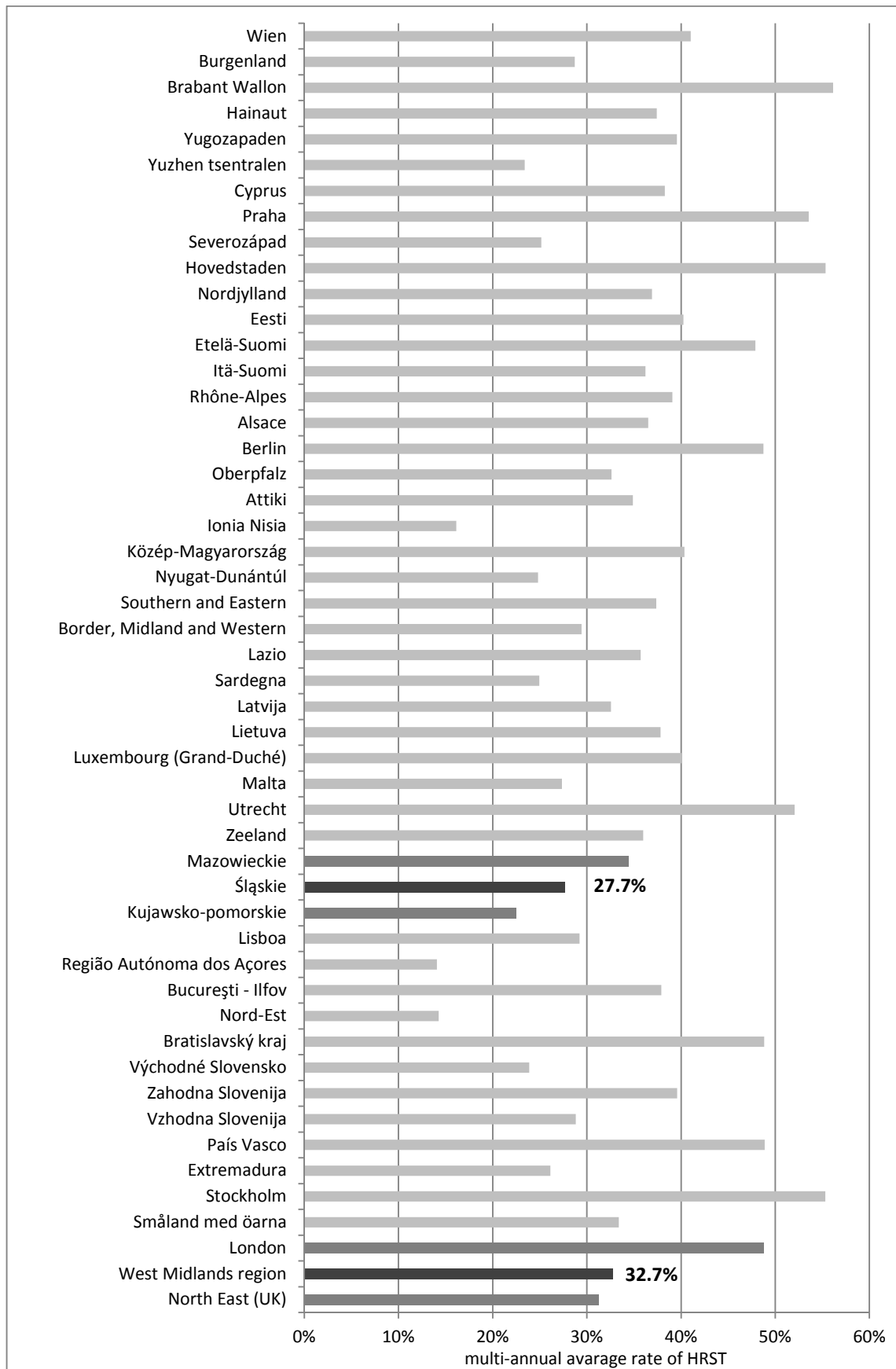
Source: author's own study based on the data from Eurostat database (Eurostat, 2011a)

It can be observed that both Silesia and the West Midlands are close to 30% HRST ratio, with WM exceeding it only by 2.7% and Silesia lacking just 2.3 to 30% level. Nevertheless what needs to be pointed out is that the best-performing UK region (not too surprisingly- London) exceeds the HRST ratio of the best performing Polish region (Mazowieckie, again, a capital region) by almost 15% (the two capital regions holding the values of 48.79% and 34.43% respectively).

The best performing region across the entire EU is Belgian Brabant Wallon (56.14%), closely followed by Danish Hovedstaden (55.33%), Swedish Stockholm (55.32%) and Czech Praha (Prague) (53.55%). Prague is also the only "new region" (i.e. from a Member State which accessed the EU in 2004 or 2007) with the value of HRST exceeding 50% of active population. Surprisingly, the value of HRST ratio in Prague is even bigger than Brussels (which stands at 50.05%). It can be said, that the HRST-rich regions are predominantly Scandinavian, with the UK, German and French capital cities closely following – the only exception being the aforementioned Prague.

Taking the above findings into consideration, interesting outcomes take place when looking at a figure depicting the differences between the most- and the least- HRST rich regions in EU states (Figure 5). It is the Czech Republic which presents the most disparities in HRST among its regions, reaching almost 30%. In this aspect, Poland is far less diversified, with the difference reaching just over 11%, although what is worth pointing out is that the Polish region with the lowest HRST ratio- Kujawsko-Pomorskie is only 2.6 % lower than Czech Republic's lowest: Severozápad (regions' HRST ratio being equal 22.4% and 25.1% respectively) and 8.8% lower than UK's lowest-HRST region of the North East.

Figure 5. Differences (in percentage) between the regions with highest and lowest rate of HRST, per every EU state consisting of 2 or more regions.
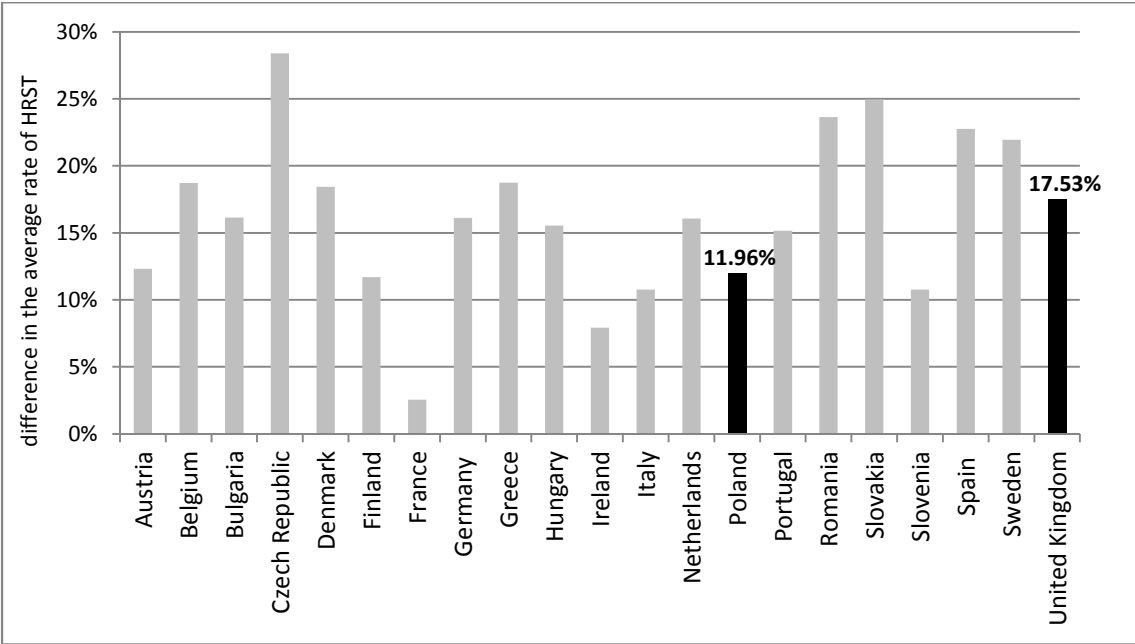
Source: author's own study based on the data from Eurostat database (Eurostat, 2011a).

When shifting the focus directly on the West Midlands Region and Silesia and applying the HRST values onto a time-scale (Figure 6), it can be seen that both of the regions "started off" from the level of between 25% and 30%, with the WM exceeding Silesian value of HRST by 3.6%. At the end of the time-scale, it was Silesia which had a greater ratio of HRST, albeit with a very small difference of only 0.5%.

Figure 6. The changes in the rate of HRST in Silesia and the West Midlands in the years 1999-2009
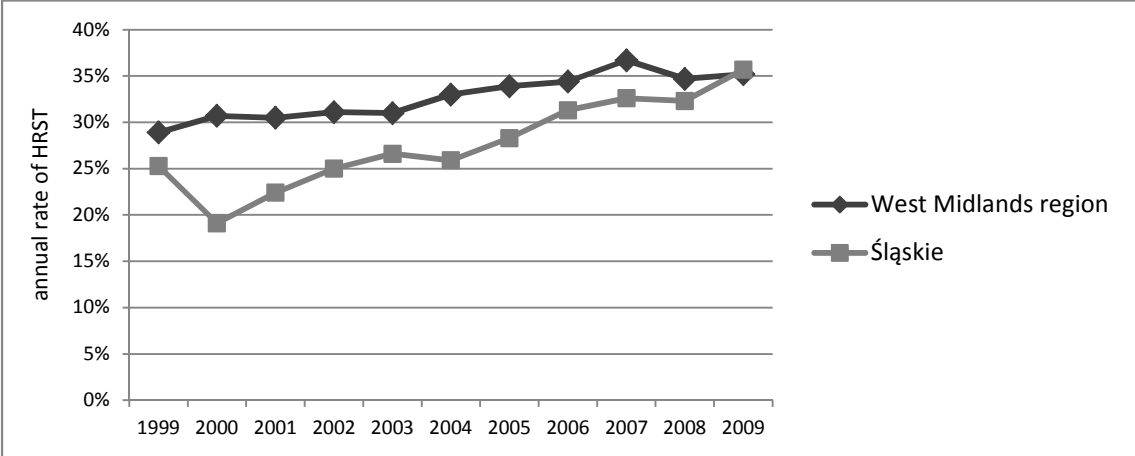
Source: author's own study based on the data from Eurostat database (Eurostat, 2011a).

The WM presented a slow, but steady growth in the HRST percentage over the years (6.3% total change in HRST value over the whole measured timescale), with a single slump (from 36.7% to 34.7%) between the years 2007 and 2008. The growth of HRST ratio in Silesia was much more rapid, with an initial decrease in the years 1999-2000 (from 25.3% to 19.1%), this could be attributed to the Administrative Reform which took place in 1999 and changed the administrative boundaries of the Silesian region. The decrease was then followed by a total increase in HRST value of 16.6%. The most significant progress, however, was between the years 2004 (the year of Poland's accession to the EU) to 2009 – 9.8% in just 5 years.

An interesting picture of the changes in HRST across the EU regions comes to view when the changes in the West Midland's and Silesian ratio of HRST over time are compared with the best-and worst- performing region out of the whole European Union (Figure 7).

Figure 7. The changes in the rate of HRST in Silesia and the West Midlands in the years 1999-2009 compared to the highest- and lowest- performing EU region
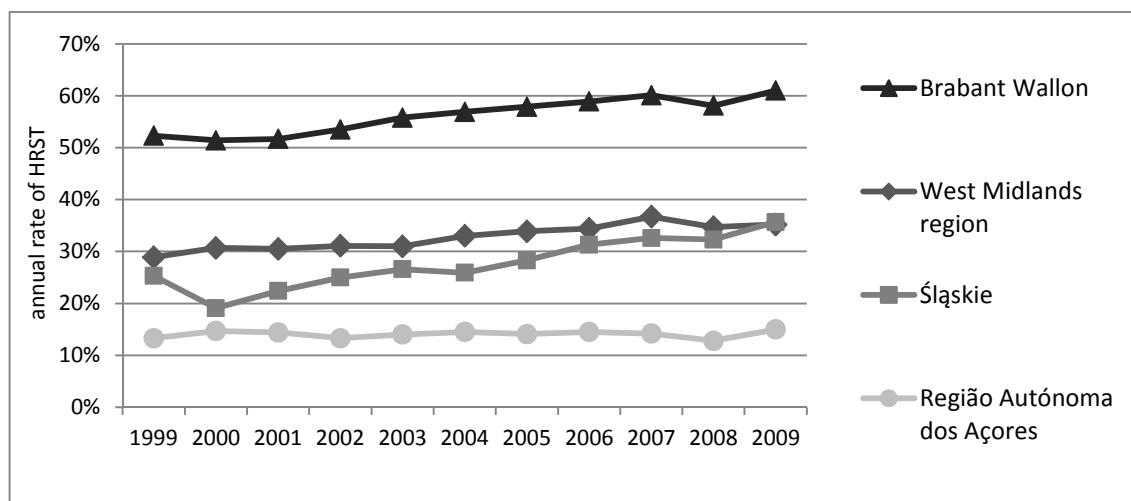
Source: author's own study based on the data from Eurostat database (Eurostat, 2011a).

As was already stated in preceding paragraphs, in the aspect of HRST the region with the highest values over time is Brabant Wallon. In the examined period this region experienced an increase of 8.7% (from 52.3% to 61%), which is just over 2% higher than the West Midlands and at the same time just under 2% less than Silesia. The region which presented the lowest

overall values of HRST in the decade 1999-2009 was the Portugese Região Autónoma dos Açores (The Azores), whose values oscillated from 13.3% in the initial year to 15.0% in the final one (which is also the highest value in the examined period), reaching its lowest values in the year 2008 – 12.8%.

Therefore it can be stated that in terms of HRST ratio change over time, both the West Midlands region and Silesia have started slightly closer to the worse-off regions, but over time found themselves almost in the perfect medium between the best- and worst- performing regions of the European Union.

The next parts of the analysis will more closely examine the HRST in Silesia in the West Midlands when compared to the situation in their respective countries.

Figure 8 presents the ratio of HRST in Silesia compared to Poland's average and in West Midlands compared to UK's average in the examined time period. It can be seen that in most cases (apart from the year 2000), Silesia's and Poland's results are much closer than respective results for the West Midlands and United Kingdom.

Figure 8. Rate of HRST in Silesia compared to Poland's average and in the West Midlands compared to UK's average in the years 1999-2009.
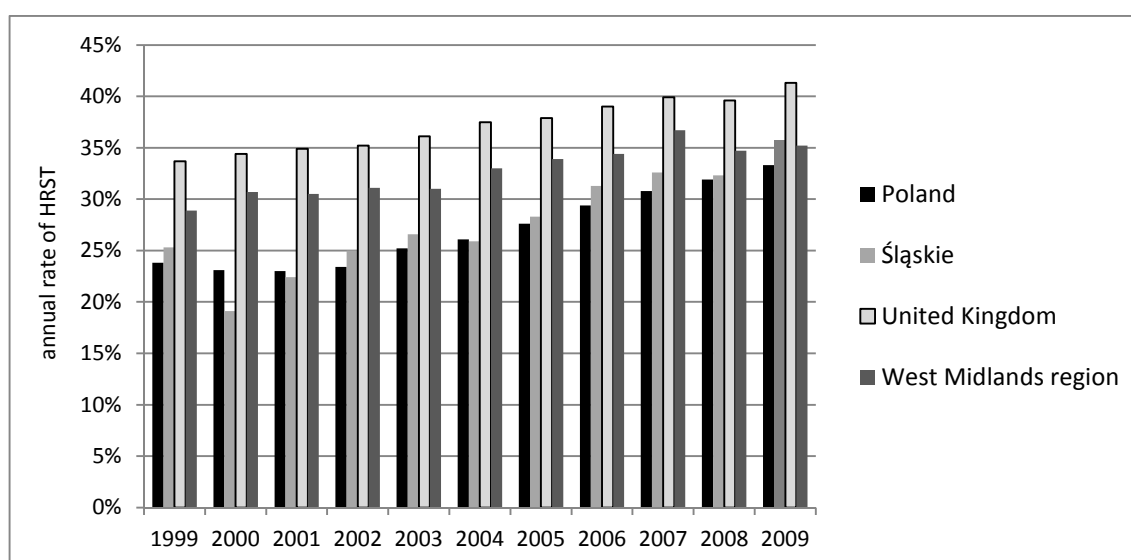
Source: author's own study based on the data from Eurostat database (Eurostat, 2011a).

The differences between the two regions (and states) become even more visible when presented as in Figure 9.

Figure 9. Differences (in percentage) between Polish and Silesian, and UK and West Midlands' HRST ratio in the years 1999-2009
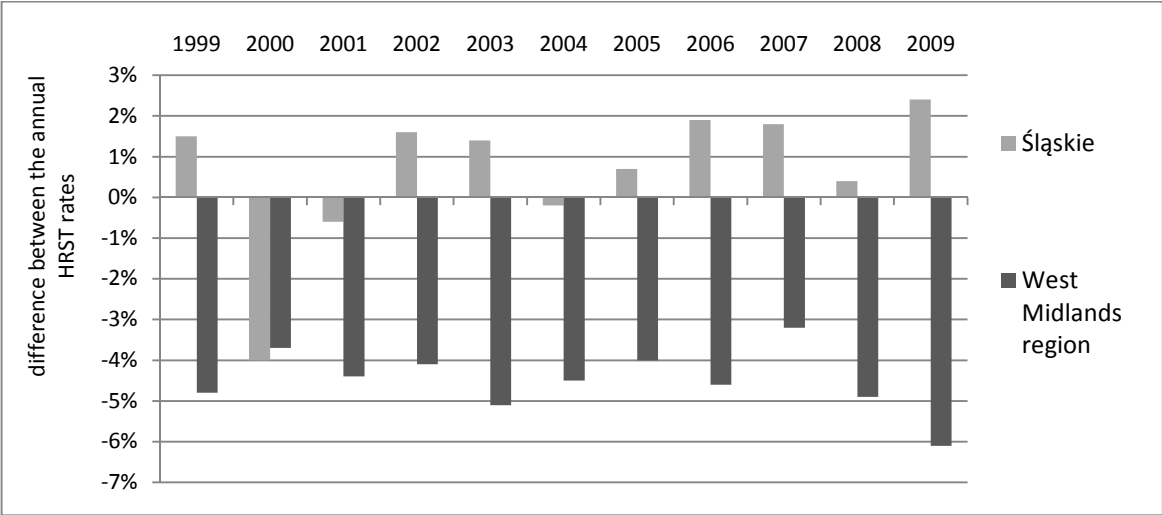
Source: author's own study based on the data from Eurostat database (Eurostat, 2011a).

Another finding worth pointing out comes into light: whereas the Silesian HRST ratio fluctuated over the years, at its lowest reaching values of 4.0% per cent lower than the whole of Poland, and at its highest exceeding the Poland's overall value by 2.4%, the West Midlands has constantly performed worse than UK's ratio in all of the examined years, with the most significant difference occurring in the year 2009, when the region's HRST ratio was 6.1% lower than the general United Kingdom's ratio.

Employment in Technology and Knowledge-Intensive Sectors (TKIS)

As defined previously, the regional values of this indicator are derived from Eurostat's data on high-tech knowledge-intensive services and high-tech manufacturing. The components of those two features were explained in detail in the previous Chapter (p.73), and they are considered to be of great importance for science in technology in general, due to generating relatively high added value (Eurostat, 2010c). For the purpose of the research the regional values of TKIS indicator were calculated as a percentage of total employment in a given EU region (NUTS 2 level for all member states apart from the UK, in which case the data was derived on NUTS 1 level).

Following the stages of analysis undertaken while analysing the regional performance of the previous indicator, the first stage of presentation and analysis of TKIS in EU regions is to investigate the percentage of TKIS across all of the EU regions. Figure 10 presents the regional disparities, again (as Figure 4 did), taking into account only the regions with the highest and lowest rate TKIS in a given Member State, per every EU state. The values presented on this Figure are the average values of TKIS ratio over the years taken into account in this research. Also, in order to maintain consistency with the description and analysis of the previous indicator and to keep the main focus on the chosen case-study regions (i.e. Silesia and West Midlands), the average TKIS values for these are denoted in the darkest colour and placed accordingly between respective Polish and British regions with the highest and lowest average rate of TKIS.

Figure 10. Regions with the highest and lowest rate of TKIS, per every EU state.
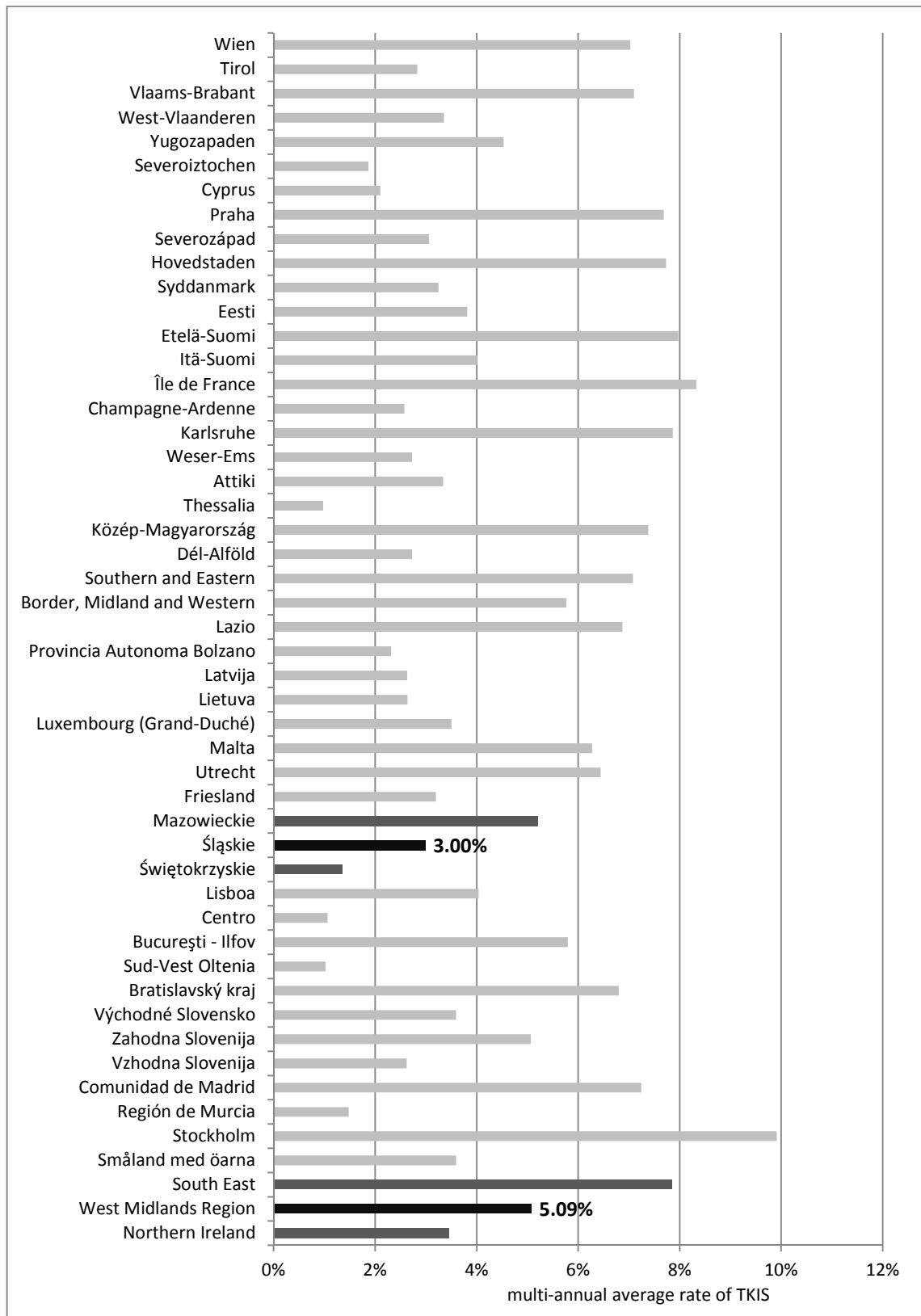
Source: author's own study based on the data from Eurostat database (Eurostat, 2011a).

Undoubtedly the best performing region in the whole of examined sample is the Swedish region of the capital Stockholm with almost 9.9% of the workforce employed in knowledge-intensive sectors. High levels of TKIS can also be observed in Île de France (i.e. Paris region) – 8.32%, Etelä-Suomi (i.e. region incorporating Helsinki) – 7.97%, and Karslruhe – 7.86%. The best-performing English region comes fifth with 7.84%, but this time, however, it is not the capital Inner London region but the South East. This is hardly surprising, taking into account that this region hosts Oxford University and the university spin-off companies, while London has a significantly bigger proportion of finance-engaged employees than TKIS (approx. 7.6% according to the *Analysis of London's employment by sector* commissioned by the Greater London Authority (Prothero, 2007) compared to approx. 5% of TKIS).

Other patterns which are similar to the spread of HRST values, is that in Poland Mazowieckie remains the best-off region and what is also worth noticing is that Czech Praha is again in the top 10, preceded by the already mentioned Swedish, French, Finnish and German regions. Interestingly, in Germany it is the region of Karlsruhe which holds the highest national TKIS average (when it came to HRST, Germany did not make it to the top 10 highest average values, and the region with the highest national values, Berlin, came only 14th). The regions with the lowest TKIS average value are from the South-East of the EU: Romanian Sud-Vest Oltenia and Greek Thessalia. What is interesting is that contrary to what might be expected, it is the Greek region which holds the EU-lowest regional average of TKIS, not the region of one of the newest members of the Union.

When it comes to this particular performance of Silesia and West Midlands, the Polish region stands on a lower position with TKIS at just above 3.0% comparing to 5.08% in WM, which might be considered a relatively bigger disparity than in the case of HRST, where the level of the values reached 56%, considering that the highest obtainable average level of TKIS is just under 10%.

The disparities between the regions with the highest and lowest rate of TKIS are presented in Figure 11. This analysis takes into account only the regions with two or more NUTS 2-level regions. Here Sweden holds the greatest difference between its regional TKIS values, reaching up to 6.3%. Other states with significant diversity are Spain (5.76%) and France (5.75%). UK's disparities (4.39%) are relatively close to Denmark's (4.48%) and not too far off Poland's, whose regional disparities are in the EU's lower average, standing at 3.85%, between Finland (3.96%) and Belgium (3.74%).

**Figure 11. Differences (in percentage) between the regions with highest and lowest rate of TKIS, per every EU state consisting of 2 or more regions**
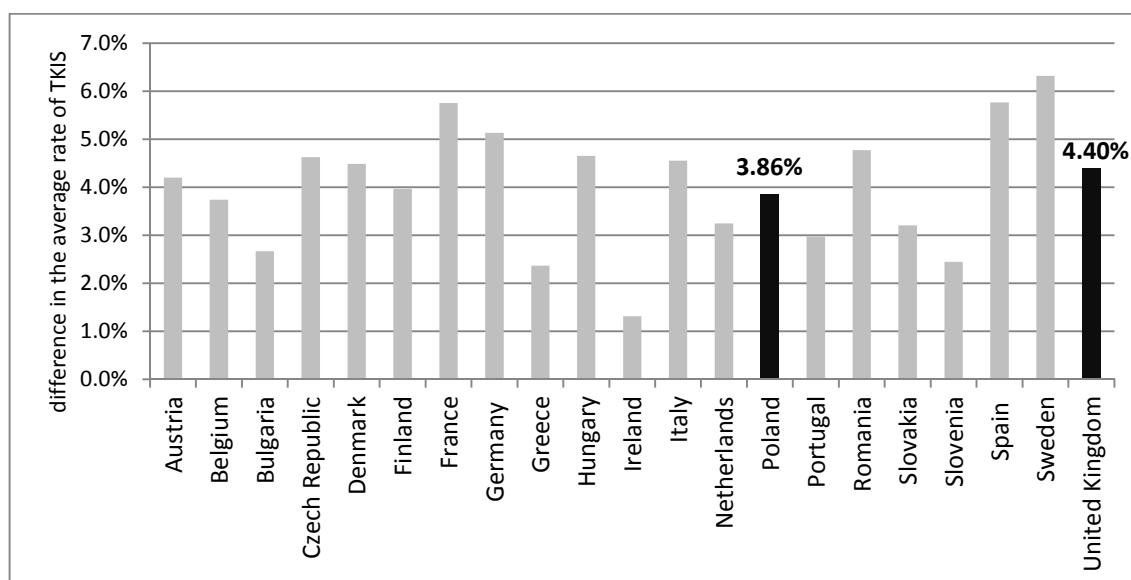
Source: author's own study based on the data from Eurostat database (Eurostat, 2011a).

When it comes to focusing directly on the performance of the West Midlands' and Silesia's TKIS over time (Figure 12), it can be found that the regions followed very different patterns.

Figure 12. The changes in the level of TKIS indicator in Silesia and the West Midlands in the years 1999-2009
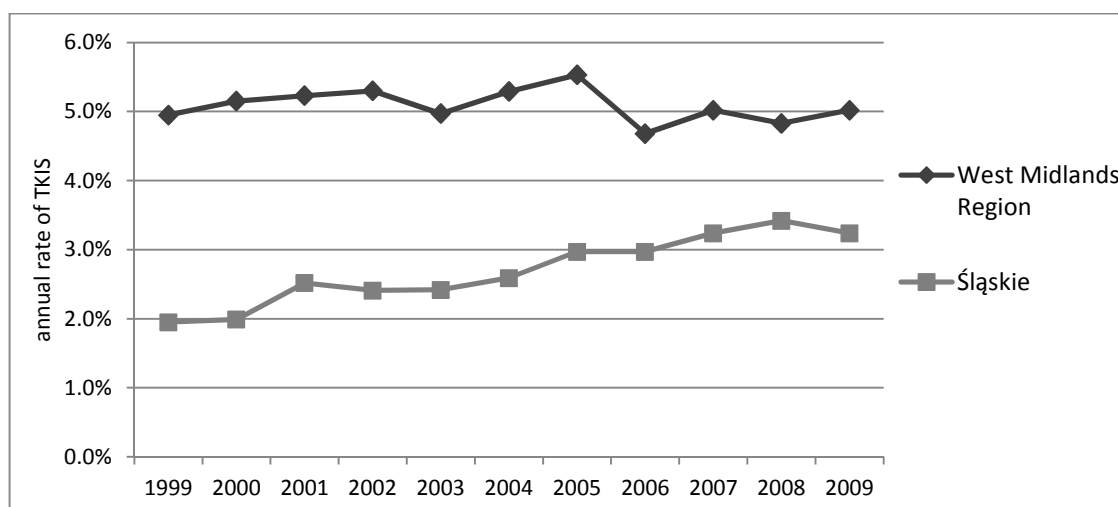
In 1999 the West Midland Region held a level of TKIS at 4.95% and at the end of the examined period this value has shifted to only 5.02%. It can be observed that the values have slightly risen over the three initial years, experienced a slight decrease in the year 2003, after which they have started increasing again to reach their peak (5.53%) in the year 2005. The following year brought the most significant decline (to 4.68%) after which the values kept on fluctuating around 5%.

Silesia followed a completely different pattern. In the year 1999 its TKIS level was at a humble 1.98%, which kept on an increasing trend, albeit with some minor fluctuations, up to the year 2008 (3.4%), after which it experienced a decrease to the final level of 3.2%. Nonetheless the overall change in the TKIS ratio was higher comparing to the change in the West Midlands (1.22% comparing to 0.07%).

The next stage of the analysis requires looking at the above described performance of West Midlands and Silesia in comparison to the best- and worst- performing region from the whole of the EU (Figure 13).

Figure 13. The changes in the level of TKIS indicator in Silesia and the West Midlands in the years 1999-2009 compared to the highest- and lowest- performing EU region
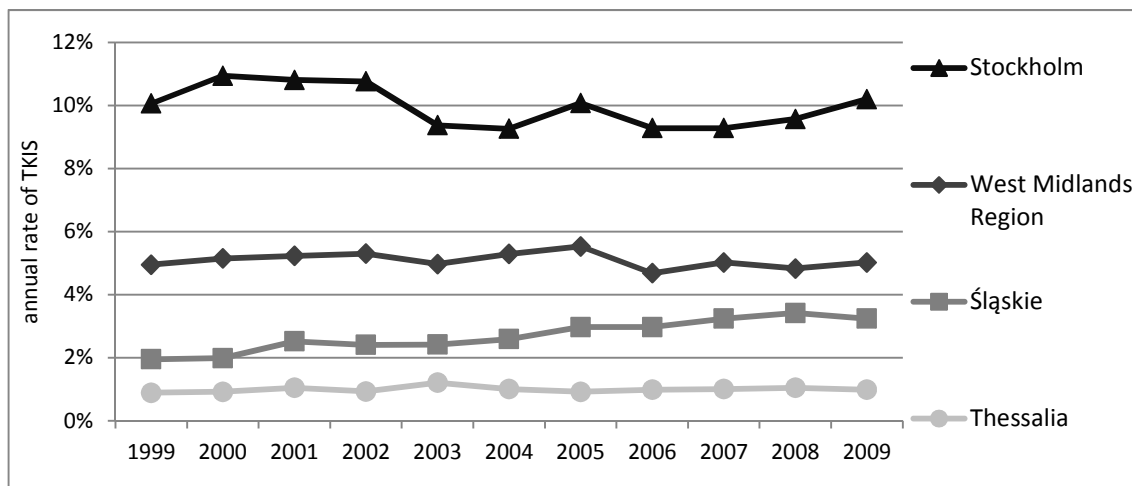
Whereas the levels of TKIS ratio in Thessalia remained on almost unchanged level over the years (0.08% to 0.99%), the indicator fluctuated significantly in the best-performing region: from 10.06% in the initial year, through its peak at 10.9% in the year 2000, followed by a slow decrease leading to the lowest value of 9.26% in 2004, only to fluctuate further and reach 10.2% in the final examined year – which is a value only 0.14% higher than in the starting point of the research. It can be seen that out of the four regions presented in the Figure, Silesia is the only one with an upwards trend. It must be obviously noted, that no matter how big the increase was, Silesia still is much closer to the region with the lowest average TKIS (i.e. Greek Thessalia) than to the region with the highest values, i.e. Stockholm.

A significant finding occurs when making a comparison of the average TKIS value for the examined time period in between the two case-study regions, and their respective national averages (Figure 14).

Figure 14.   Differences (in percentage) between Polish and Silesian, and UK and West Midlands' 10-year average levels of TKIS.
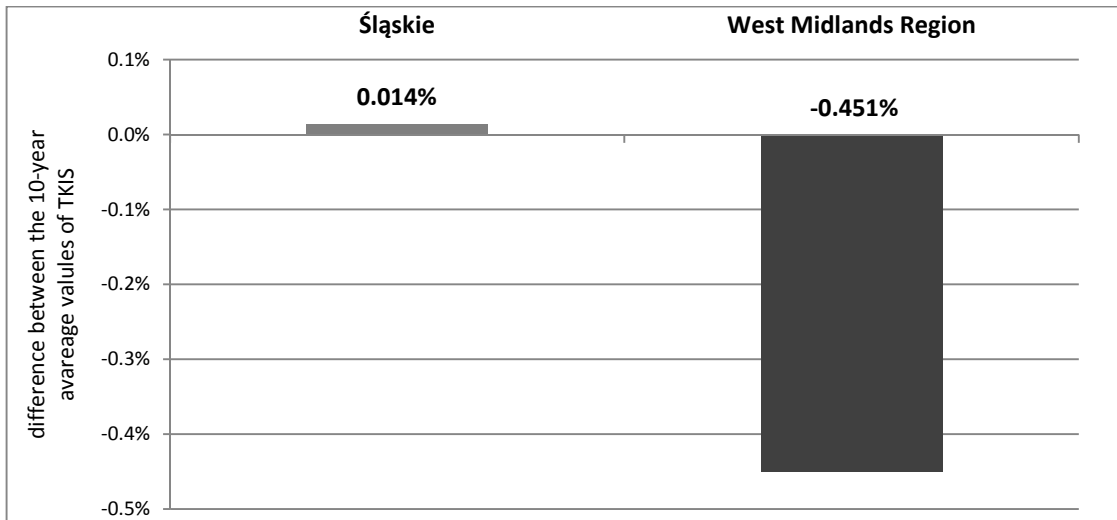
Both of the regions hold within 0.5% difference from their national averages. And although, as it was already presented, the TKIS average of West Midlands is generally much higher than the one of Silesia, it comes to light that Silesia's average is above Poland's average (if only by 0.014%), whereas the West Midlands' average is lower than the UK's – by 0.45%.

Pupils and Students in the Whole of Education

This indicator was calculated as a percentage of students in all levels of education (primary, secondary, tertiary) in relation to all of the population of a given region. The reasoning behind such a way of calculation was presented in the methodology section of the previous chapter (see page 73). In order to facilitate the description and analysis process, henceforth in order to name the indicator only the word "students" will be used, and this will refer to people in all of the three levels of education. Because when compiling data on education, the Eurostat used academic years instead of calendar years, the same approach is adapted to time-scaling of this particular indicator.

Keeping to the previously established order of describing and analysing the indicators across European regions, the first stage consists of investigating the number of students in the regions with the highest and lowest rate of them in all of EU member states (Figure 15). As it was done before, Silesia's and the West Midlands' results are denoted in the darkest colour and placed between the regions with highest and lowest percentage of students in their respective states.

In this particular case, it is not the UK region which holds the highest rate of the examined indicator; it is the Belgian capital region of Brussels at 34.5%. What is interesting is that the second region regarding the percentage of students is Bratislavský Kraj, the capital region of Slovakia. This is a very high position for a relatively new Member State. A very significant finding is that the West Midlands region finds its place in the top 10, being also the UK's region with the highest ratio of students (the worst region being the East of England at 24.0%). Not surprisingly, in the Polish case the region best-performing in this aspect is, repeatedly, Mazowieckie (27.1%). Silesia, with its values slightly exceeding 23% comes relatively close to the worst-performing Polish region, i.e. Opolskie (22.5%).

Figure 15. Regions with the highest and lowest rate of students, per every EU state
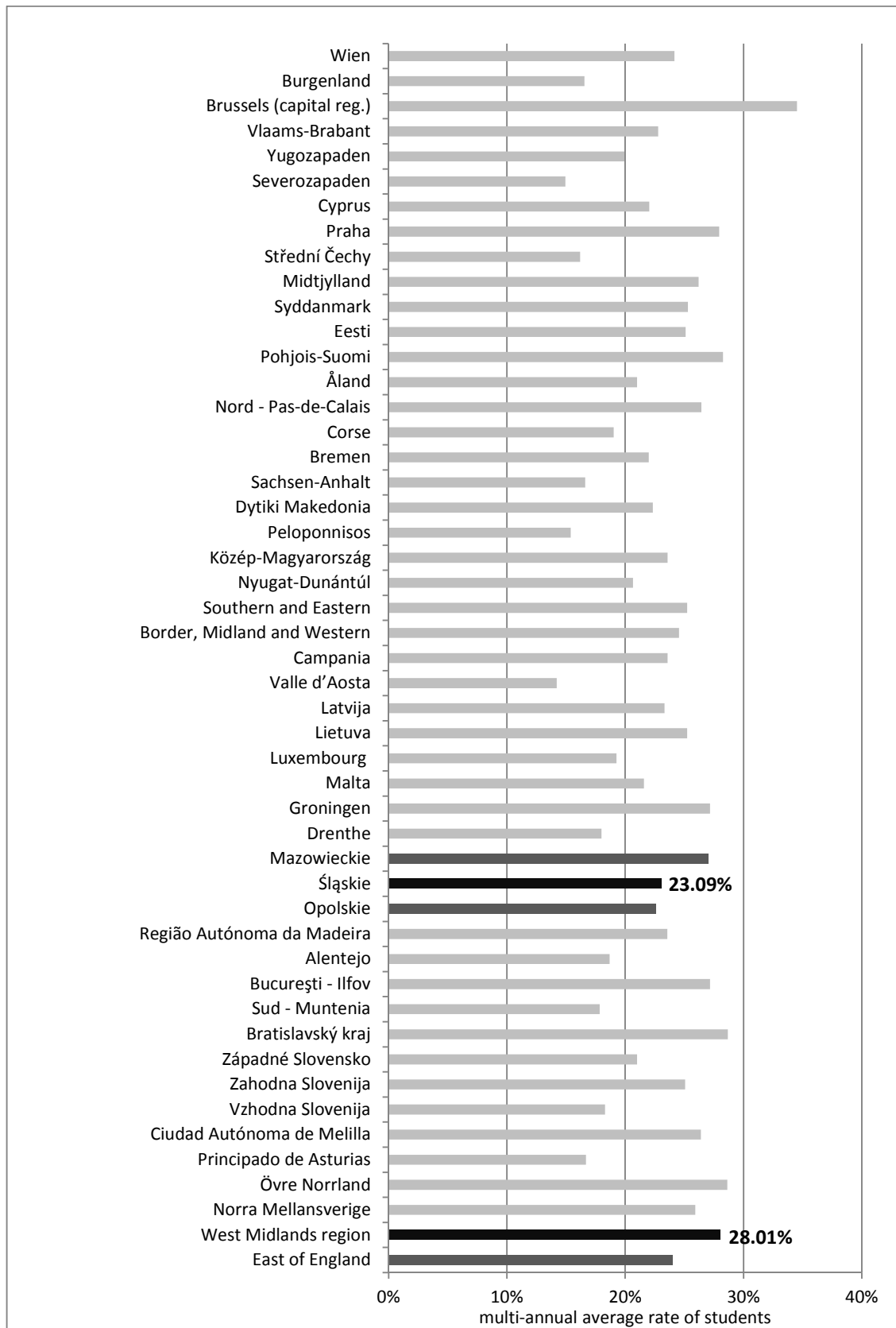
Source: author's own study based on the data from Eurostat database (Eurostat, 2011a).

Moreover, what is clearly visible from Figure 15 is that the spread of values over all of the examined regions is not as significant (just over 20%) as it was e.g. in the case of HRST, where the difference between the overall best- and worst- performing region reached 42.3%.

Disparities between the regions within Member States become more visible when presented as in Figure 16. Although the scale of differences is relatively low (under 14.0%), yet it shows the dissimilarities among EU states. The states with the most significant differences between the regions with highest and lowest ratio of students are France (13.1%), closely followed by Belgium and Czech Republic who share values of 11,7%.

The states with the lowest regional disparities are Denmark (0.90%) and Ireland (0.69%), though it must be noted that the latter consists of only two NUTS 2 regions: Southern and Eastern; and Border, Midland and Western.

When it comes to assessing the differences between the regions with the highest and lowest rate of students in United Kingdom and Poland, it can be found that both States have rather close values of disparities: 3.99% in case of UK and 4.42% for Poland.

Figure 16. Differences (in percentage) between the regions with highest and lowest rate of students, per every EU state consisting of 2 or more regions.
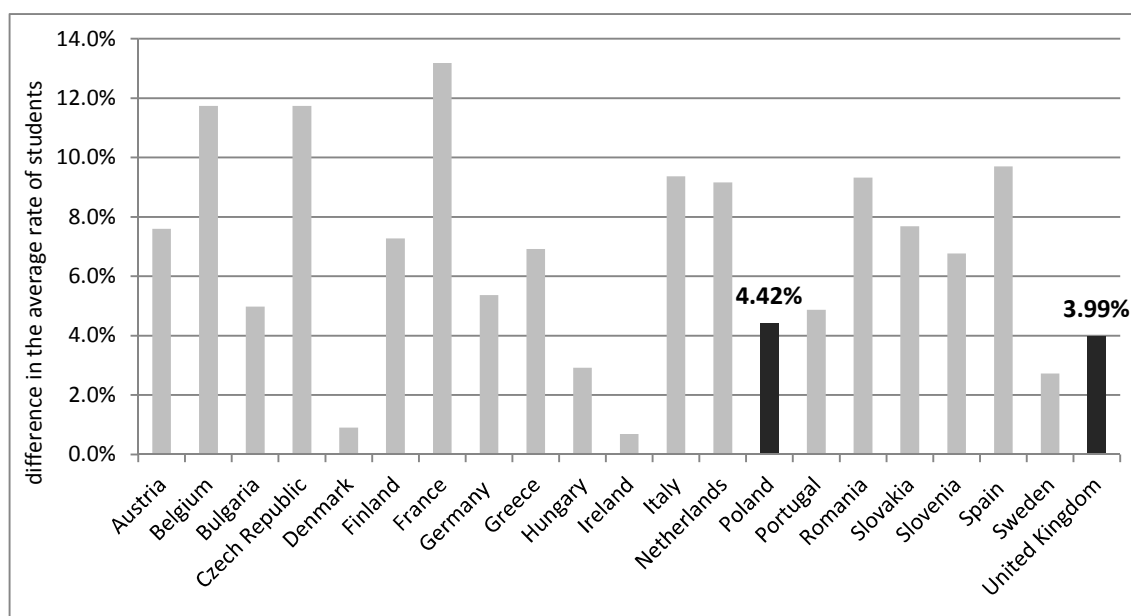
Source: author's own study based on the data from Eurostat database (Eurostat, 2011a).

Interesting findings can be observed when examining closely the changes in the amount of students from academic year 1999/2000 to 2008/2009 in both the West Midlands and Silesia (Figure 17).

Figure 17. The changes in the ratio of students in Silesia and the West Midlands from the academic year 1999 to 2009
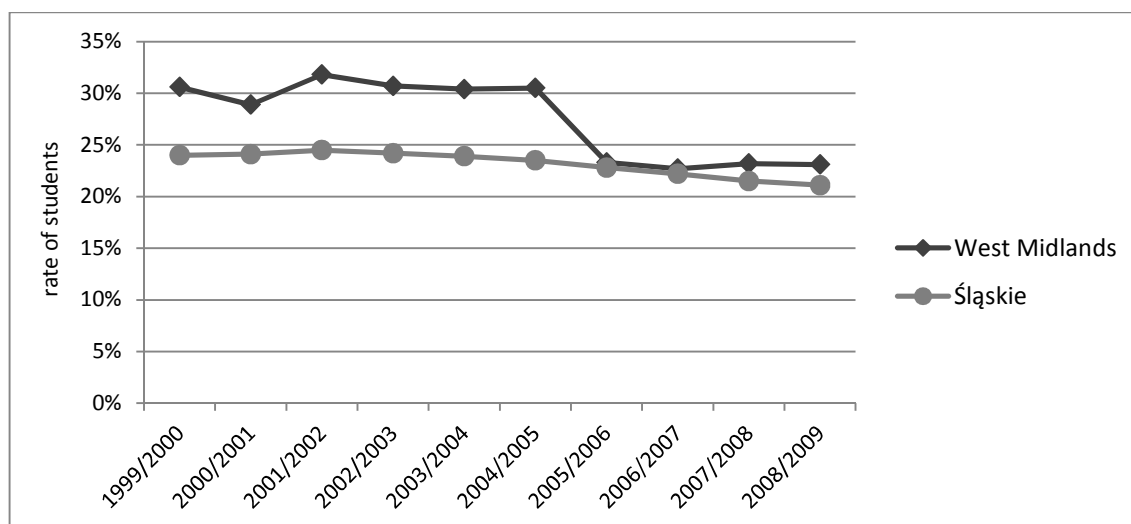
Source: author's own study based on the data from Eurostat database (Eurostat, 2011a).

Silesia kept a lower rate of students almost throughout the whole examined period, although in time the differences seemed to become smaller and smaller. In the academic year 1999/2000, Silesia's number of students was 6.6% lower than the West Midlands' (24% and 30.6% respectively).

The West Midlands' trend was slightly fluctuating, from initial downfall by 1.7%, followed by increase in the number of students by roughly 2% and remaining the level just slightly above 30%, to a slump down to 22.8% in the academic year 2005/2006, followed by a very slow increase to 23.10% in the last examined year. Silesia held a slow, almost steady, decrease; reaching 21.10% at the end of the examined period. In the academic years 2005/2006 and 2006/2007 the regions' student ratio was almost identical with the values of 22.8% (West Midlands) and 22.2% (Silesia) in the former and 23.3% (WM) and 22.7% (Silesia) in the latter year. In the last two academic years both regions experienced only marginal changes, although it

should be noted that the WM's trend-line seems to be slowly increasing, whereas Silesia is still experiencing a very slight downfall.

When comparing Silesia's and the West Midlands' student ratio to the EU regions with relatively most and least students (Figure 18), it is clear that the West Midlands' slump following the academic year 2004/2005 was the most significant one. During the whole course of the examined period, both Brussels and Italian Valle d'Aosta experienced a modest increase (by 0.4% and 1.7% respectively). The downfall that happened in the Brussels region in the years 2001/2002-2002/2003 was by 7.0% (comparing to WM's 7.2% downfall of the year '04/'05, as already described in the previous paragraph), yet Brussels managed to recover from it much better than the West Midlands.

Figure 18. The changes in the student ratio in Silesia and the West Midlands from the academic year 1999 to 2009, compared to the highest- and lowest- performing EU regions

Source: author's own study based on the data from Eurostat database (Eurostat, 2011a).

The performance of Silesia and West Midlands in comparison to the national averages of their respective states also provides notable findings. Figure 19 clearly demonstrates a downfall in relative numbers of students, both in the West Midlands and the whole of United Kingdom, from the year '04/'05 onwards.

Figure 19. Ratio of students in Silesia compared to Poland's average and in the West Midlands compared to UK's average from the academic year 1999 to 2009.
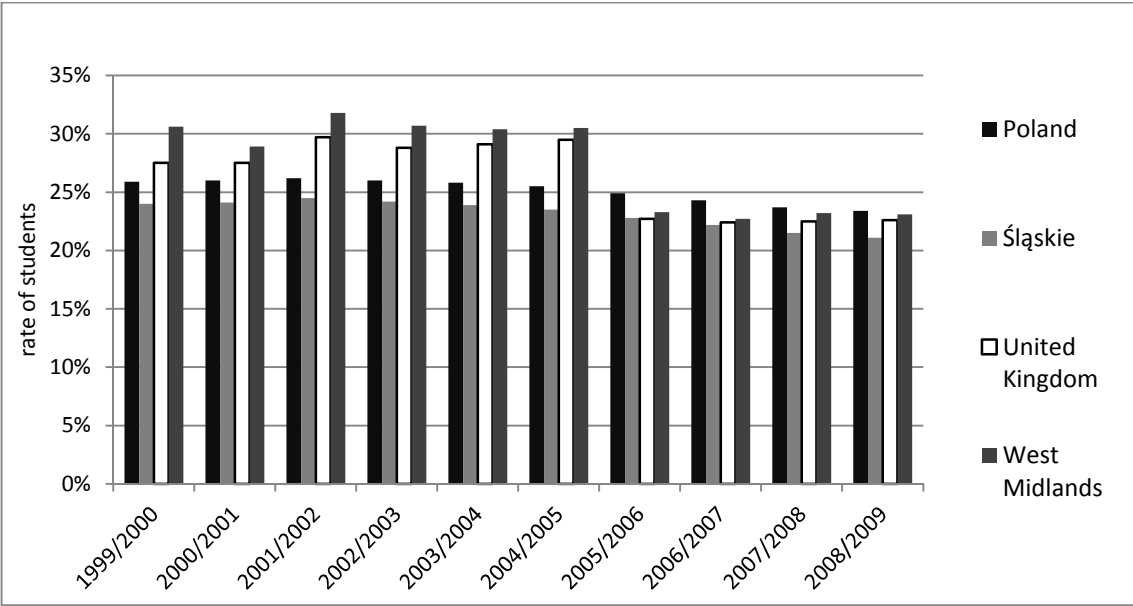
During the examined period both Silesia's and Poland's values decrease as well, yet the downfall is not as significant as in the UK's case.

There is another analysis which might be extracted from the performance of regional and national data over time. Those are the percentage differences between Polish and Silesian, and the UK and the West Midland's ratio of students in respective academic years (Figure 20). Here it becomes even clearer than from previous figure that throughout all of the examined years the West Midlands maintained a higher relative number of students than the UK's average, whereas Silesia's students' level was constantly lower than the Polish average. It should be noted that the differences between the West Midlands' and the UK fluctuated between 3.1% and 0.3%, and at the same time the disparities between Silesia's and Polish levels of students were always close to 2.0% (from 1.7% to 2.3%).

Figure 20. Differences (in percentage) between Polish and Silesian, and UK and West Midlands' students ratio in the years 1999-2009.
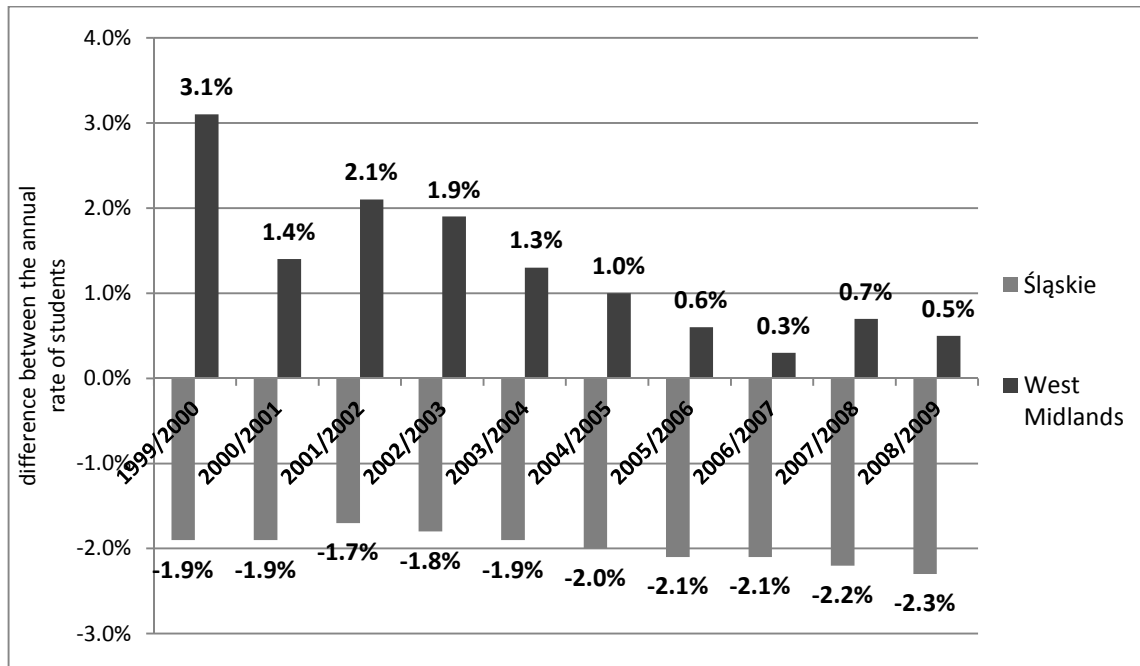
Source: author's own study based on the data from Eurostat database (Eurostat, 2011a).

Total Intramural R&D Expenditure (GERD). R&D intensity.

The next indicator to be examined is the Total (Gross) Intramural Research and Development Expenditure (GERD). As defined in the quantitative methodology section of the thesis (page 74), this indicator consists of added values of R&D expenditures of business enterprises, higher education institutions, as well as government and private non-profit organizations; it is also treated as one of the main drivers of innovation and one of the most important world-wide monitoring tools of resources devoted to increasing science and technology (Eurostat, 2011b).

For the purpose of this research GERD will be presented in terms of "R&D intensity", i.e. as a percentage of regions' GDP (Gross Domestic Product). What needs to be pointed out before performing the analysis of GERD is that at the Barcelona Council in 2002, the European Union agreed to a target of 3% R&D intensity. As the analysis will show, in most of the cases, this target was not reached.

Figure 21 presents the regions with the highest and lowest average of R&D intensity in the period of 1999-2009. As was done in previous analysis, Silesia and the West Midlands are denoted in the darkest colour and placed accordingly between the best- and worst- performing regions of Poland and the UK.

When examining the Figure, it becomes clear that there were only 7 states whose best-performing regions exceeded the 3% level. These regions were Braunschweig (Gernmany) at 6.56%; Hovedstaden (Denmark) at 4.84%; Pohjois-Suomi (Finland) at 4.79%; Västsverige (Sweden) at 4.34%; Steiermark (Austria) at 3.42%, and East of England (United Kingdom) at 3.20%. The average of all best-performing regions does not reach 3%, standing at 2.62% (and is only 0.46% for the worst-performing ones).

Figure 21. Regions with the highest and lowest rate of R&D intensity, per every EU state
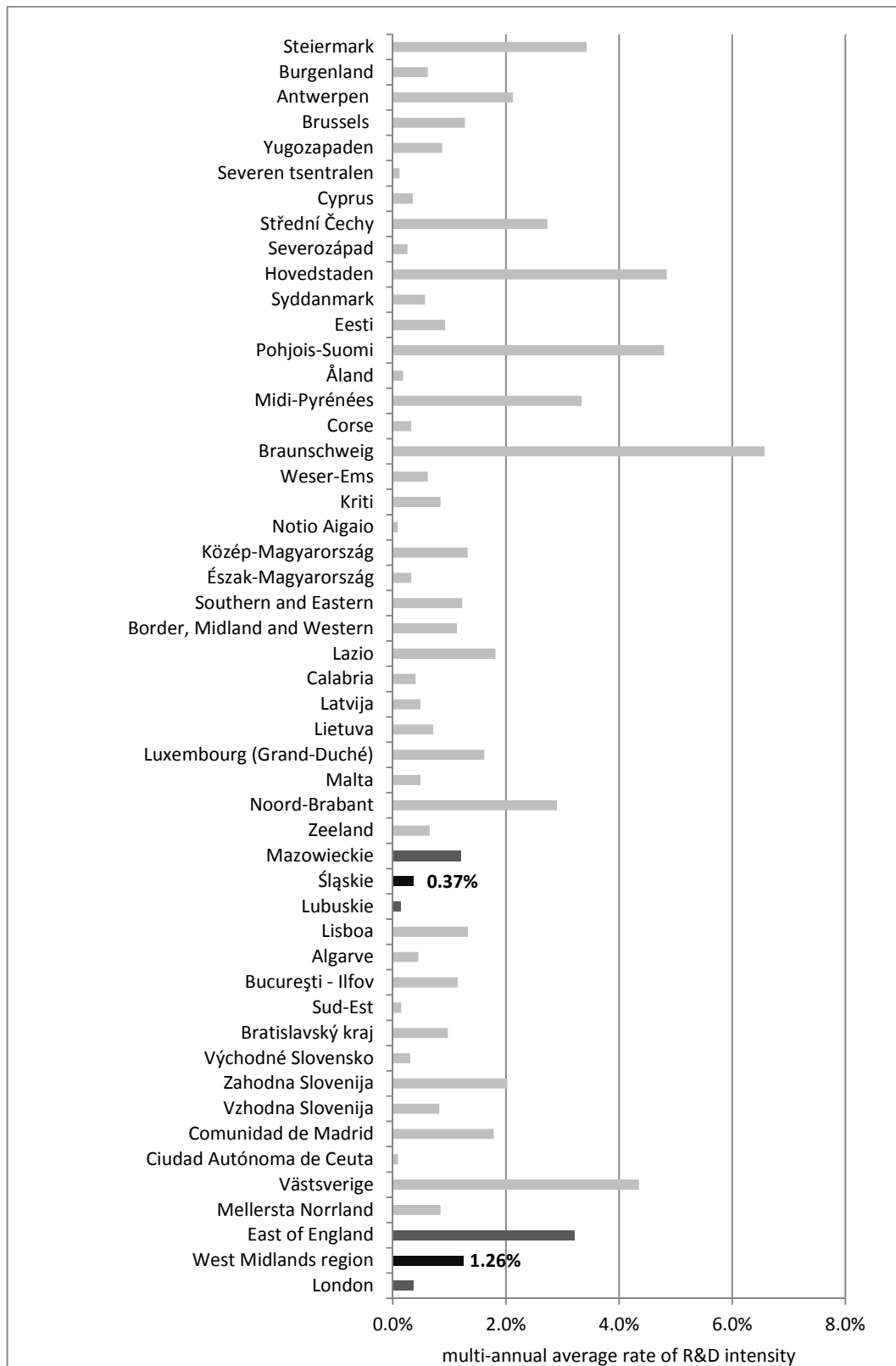
Source: author's own study based on the data from Eurostat database (Eurostat, 2011a).

Silesia and the West Midlands show relatively poor performance, with GERD to GDP ratio at 0.37% and 1.26% respectively. In the Polish case the best-performing region, by now it may come as no surprise, is Mazowieckie, though its R&D intensity is only at 1.20%. However, rather surprisingly, the UK's worst-performing region is London (at 0.36%).

What is interesting, although not presented on the graph, is that the quantitative analysis of all of the EU regions showed that there were only 24 regions (out of 246 examined), which exceeded the 3% boundary. These were eleven German regions (Braunschweig– 6.57%, Stuttgart– 5.21%, Oberbayern– 4.66%, Tübingen– 4.05%, Karlsruhe– 3.63%, Berlin– 3.62&, Dresden– 3.61%, Niederbayern– 3.51%, Rheinhessen-Pfalz– 3.23%, Darmstadt– 3.12% and Köln– 3.13%), four Swedish regions (Västsverige– 4.35%, Sydsverige– 4.22%, Stockholm– 3.87%, Östra Mellansverige– 3.62%), three Finnish regions (Pohjois-Suomi– 4.79%, Etelä-Suomi– 3.56%, Länsi-Suomi– 3.55%), two Austrian regions (Steiermark– 3.42% and Wien–3.37%), two French regions (Midi-Pyrénées– 3.34% and Île de France– 3.24%), one Danish region (Hovedstaden– 4.84%) and one UK region (East of England– 3.20%).

Figure 21 shows that there are significant disparities within EU states, when it comes to regional levels of R&D intensity. This becomes even more visible when presented as in Figure 22. Here, it can be observed that the state (Germany) which included the overall best-performing region and ten of its regions exceeded the 3% boundary also holds the most significant disparity – reaching almost 6%. The smallest disparity can be found in the case of Ireland (0.095%), but, again, it must be remembered that this state consist of only two regions.

Poland's level of disparities is considerably smaller than the UK's and standing at only 1.07%, compared to over 3.21% in the case of United Kingdom.

Figure 22. Differences (in percentage) between the regions with highest and lowest rate of GERD, per every EU state consisting of 2 or more regions.
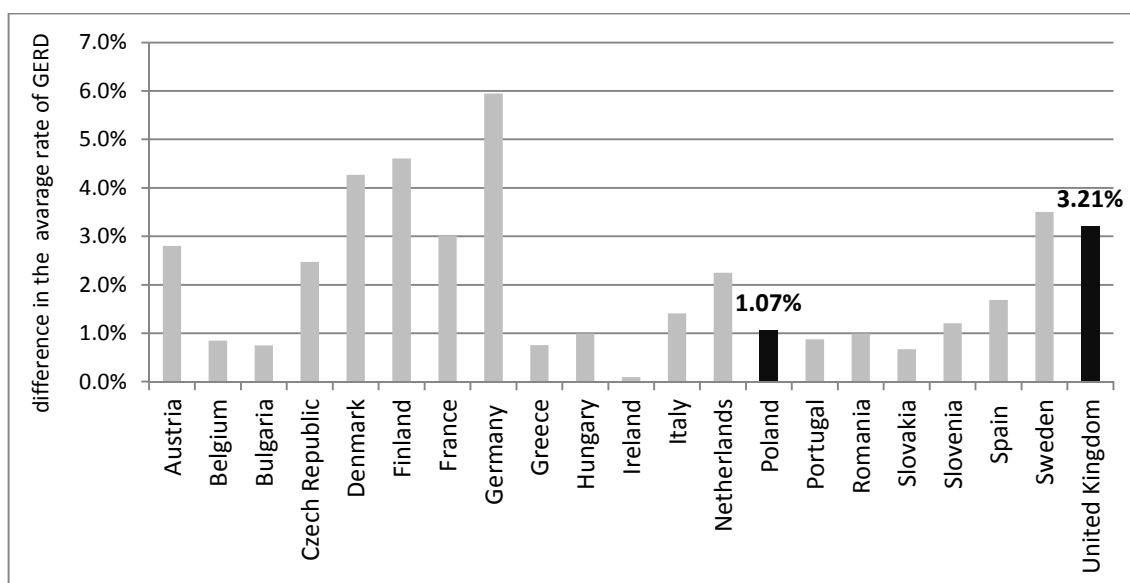
Source: author's own study based on the data from Eurostat database (Eurostat, 2011a).

The next stage of analysis focuses on the performance of R&D intensity in Silesia and the West Midlands over the course of the examined time period (Figure 23). It can be observed that the values did not fluctuate significantly; in case of the West Midlands the difference between the year with the highest and lowest levels of R&D intensity (1999 and 2005) is just 0.27%, and for Poland the difference between the values in the year 1999 (highest) and 2002 (lowest) is only 0.14%. The main difference between the visual representations of the changes of R&D intensity in Silesia and the West Midlands is that the former kept a rather steady trend, experiencing just a 0.1% decrease in the whole course of the examined years, eventually reaching 0.44%, which is just 0.01% lower than the initial value, whereas the latter experienced two slumps in 2005 and 2008 (both less than 0.2% from the previous values), ending with the final value 1.27% lower than the initial one.

Figure 23. The changes in the GERD indicator in Silesia and the West Midlands in the years 1999-2009.
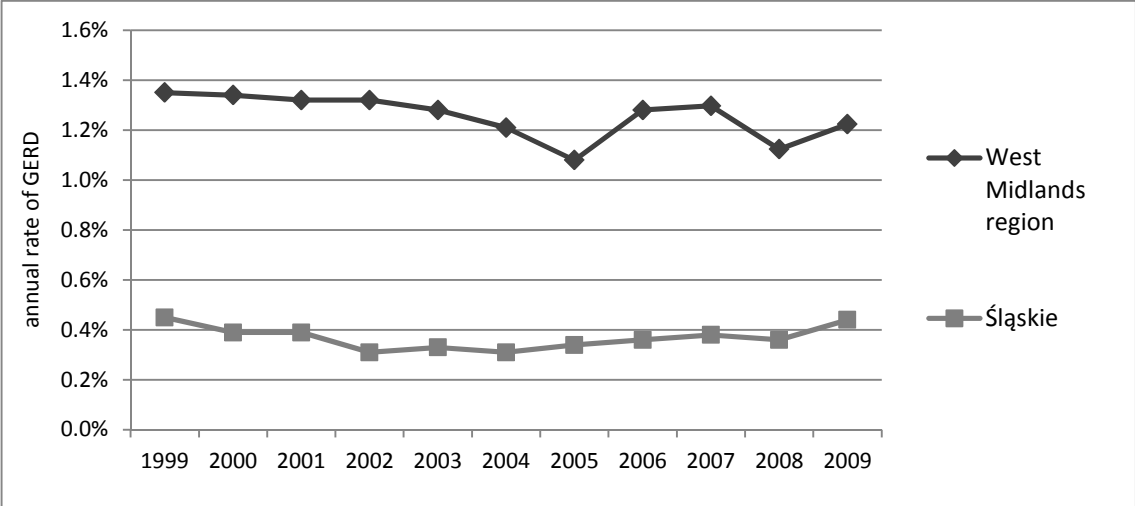
Source: author's own study based on the data from Eurostat database (Eurostat, 2011a).

Following the order of previous analysis, the next stage is to compare the performance in time of Silesia and the West Midlands with the regions of the highest- and lowest- R&D intensity average in the examined period (Figure 24).

Figure 24. The changes in GERD ratio in Silesia and the West Midlands in the years 1999-2009 compared to the highest- and lowest- performing EU region
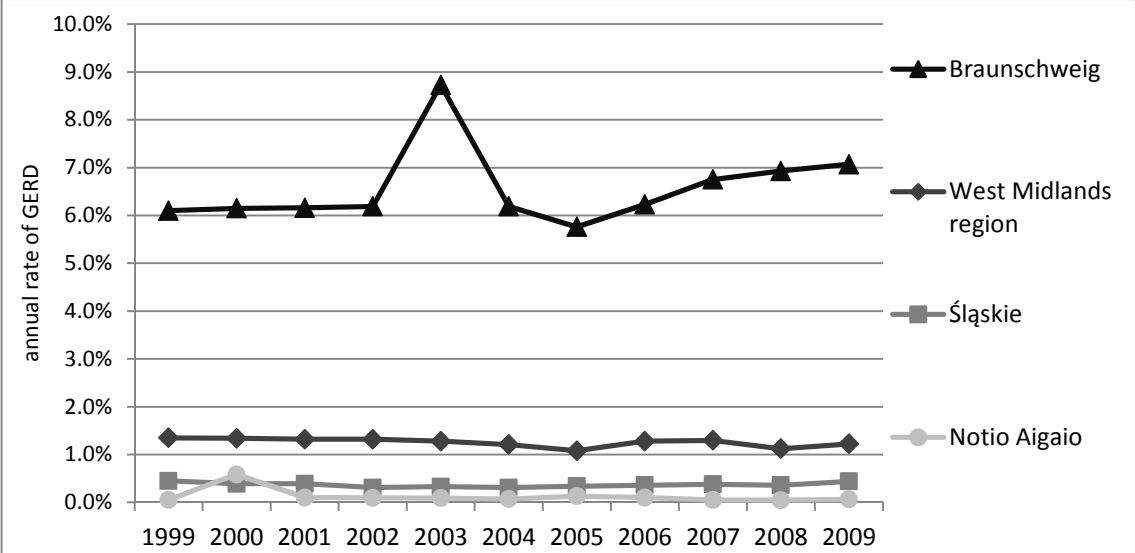
Source: author's own study based on the data from Eurostat database (Eurostat, 2011a).

It can be seen that both Silesia and the West Midlands are far closer to the worst performing region (Greek Notio Agaio, whose average over the years was 0.084%) than to previously mentioned German Braunschweig. The figure also gives perspective to the two

(Silesia and WM) regions' performance and makes it clear that their performance over time was relatively steady. Notio Agaio, kept a relatively steady pattern of R&D intensity, on average at a level of 0.05%, with one single peak in 2001, when the R&D intensity reached 0.1%. Braunschweig's performance was slightly more diversified, with a very steep peak in 2003 (8.73% compared to approx. 6.2% in the previous and following year). This region also experienced a slight decrease in the year 2005 (5.76%), followed by a relatively steady growth up to the level of 7.07% in the final year of the examined period.

The next step in analysing the performance of R&D intensity in the West Midlands region and Silesia is to examine their performance in comparison to the value of the GERD ratio in the whole of the United Kingdom and Poland respectively. A general comparison of the values over the years is presented in Figure 25.

Figure 25. Ratio of GERD in Silesia compared to Poland's average and in the West Midlands compared to UK's average in the years 1999-2000.
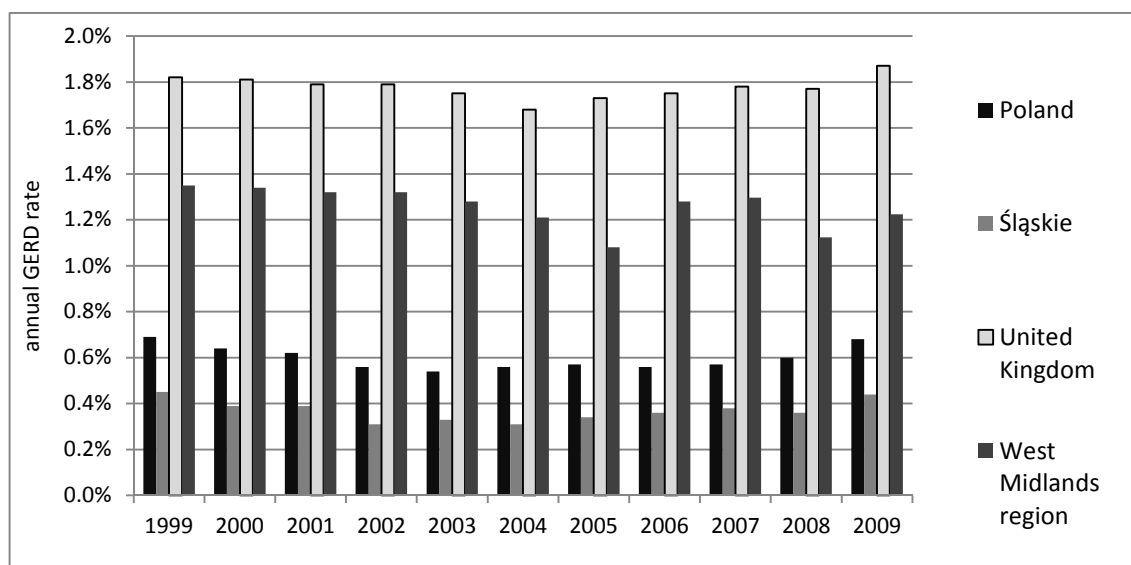
Source: author's own study based on the data from Eurostat database (Eurostat, 2011a).

It becomes very visible that the UK's R&D intensity is on a much higher level than Poland's over all of the examined years. What is interesting is that whereas in the case of the UK

the value of R&D intensity in the final year is slightly higher (by 0.05%) than in the initial one, in the case of Poland the values dropped by 0.01%.

Other significant findings resulting from the analysis presented in Figure 26 are that both the West Midlands' and Silesia's rate of R&D expenditure is on a lower level than the average for all of their respective states. It can be observed that over the whole examined period the difference between Silesia's and Poland's R&D intensity was much smaller than the difference between the West Midlands and the UK; the former oscillated between 0.19% and 0.25%, and whereas the latter was as much as 0.47% to 0.65%. Therefore it can be stated that although both regions seem to be underperforming comparing to their respective states' average, the West Midlands is in a comparatively worse position.

Figure 26. Differences (in percentage) between Polish and Silesian, and UK and West Midlands' GERD ratio in the years 1999-2009.

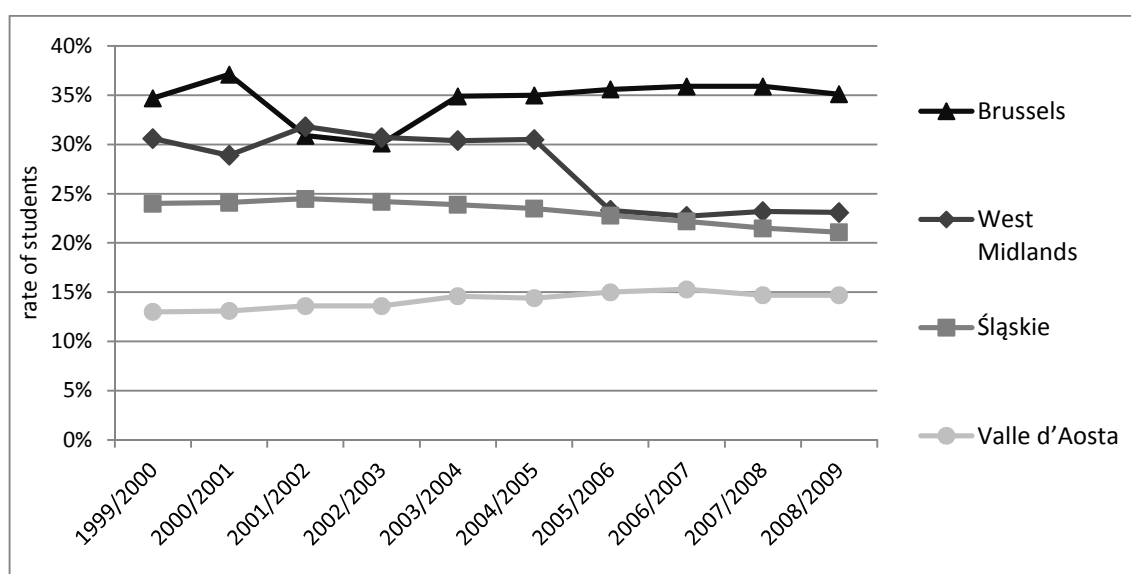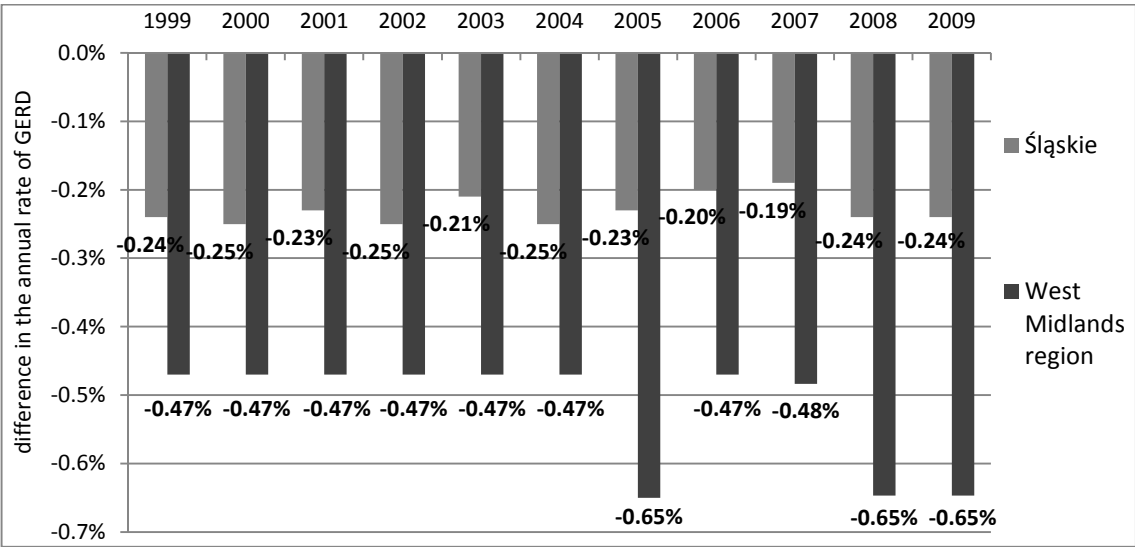Source: author's own study based on the data from Eurostat database (Eurostat, 2011a).

Patent applications to the EPO: hi-tech, ICT and biotechnology

The final indicator consists of the sum of data on patents submitted to the European Patent Office (EPO) from the areas of Information and Communication Technologies (ICT), biotechnology and high-technology. As was already discussed in the part of the previous chapter which outlined the reasons behind the choice of the indicators (see in particular p.74-75), although the number of patents can serve as one of the best measures of inventive capacity in a given region, it has some limitations; it is quite obvious that not all inventions made in a region are patented, various patents may have different intrinsic values and not all of them will lead to noteworthy technological or scientific breakthroughs.

For the purpose of this research, following the methodology of data collection by the Eurostat, the number of patent applications is counted according to the year in which they were filed and are assigned to a given region according to the inventor's place of residence. Fractional counting is used in the cases of patents with multiple inventors. Furthermore, in order for the data to be more representative and comparable on the regional level, the sum of patent applications in the three before mentioned sectors was re-scaled and presented as per million inhabitants of a given territorial unit (henceforth denoted as "p_a/i_m"). A very important issue is that in a handful of cases the Eurostat database lacks regional data on number of patent applications. Therefore, for the purpose of analysis it was decided to focus on using average values rather than particular data for a given year.

The analysis allows for some very interesting findings. First of all, the ratio of patents' application number in European regions is very diverse. This can be seen at Figure 27, which presents the regions with the highest and lowest average rate of patent applications from within the examined time period (1999-2009). As was done in the analysis of previous indicators, both the West Midlands and Silesia were intended to be denoted in the darkest colour, but because of the very low rate of p_a/i_m in Silesia (just over 0.22 p_a/i_m), it is only the West Midlands region that is clearly visible.

Figure 27. Regions with the highest and lowest rate of patent applications, per every EU state

Figure 27. Regions with the highest and lowest rate of patent applications, per every EU state
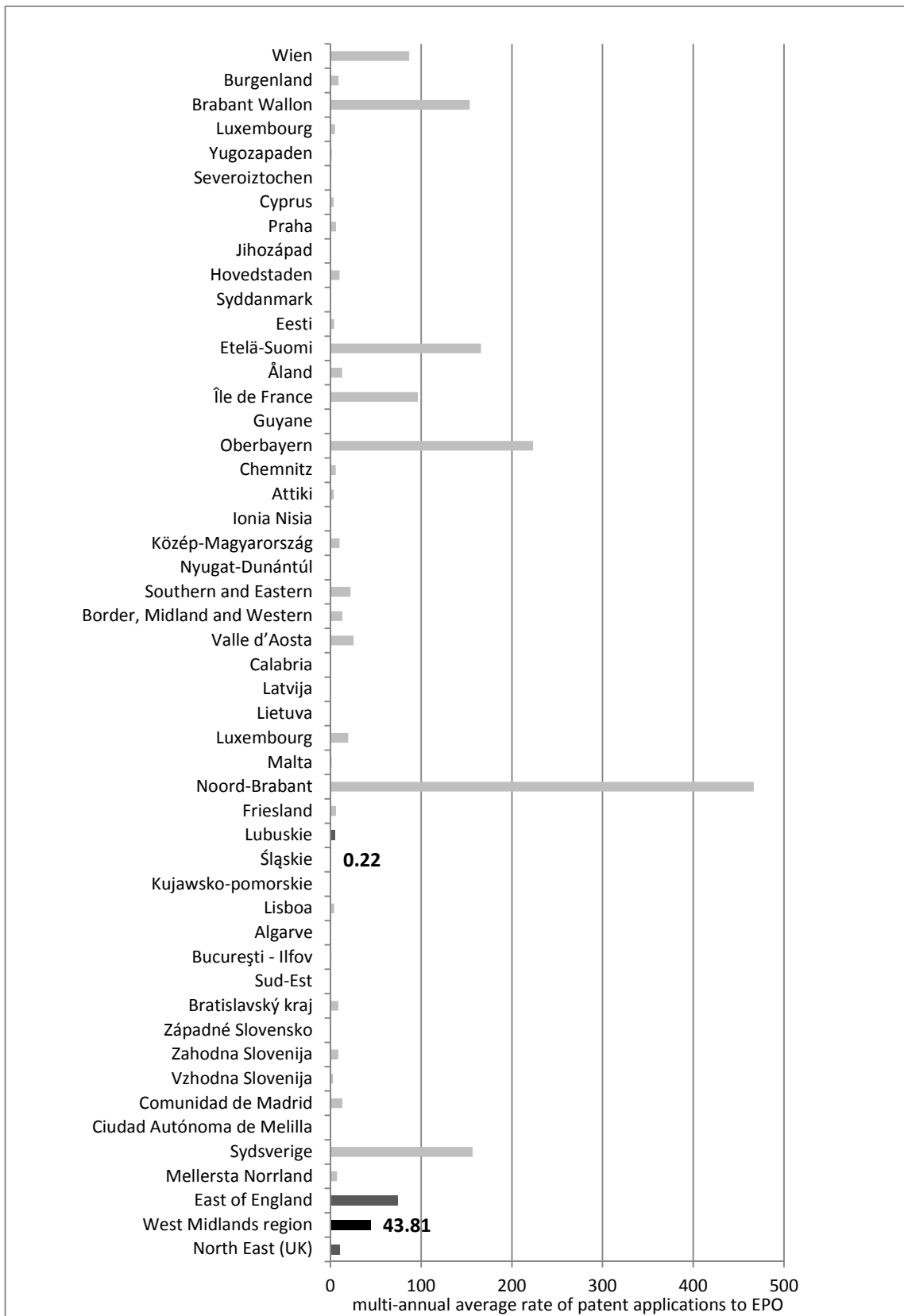
Source: author's own study based on the data from Eurostat database (Eurostat, 2011a).

The values of patent applications ratio vary significantly even in the case of "best-performing" regions in every state; from 466 patent applications / million inhabitants in Dutch Noord-Brabant to 0.95 p_a/i_m in Romanian Bucureşti-Ilfov. Regions with significant (i.e. exceeding 100 per 1 M inhabitants) number of p_a/i_m which are the best-performers in their respective states, besides the already mentioned Noord-Brabant, are German Oberbayern (223.2 p_a/i_m), Finnish Etelä-Suomi (165.98 p_a/i_m), Swedish Sydsverige (156.64 p_a/i_m), and Belgian Brabant Wallon (153.58 p_a/i_m).

Overall, from all of the regions taken into account for the analysis, there are only 11 instances of p_a/i_m exceeding 100. Apart from the ones listed in the previous paragraph and presented in Figure 24, these include: German Mittelfranken (152.28 p_a/i_m), Oberpfalz (102.11 p_a/i_m) and Stuttgart (100.72 p_a/i_m), Finnish Länsi-Suomi (126.95 p_a/i_m) and Pohjois-Suomi (121.71 p_a/i_m), and the Swedish Stockholm region (153.41 p_a/i_m). The East of England falls short in this aspect, with p_a/i_m reaching only 74.14.

Another issue worth pointing out is that when it comes to Poland, this is the only indicator in which it is not Mazowieckie that holds the highest score: it is Lubuskie (4.64 p_a/i_m); the capital region is at second position with 1.28 p_a/i_m.

In the general case of regions with the lowest rate of patent applications the values are also quite diverse (although not as much as within "best-performers") and range from 13 p_a/i_m (Irish Border, Midland and Western) to nil (0.00) in cases of French Guyane, Greek Ionia Nisia, and Portuguese Ciudad Autónoma de Melilla

The regional disparities within given EU states become very clear when visualised as in Figure 28. Here, the state one of whose regions holds the highest value of p_a/i_m in the whole of EU, i.e. the Netherlands, is also the one with the most significant difference between its "best" and "worst" region: 460.5 p_a/i_m. It can also be observed that all of the states whose regions were listed in previous paragraphs as achieving a relatively high rate of p_a/i_m are holding a high

disparity score. In two states, i.e. Bulgaria and Romania the disparity is on a very modest level, in both cases around value of 1 p_a/i_m. Notably, these are also the countries with a relatively poor performance in the aspect of this indicator.

Figure 28. Differences between the regions with highest and lowest rate of patent applications, per every EU state consisting of 2 or more regions
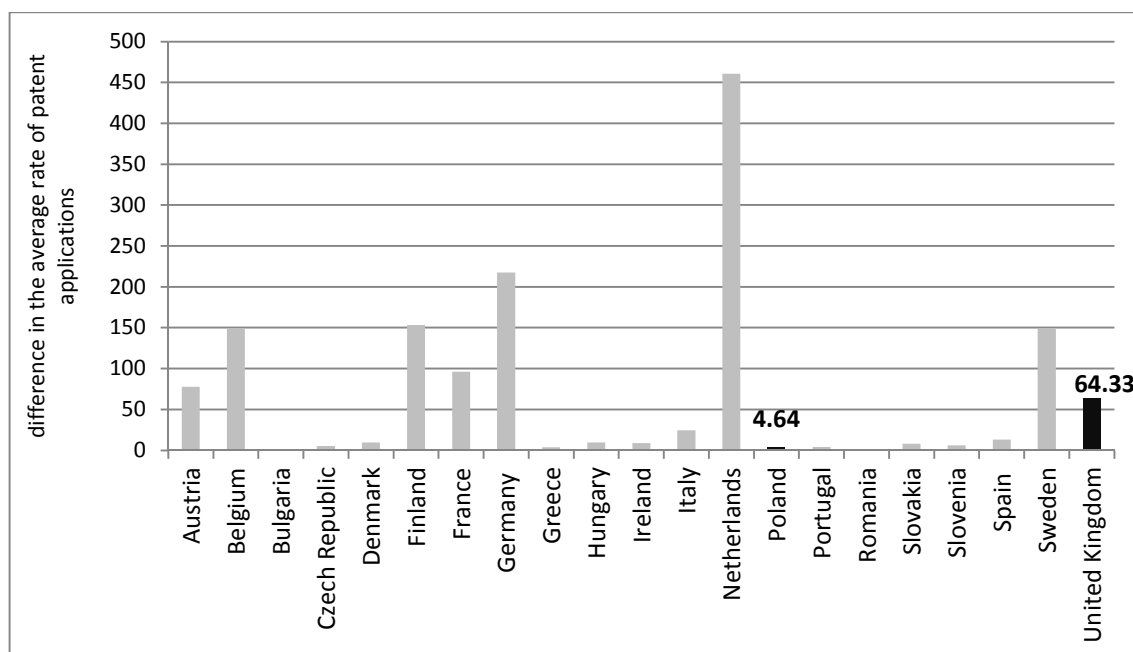
Source: author's own study based on the data from Eurostat database (Eurostat, 2011a).

When it comes to examining the situation in the states which are of most interest to the research, it becomes clear that the differences in the case of the UK are considerably bigger than in Poland (64.33 p_a/i_m compared to 4.64 p_a/i_m). The UK's level of disparity between the best- and worst- performing region can be located halfway between the ones presented by Austria (77.76 p_a/i_m) and Italy (24.69 p_a/i_m); Poland's disparity value is close to the ones of Portugal (4.08 p_a/i_m) and the Czech Republic (5.47 p_a/i_m).

Looking into the differences between the averages, it is worth focusing on the difference between average numbers of patent applications over the examined period in the two chosen case-study regions and their respective states (Figure 29). In the case of the West Midlands it can be seen that on average it has had a higher number of patent application over

the years, whereas Silesia falls short of Poland's average. It should be noted, however, that both

of the differences are not that substantial, and in both cases do not reach more than 0.5 p_a/i_m.

Figure 29. Differences between Polish and Silesian, and UK and West Midlands' 10-year average patent application.
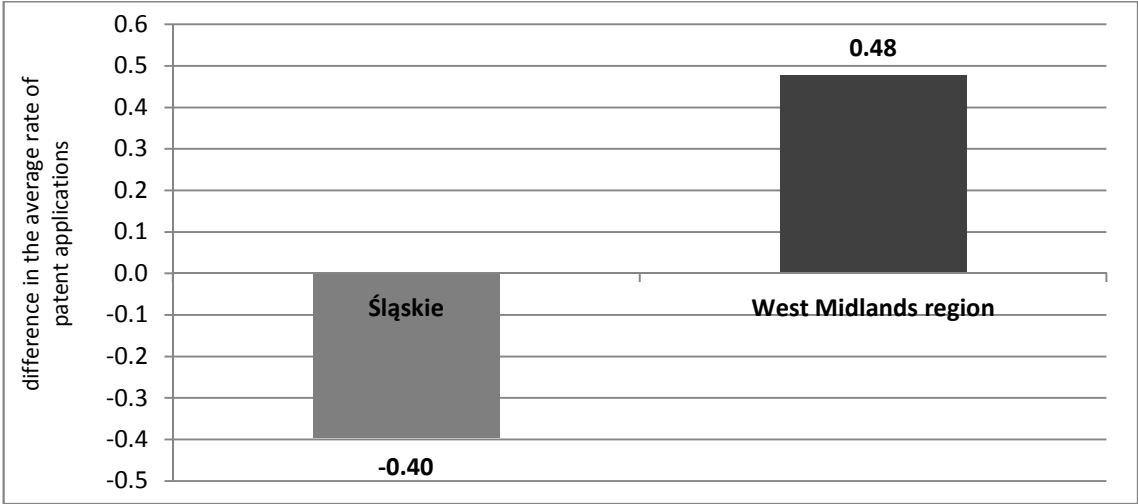
Source: author's own study based on the data from Eurostat database (Eurostat, 2011a).

As stated already in the section's introduction, the analyses presented above will

contribute to both the subsequent analysis of the KBE performance across EU regions, and to

testing the thesis' hypotheses as presented on p.216- 232.

KBE in European regions

After gathering and analysing the data on chosen indicators of the Knowledge-Based Economy in European regions, the next vital stage of the research is calculating the KBE General Index (*KBE GI*) and analysing its performance over the assumed time period (1999-2009). The stages of the analysis closely follow the stages used for previously analysing the particular indicators which the General Index consists of.

Firstly, the Index was calculated according to the methodology presented on pages 76-80). After obtaining the KBE GI real values for each of the examined 246 European regions for each year of the 1999-2009 time-span, the data were normalised to a coefficient where the pan-European mean for every year is equal to 100 and each score was transformed into a value >100 or <100 as this allows for a good comparison between the regions. Therefore all of the values used in visual presentations of the analysis' results are the normalised coefficients.

For the full table with the values of Knowledge-Based Economy General Index expressed both in real and relative values, please see Appendix 3. For reasons of space and clarity, all the values are presented accurately to two decimal places.

The first stage of analysing the performance of European regions in terms of their Knowledge-Based Economy is to compare the regions with the highest- and lowest- value of KBE GI per all of the EU Member States (Figure 30). What was taken into account is the multi-year average of the KBE GI and the figure presents only the regions of given member states which had the highest and the lowest score (alphabetically according to the State's name). Member States consisting of just one NUTS2 region (i.e. Cyprus, Estonia, Latvia, Lithuania, Luxembourg and Malta) are presented in the figure as well. Value = 100 denotes the European average. Additionally, the figure includes the results for Silesia and West Midlands, denoted in darkest colour and placed accordingly between the regions with the highest and lowest value of KBE GI in Poland and the UK.

Figure 30. Regions with the highest and lowest rate of KBE GI (normalised).
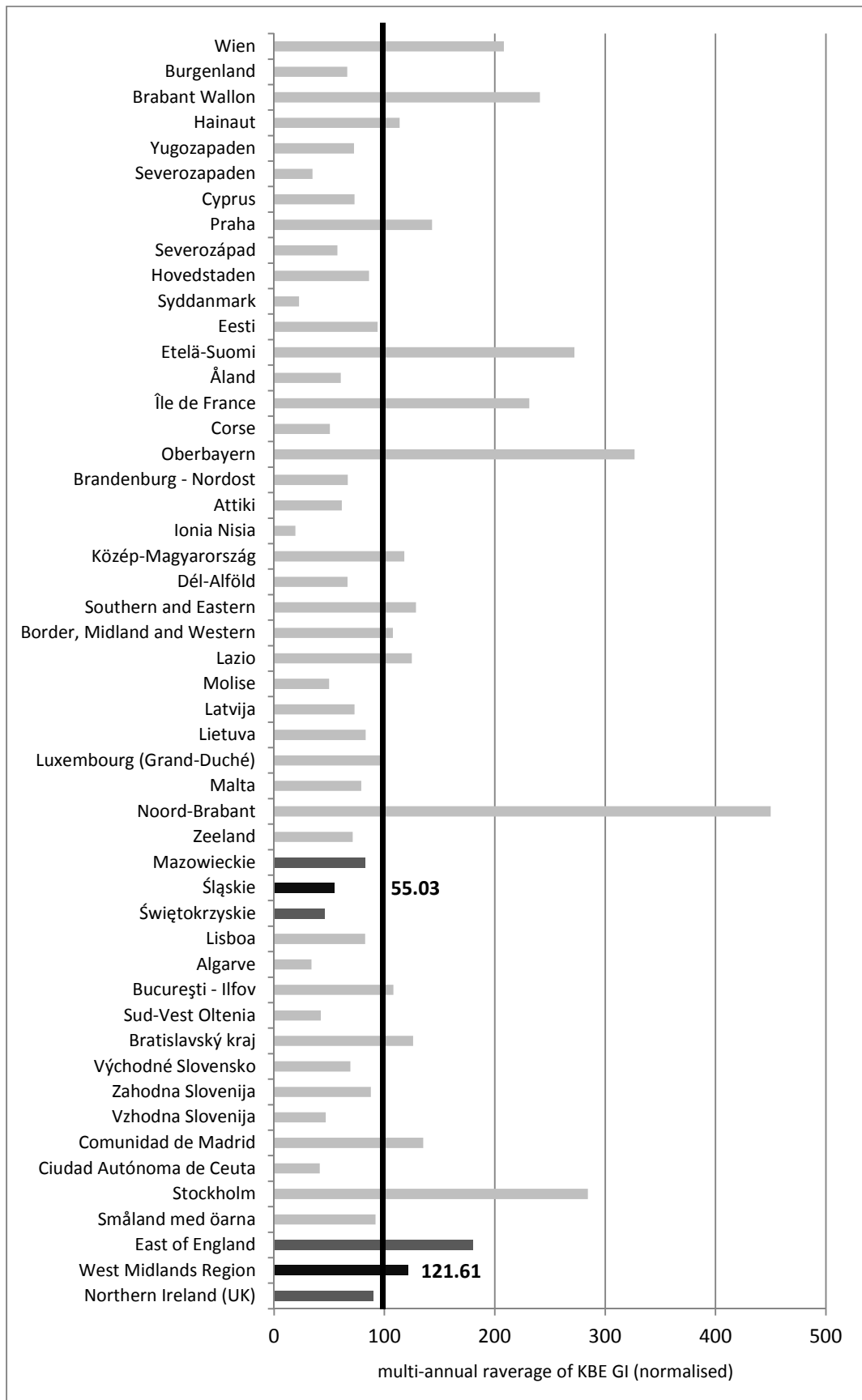
Source: author's own study

The differences in regional performance are clearly visible here. Out of all of the best performing regions, the highest result was obtained by Dutch Noord-Brabant (which scored very high in the indicators of R&D intensity and was by far the region with most patent applications), whose KBE GI was over 4.7 times higher than EU average. Other best-performing regions with significantly high value of KBE GI (i.e. exceeding the value of 250), yet much lower than Noord-Brabant , are German Oberbayern (326.68), Swedish Stockholm (284.41), Finnish Etelä-Suomi (272.10), and Swedish Sydsverige (260.48). The regions which were best-performers in their country yet their KBE GI is below EU average, are: Slovenian Zahodna Slovenia (87.78), Danish Hovedstaden (86.10), Polish Mazowieckie (82.92), Portuguese Lisboa (82.64), Bulgarian Yugozapaden (72.35) and Greek Attiki (61.51).

What can be observed is that majority of the highest performing regions are the capital regions of respective states, but strikingly, is not the case for Belgium (where the best performing region in terms of KBE GI is Brabant Walloon, not Brussels), Germany (Oberbayern, not Berlin), Netherlands (Noord-Brabant instead of Noord Holland), and the UK (East of England, not London). The UK case can be explained by the already stated estimations (page X) that in London significant part of the labour force is employed in the finance sector, not in high technologies and knowledge-rich sectors.

When looking at the other side of the KBE scale, the regions with the lowest national performance (i.e. KBE GI below 45) are: Spanish Ciudad Autónoma de Ceuta (44.27), Romanian Sud-Vest Oltenia (41.92), Bulgarain Severozapaden (36.49), Portuguese Algarve (36.18), Danish Syddanmark (33.14) and Greek Ionia Nisia (21.03). What is interesting, although not shown in Fig. 30 is that out of the 10 worst-performing regions of the entire EU (i.e. with KBE GI below 30), 8 regions are Greek; their KBE GI ranges from 29.75 (Anatoliki Makedonia) to 19.35 (Ionia Nisia).

In case of the West Midlands and Silesia it is visible that while the former slightly exceeds the EU average (at 121.61), the latter scored far lower with the KBE GI value standing only at 55.03. There is also a significant gap between the best performing regions in the UK and Poland. The before mentioned East Anglia is one of the best performing regions in the entire EU (it is in the first 25 regions with its KBE GI reaching 180.35), while Mazowieckie falls short of reaching the EU average (82.93). When looking at the worst performing regions in the two states (Northern Ireland and Świętokrzyskie) the differences between their results are also significant, with the regions reaching 89.96 and 46.23 respectively.

The disparities between the regions with highest and lowest values of KBE GI, per every EU state consisting of more than two NUTS 2 regions, are presented in Figure 31. Here again the highest column belongs to the Netherlands – although it accommodates the region with the highest value of KBE GI (Noord-Brabant) it also exhibits the biggest rate of regional disparities (reaching 405.88).

When comparing this figure to the previous one it can be seen that all of the states whose regions have the highest values of KBE GI show very significant disparities. The lowest regional disparity level can be observed in Ireland, which contains only two NUTS 2 regions (Southern and Eastern; and Border, Midland and Western which experienced a very similar level of performance in terms of KBE). For the two states to which the main case-study regions belong, it can be found that although Poland's regions in general score lower than the UK's in terms of KBE GI, as per Figure 31, the disparities between them are much smaller; the differences between the best- and worst- performing regions in the UK reach 90.38, whilst for Poland the disparity value is only 36.71.

Figure 31. Differences between the regions with highest and lowest rate of KBE GI (normalised), per every EU state consisting of 2 or more regions.
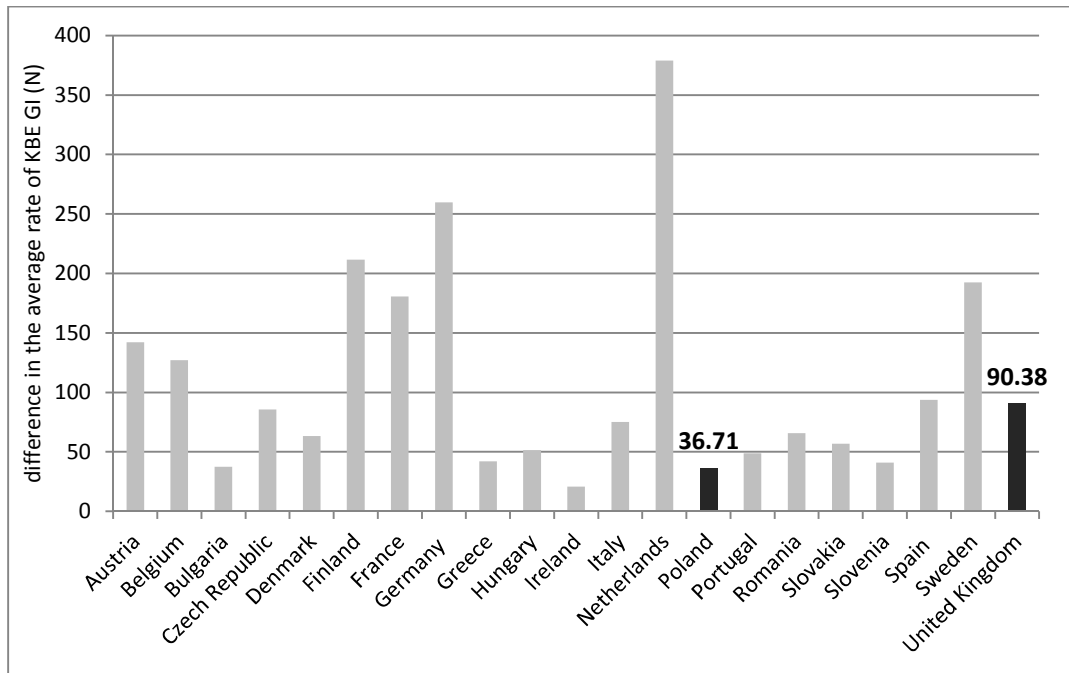
Source: author's own study

The next stage of the analysis requires focusing on the particular performance of the Knowledge-Based Economy General Indexes for the West Midlands region and Silesia over time (Figure 32). The higher lines denoted in lighter colours present the values of KBE GI normalised (N) to an EU average = 100 (marked with a bold black line). What must be kept in mind is that the values are expressed in relation to the EU average which was calculated for each year separately and therefore was subject to annual changes. The lower lines in the figure, denoted in darker shades, represent the KBE GI in real values (R). In order for both the normalised and real values to be more legible in the visual representation, the normal values were all multiplied by a factor 100.

Figure 32. The changes in the KBE GI (normalised [N] and real [R]) in Silesia and the West Midlands in the years 1999-2009.
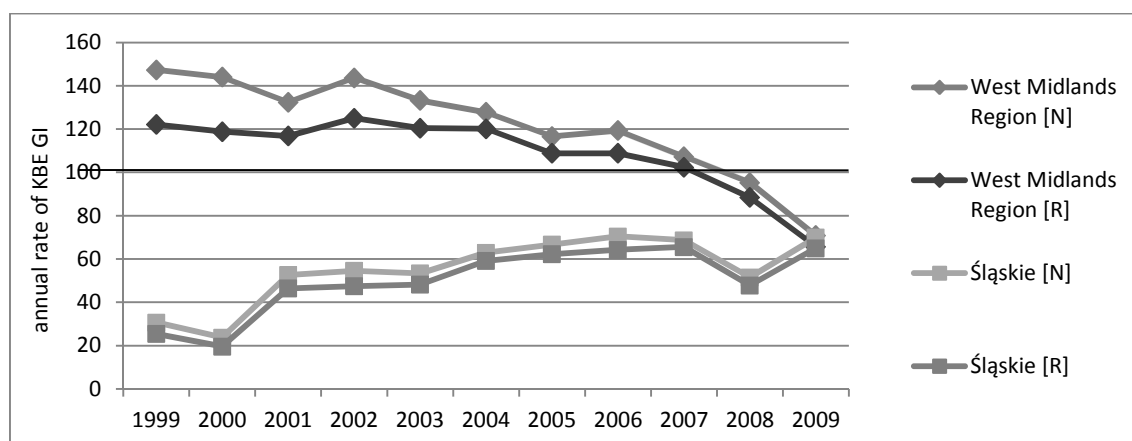
Source: author's own study

The first general observation is that although the values fluctuated over the years, Silesia kept a rather upward trend, whereas the West Midlands experienced a downfall. The second vital observation is that despite the downfall, the West Midlands kept above the EU average (in normalised values) for almost all of the examined time period. The most significant slump which occurred in this region took place in 2008/2009 when the values decreased by 24.51 in normalised values (and by 22.68in real values). Generally, over the course of the time-span taken into account in this research, the West Midlands' KBE GI value dropped in nominal values by 56.38 (from 122.13 to 65.75); and in real values by 76.57 (from 147.37 to 70.80).

At the same time the value of KBE GI for Silesia experienced an increase of 39.24 in normalised values (39.51 in real values), with the most significant upwards change in the year 2000/2001: 28.89 in normalised values (26.85 R). The only significant downfall in Silesia's performance took place in 2007/2008 when the KBE GI decreased by 17.17 N (17.75 R). Yet overall the increase of the values in Silesia over the course of the examined period reached 39.43 in normalised values, from initial 30.72 to 69.96 (in real values: 39.51, i.e. from 25.45 to 64.96). What is worth emphasis is that the initial normalised disparity between the regions which reached 116.65 in 1999 has decreased to 0.85 in 2009, which is a decrease by 115.81 (a decrease of 95.89 using real values).

Notable findings come into light when the performance over time of West Midlands and Silesia is compared to the overall best- and worst-performing regions of the EU (namely Noord-Brabant (Netherlands) and Ionia Nisia (Greece) (Figure 33) Here all the values are presented as normalised to the EU average =100.

Figure 33. The changes in KBE GI (normalised) in Silesia and the West Midlands in the years 1999-2009 compared to the highest- and lowest- performing EU region
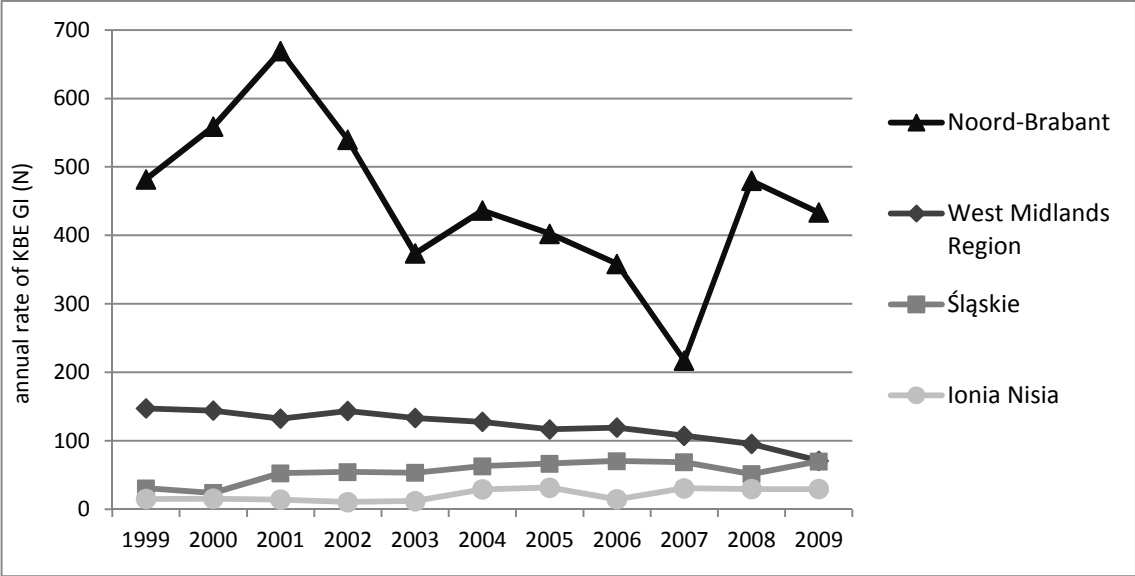
Source: author's own study

In terms of their KBE performance, both the West Midlands and Silesia can be seen as much closer to the worst-off region. It can also be seen that despite the changes in the levels of KBE GI as described in the paragraphs above and visualised by Figure 32, both the West Midlands' and Silesia's values did not fluctuate that significantly; whereas during the examined time period Noord-Brabant has experienced quite a few significant increases and decreases in the value of KBE. The overall amplitude of those changes reached as much as 452.00 (669.17 in 2001 compared to 217.18 in 2007). In the end, the overall change of Noord-Brabant's performance was a decrease over the years by 48.52. Yet it must be noted that all through the time-span taken into account the values of KBE GI for this region did not drop below the EU average. On the other hand, the worst performing region - Greek Ionia Nisia – experienced a

small (14.56) increase in the values of KBE GI (from 14.92 in 1999 to 29.48 in 2009) and faced

slight fluctuations in the KBE GI values over the course of the examined time period.

The final stage of analysing the changes in the KBE GI in the West Midlands Region and

Silesia is to compare them with the performance of their respective states over time (Figure 34).

Figure 34. The changes in KBE GI (normalised) in Silesia and the West Midlands in the years 1999-2009 compared to KBE GI (normalised) in Poland and the UK.
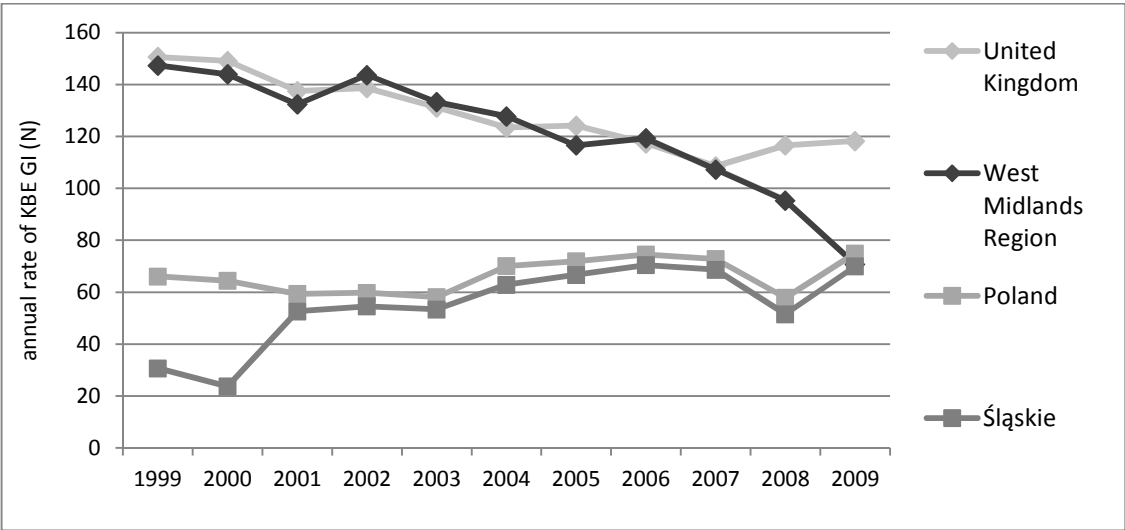
Source: author's own study

It can be seen that for most of the examined time span, both of the regions followed a

rather similar pattern to the one exhibited by average values of the KBE GI in their respective

states. However, both of the regions deviated from the national pattern in two years, yet what is

notable is that this occurred on two different ends of the scale. Silesia was a region exhibiting

values of the KBE GI that were much lower than the national level in the years 1999 and 2000,

and in subsequent years its performance was almost an exact reflection of the Polish level,

albeit always less than 10 points lower. On the other hand, the West Midlands KBE GI was of

almost exactly the same values as the UK level from the very beginning of the examined time-

frame, however in the years 2008 and 2009 the WM experienced a significant decrease in KBE GI

values and fell much below the UK level. What also should be pointed out again is that despite

their general upward trend, the values of KBE GI in Poland (and Silesia) have not yet reached the level of the EU average, whereas UK (and the West Midlands up to the year 2008) have kept above the EU average.

The above analysis of particular KBE indicators and its GI in European regions created a robust picture of how those aspects have changed over the examined decade and proved, unsurprisingly, vast differences between the regions. The findings will contribute to testing the thesis' hypotheses, as presented in the Chapter Five (pages 216-232).

What is more, having this in-depth knowledge of one part of the research puzzle allows moving on to the statistical analysis of the relationship between the KBE and the volume of Funds allocated to given regions.

The European KBE and the Structural Funds

The final stage of quantitative analysis will consist of examining the volumes of Structural Funds' allocations in European regions followed by performing statistical analysis of the relations between the Knowledge-Based Economy and the Funds. For the purpose of this research the Knowledge-Based Economy will be expressed in terms of performance of its General Index which was analysed in depth in the previous part of the chapter.

The three methods of statistical analysis (Pearson product-moment correlation, Spearman's tank correlation and two-way Analysis of Variance, as explained in great details in the Methodology section on pages 81-84) were applied to all of the EU regions; however in the course of presenting the analysis' findings a particular focus will be placed on a handful of chosen regions. Because of the already defined territorial focus of the research, the two main regions taken into account will be the West Midlands Region and Silesia (*Śląskie*). To put the findings for the two regions into perspective, other regions whose results will be emphasised will include the regions with best and worst performance in given terms across the entire EU and best- and worst- regions from the respective states: the United Kingdom and Poland.

Structural Funds in European regions

The Funds which will be taken into account in this analysis are the Structural Funds (SF), i.e. the European Regional Development Fund (ERDF) and European Social Fund (ESF) as an aggregate. The years for which the Funds will be considered depend on the European region in terms of relevance to their state's accession date. Therefore the time span 1999-2009 will be applied to the regions of the "old" EU-15 states (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and United Kingdom); Funds allocated in the years 2004-2009 will be used for regions of the "big-bang" eastern Enlargement states, namely: Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia; and finally, the time period of 2007-2009 will be taken into account for Funds allocated to regions of Bulgaria and Romania.

The data on Structural Funds allocation were extracted from the hard copy of *Table of Allocation for the years 1999-2009* obtained personally by the author from the DG Regio in February 2011.

The following graphs (Figure 35 and 36) present the volume of Structural Funds allocated to chosen regions in the pre-defined time periods. In order for the visualisations to be more comparable for West Midlands' and Silesia's results, they take into account different time periods. Figure 35 takes into account the regions from the "old EU", i.e. which were receiving SF in all the years of the period 1999-2009. The regions chosen for this visual presentation are: the regions with the highest- and lowest- sum of allocation volumes across the entire EU-15 (Spanish Andalucía and Finnish Åland respectively), the West Midlands region and the UK regions whose SF allocation was the highest (North West), and lowest (South East). The values on vertical axis are the allocations of SF in Million Euros.

Figure 35. Allocation of Structural Funds (in million €) in chosen regions for the years 1999-2009.
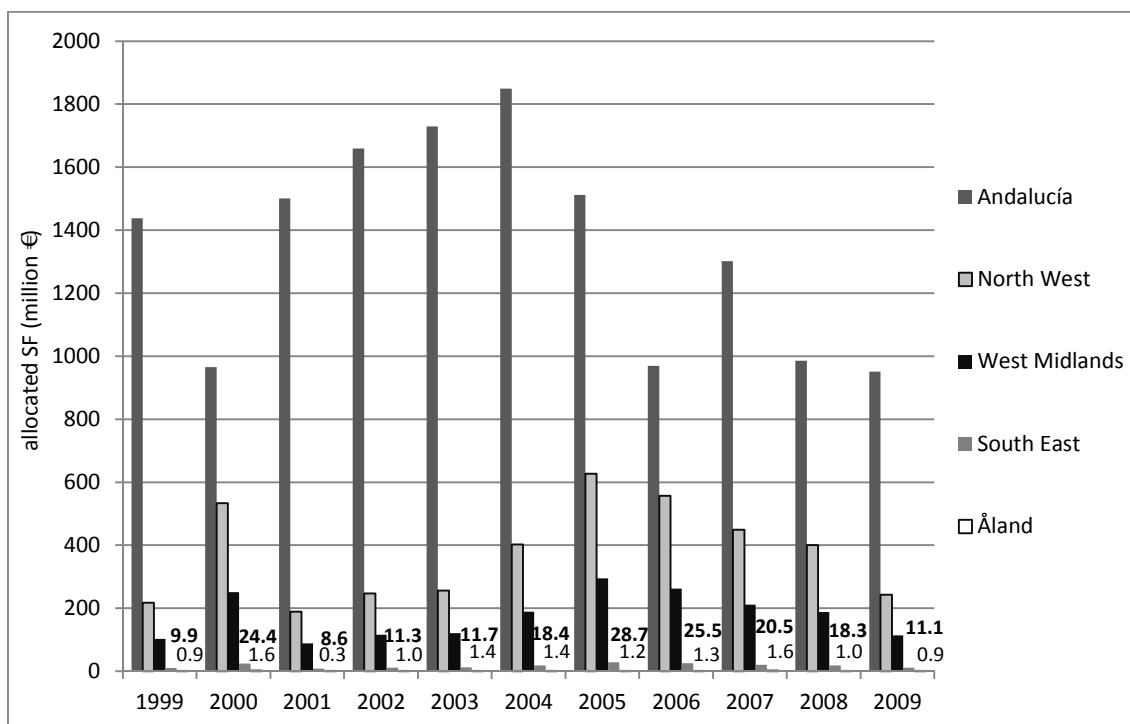
Source: author's own study based on the *Table of Allocation for the years 1999-2009*

It is clearly visible that the volume of allocation received by Andalucía is remarkably high, what must be remembered, however, is that Spain was receiving the highest amount of Structural Funds out of the whole EU-15. The lowest amount of allocation in the UK was destined for South East and in the whole of the EU – for Finnish Åland – the volumes were so comparatively small, that they are not visible on the visual representation; hence in the figure the values are given in numbers instead of bars. Out of the regions presented above, the West Midlands region was allocated a comparatively small amount of funding. Observing the changes of allocations over time it can be seen that the amounts of funding for the chosen regions did experience a drop after the year 2004, i.e. when the Eastern enlargement took place.

Figure 36 presents the volume of allocations for chosen regions which joined the EU after the year 2004. Regions taken into account here include the ones with highest and lowest allocation volumes across all of the "new" EU and, due to the thesis' focus on Silesia, Polish regions with highest and lowest SF allocation.

Figure 36. Allocation of Structural Funds (in million €) in chosen regions for the years 2004-2009.
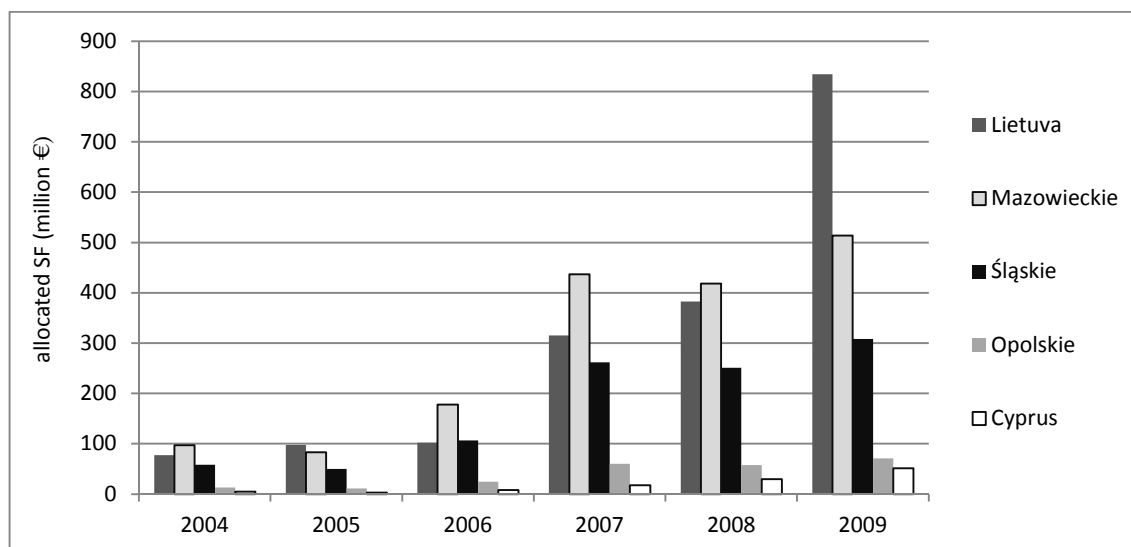
Source: author's own study based on the *Table of Allocation for the years 1999-2009*

The greatest allocation was destined for Lithuania, which despite being a state, in terms of European regional statistics is considered to be one NUTS 2 region (just like Cyprus, Estonia, Latvia, Luxembourg and Malta). The lowest volume of SF was allocated to another single-region state, i.e. Cyprus. When it comes to Poland, the highest volume of funding for the time period 2004-2009 was destined for Mazowieckie region, and the lowest- for Opolskie. Silesia received an average allocation, almost exactly half way between the volumes of SF destined for the two aforementioned Polish regions. An important observation is that the volume of funding for all of the regions analysed here has significantly increased from the year 2007 onwards, i.e. with the start of the Financial Perspective 2007-2013. What also should be noted is that even the region with the highest allocation volume was not allocated as much as Andalucía.

Interesting findings result from comparing the allocations for West Midlands and Silesia on one graph (Figure 37).

Figure 37. Allocation of Structural Funds (in million €) for the West Midlands and Silesia
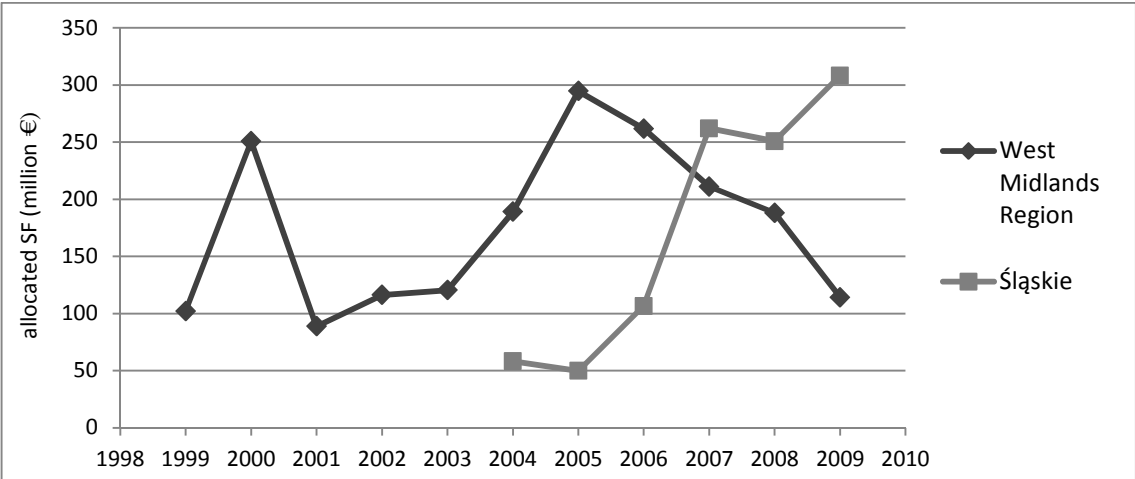
Source: author's own study based on the *Table of Allocation for the years 1999-2009*

It can be visible that WM was given a relatively high allocation in the first year of the 2000-2006 Financial Perspective, and in the year 2005. After that the volume of allocation experienced a steady steep downfall. Silesia, on the other hand, was receiving an increasing Funds' allocation, with a most significant rise in the first year of 2007-2013 perspective (€ 202 million, compared to € 106.6 M in the year 2006). In the final analysed year the West Midlands region was allocated just above €100 million, whereas allocation for Silesia exceeded €300 million. In other words, from the year 2005 onwards, the trends of allocations for the two regions were in completely opposite directions.

Statistical analysis of the KBE-SF relation

This part of the chapter deals with statistical analysis of the relation between the values of the Knowledge-Based Economy and the Structural Funds' allocation. The findings obtained are of particular importance for attempting to answer the thesis main research question.

Following the methodology explained on pages 81-84 the first stage of analysis consists of calculating the Pearson product-moment correlation coefficients and Spearman's rank correlation coefficients of the volume of Funding allocated to a given region and the region's KBE GI.

Pearson product-moment correlation

In case of Pearson's *r,* after calculating the correlation coefficients for all of the EU regions in the three chosen time series[11] (*t*, *t+1*, *t+2*), the regions were sorted according to the strength of each correlation (determined independently by the two correlation coefficients), separately for *t*, *t+1* and *t+2.*

For the full list of Pearson's and Spearman's correlation coefficients approximated to third decimal space for European regions in *t*, *t+1* and *t+2* please refer to Appendix 4.

Table 6 presents the values of Pearson's correlation coefficients in all three time scales for West Midlands Region and Silesia and, to put their results into perspective, the regions with best and worst performance across the entire EU and best- and worst- regions from United Kingdom and Poland in terms of Pearson's coefficients. The values of correlation coefficients are approximated to a third decimal space.

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[11] For explanation of the concept of the applied three time-series, please refer to page 83.

Table 6. Correlation coefficients for chosen regions in the three time series

	t		t+1		t+2	
	regions	**r**	**regions**	**r**	**regions**	**R**
EU-best	Jihozápad	0.894	Friuli-Venezia Giulia	0.722	Észak-Magyarország	0.828
UK-best	North East	0.285	North East	-0.146	North East	-0.365
PL-best	Świętokrzyskie	0.374	Świętokrzyskie	- 0.002	Świętokrzyskie	0.734
WM	West Midlands Region	-0.016	West Midlands Region	-0.383	West Midlands Region	-0.425
Silesia	Śląskie	-0.065	Śląskie	-0.556	Śląskie	0.086
PL-worst	Kujawsko-pomorskie	-0.495	Kujawsko-pomorskie	-0.614	Zachodniopomorskie	-0.041
UK-worst	East Midlands	-0.144	East Midlands	-0.544	Northern Ireland	-0.612
EU-worst	Severovýchod	-0.958	Lietuva	-0.965	Latvija	-0.996

Source: author's own study

It can instantly be seen that over the time scales the regions which were considered for comparative reasons do not remain unchanged. In the first time scale (*t*) the region which holds the strongest positive correlation coefficient out of the whole EU is Czech Jihozápad, but in the subsequent time scales this changes to Italian Friuli-Venezia Giulia (in *t+1*) and Hungarian Észak-Magyarország (in *t+2*). The regions with the strongest negative correlation in the whole EU change as well: from Czech Severovýchod in *t*, to Lietuva (Lithuania) in *t+1* and Latvija (Latvia) in *t+2*.

However, the UK's "best" region remains the same for the three time-scales: it is the North East. What should be noted is that in *t*+1 and *t+2*, the "best" correlation results are indeed negative. The UK regions with the "worst" correlation change from East Midlands in *t* and *t*+1 to Northern Ireland in *t+2.*

When it comes to Poland, Świętokrzyskie remains the region with the "best" correlation in all three time scales, although in *t+1* the correlation is of a small weight negative value. The Polish regions with the strongest negative correlations in the three time scales are Kujawsko-pomorskie (in *t* and *t+1)* and Zachodniopomorskie, yet it must be pointed out that it is only the first region whose correlation coefficient can be described as being of meaningful

strength, following the definition of "meaningful" as exceeding the values of |0.4| (see Table 3 on p. 82).

Overall, in two of the three cases (*t* and *t+2*) the regions with the strongest positive correlations belong to Central-Eastern European (CEE) States, who joined the EU in 2004: Czech Republic (Jihozápad) and Hungary (Észak-Magyarország); yet what is very interesting is that in all of the three time-scales the greatest negative correlation values occur for regions which are from CEE states as well (again Czech Republic, Latvia and Lithuania). Also, the negative correlations are of greater strength than positive ones in all three time-scales.

When focusing on the two case-study regions it becomes visible that in most instances the correlations are of negative values (all time-scales for West Midlands and *t* and *t+1* for Silesia). What is more, irrespective of their values the correlations are in the majority of cases of a relatively weak strength; the only correlations which could be described as meaningful, i.e. exceeding the values of |0.4|, are the correlations occurring in the West Midlands for the time scale *t+2* and in Silesia in *t+1*. What seems of particular importance is that in both of those cases the correlations are negative, which implies a lack of positive linear relationship between the KBE and the volumes of SF allocation.

Bearing in mind the triangulation *within* methods approach previously explained on pages 69 and 97, the Pearson's product-moment correlation coefficient seems insufficient for describing the KBE-SF relationship, despite the fact that it does yield a number of notable findings. The second stage, therefore, was to calculate Spearman's rank correlation coefficient ρ.

Spearman's rank correlation

The following graphs present the plotting of this coefficient against the volume of allocated Funds across all of the EU regions in all three timescales, however what should be taken into account is that the graph does not represent individual years, therefore the volume of allocation presented on the horizontal axis is a sum of allocations for the given region from the whole of the examined period (1999-2009).

Figure 38. Spearman's ρ in relation to the sum of allocated Funding in EU regions (t, t+1, t+2)
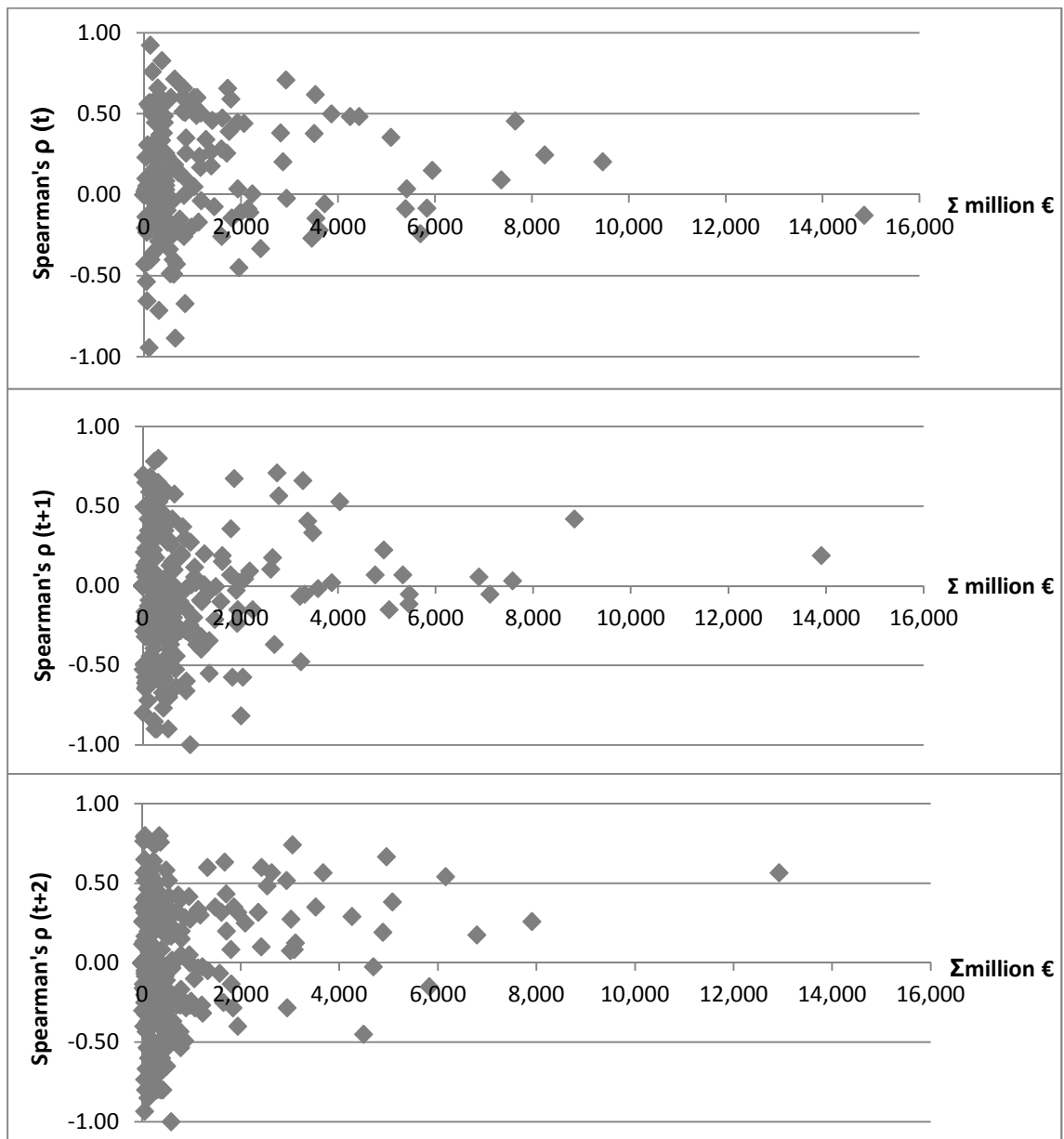
Source: author's own study

Figure 38 demonstrates that there is no significant change in the pattern of Spearman's ρ's distribution with the shift in timescales. What is visible on all three graphs is that the highest spread of Spearman's correlation coefficient (from almost -1 to +1) in all three time-scales occurs with the sums of Funding ranging from 0 to 2,000 million Euros (two billion) – this means an approximated average of 200 million Euros annual allocation in the period 1999-2009.

When examining in depth the volume of meaningful correlations (as per terms defined on page 82) it becomes clear that the number of meaningful Spearman's correlations (regardless of their positive or negative character) remains relatively stable and amounts to 83 in *t*, 74 in *t+1* and 90 in *t+2*. However there is a significant difference in the numbers of positive and negative correlations contained in those sums. Whereas in timescale *t* there is a considerable predominance of significant positive correlation values (61 to 22 negative), the situation changes completely in *t+1* where there are only 32 significant positive correlation values opposed to 42 negative. Strikingly, in the last time series (*t+2*) a somewhat of a balance can be observed between significant correlations of positive and negative values (48 to 42). Also what can be derived from the data is that there is a number of Spearman's correlation coefficients' values close to zero (i.e. with an absolute value of |0.01| or less) which remains very similar in all three time-scales: 28, 30 and 31 in the respective time-scales. What should be pointed out, however is that it is only in *t+1* and *t+2* where two instances of complete negative correlation (ρ=-1) can be found, in both cases these relate to Lithuania. For the timescale of *t+1* this result corresponds to the findings of the analysis of Person's *r* presented before.

However, apart from the observation of the greatest spreads of ρ associated with relatively low allocation it is rather difficult to identify any more complex patterns. That is why the next stage of examining the results of Spearman's ρ calculations is to investigate whether the visible spread of ρ's values is associated in any way with the performance of the new Member States, as may have been suggested by previous analysis of Pearson's *r*.

The figure on the following page demonstrates the spread of values of Spearman's ρ in the thee timescales (*t*, *t+1* and *t+2*) on graphs depicting their values separately for the regions of EU-15 (i.e. before the enlargements of 2004 and 2007) and the regions of the new Member States, who joined the Union after May 2004. Similarly to the visual representation of data presented on the previous page, the vertical axis shows the values of Spearman's ρ and the horizontal axis corresponds to the sum of the Funding allocations in millions of Euros.

Figure 39. Spearman's ρ in thee time-scales in EU-15 and the new Member States.
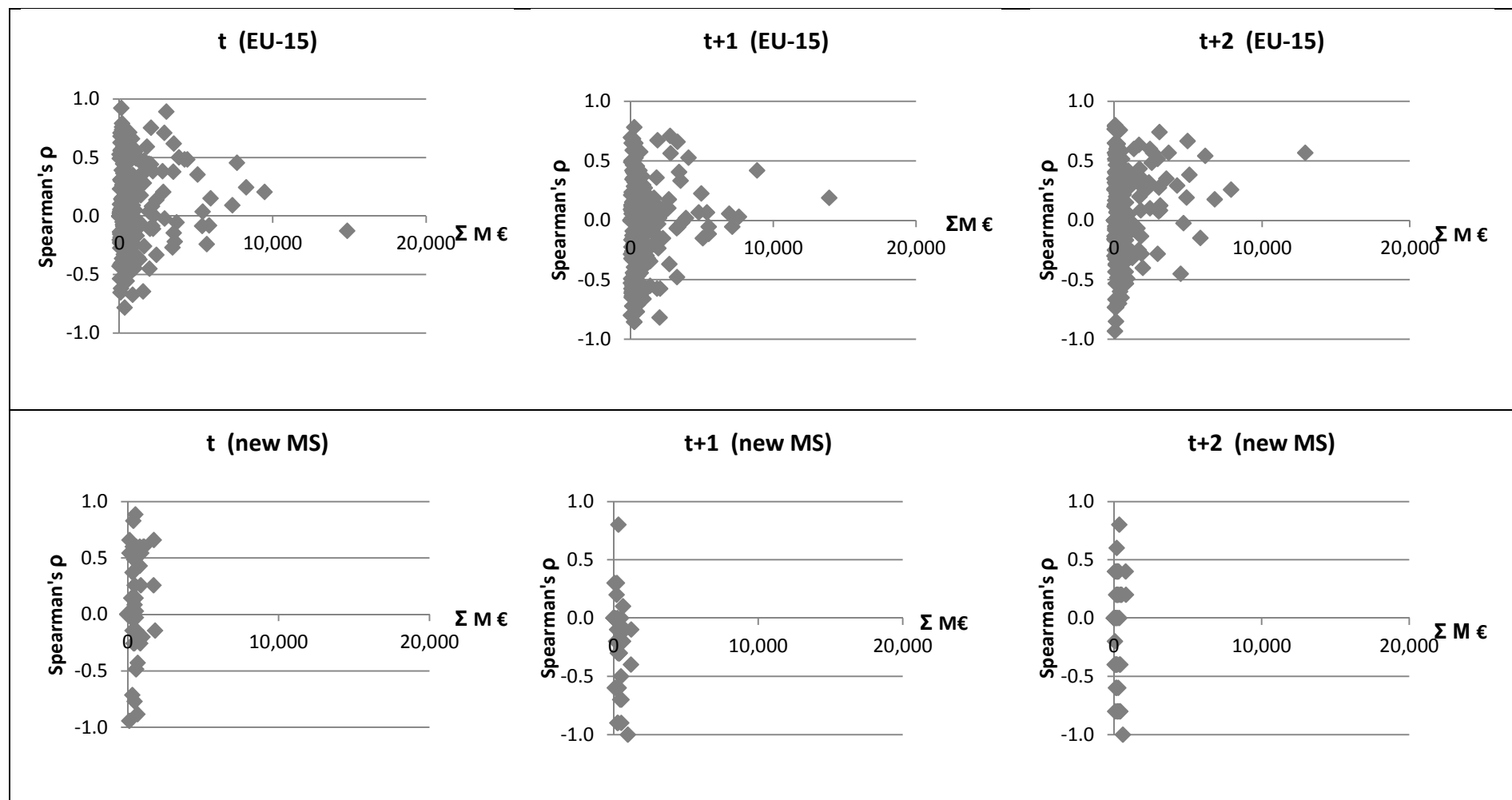
Source: author's own study

Figure 39 shows clearly that whether the fact the regions belong to the group of states relatively new to the European Union has no impact whatsoever on the large dispersion of ρ values.

Looking back to the results of correlations for across all of the EU, in order to further explore the issue of vast spread of the results of Spearman' correlation as presented in Figures 38 and 39 it was decided for a further step of statistical analysis.

Analysis of Variance (ANOVA)

The next stage of statistical analysis consists of performing ANOVA tests for datasets grouped not by origin of a given region ("old"/"new" member state) but for groups of regions classified according to the average annual allocation of structural Funds. Due to the actual spread of allocation values, i.e. the particular volumes of allocation decided by the EC, it was decided that for the purpose of this ANOVA analysis the groups were divided as follows: i) regions with average annual allocation under 10 Million Euros; ii) regions with average annual allocation between 10 and 99 Million Euros; iii) regions with average annual allocation between 100 and 499 Million Euros; and iv) regions with average annual allocation exceeding 500 Million Euros.

In order to assess what has a statistically significant impact on the changes of the regional KBE, namely is it the amount of allocated Structural Funds or other phenomena occurring in the region, the performed ANOVA analyses are of two-way type. Therefore the independent variables included in the ANOVA analyses are a) the average annual volume of Structural Funds' allocations for the given region; and b) the characteristics, economic or social properties intrinsic to the region, other than the volume of allocated SF (denoted in the ANOVA tables below as "regions"). The dependent variables in those analyses are the real (i.e. not normalised) values of the KBE GI calculated according to the previously presented methodology. The significance level assumed for all ANOVA analyses is α = 0.05.

In all of the cases presented below each of the factors ("SF allocation" and "region") has a null hypothesis (*H0*) stating that varying the given factor had no effect on the outcome (the value of regional KBE GI). If the calculated F-statistic is greater than F critical with the α = 0.05, the null hypothesis of the lack of impact of a given factor can be rejected with a certainty of at least 95%.

In the tables 7 to 10, *SS* denotes the sum of squares, *df-* degrees of freedom, *MS* – mean square, *F* – F-statistic, *P-value-* probability value of obtaining F≥ F computed in the data, assuming H0 is true, *F-crit* – the highest value of F that can be obtained without rejecting H0.

Table 7. ANOVA for regions with average annual SF allocation of smaller or equal to 10 million €.

ANOVA [0<SF≤10 M€]						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
SF allocation	10.28	5	2.06	2.92	0.01	2.30
Regions	81.22	20	3.42	4.94	0.01	1.57
Total	161.88	125				

The analysis for regions with average annual allocation of SF up to 10 million € shows that both in cases of "SF allocation" and "regions" the null hypotheses has to be rejected, i.e. there is an impact of the both variables. In other words, for the regions which received relatively small EU financial support it has brought on changes in the development of the regional KBE, and those changes also depended on the variety of the regions, i.e. their different economic and social structures and features other than the amount of SF allocated to them.

Table 8. ANOVA for regions with average annual SF allocation between 11 and 99 million €.

ANOVA [11<SF≤99 M€]						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
SF allocation	37.52	5	7.50	0.75	0.58	2.22
Regions	1330.21	139	9.57	0.96	0.62	1.23
Total	8320.37	839				

The group of regions with average SF allocation for the years 1999-2009 ranging from 11 to 99 million Euros was the biggest one, as it included 140 out of the European regions. The ANOVA performed for this group allows for accepting the null hypotheses for both independent variables, i.e. stating that both "SF allocation" and "regions" lacked impact on the changes of the regional KBE GI.

The same conclusion can be reached for the group of regions which received annual allocation ranging from 100 and 499 million Euros, based on the ANOVA results presented in Table 9. Importantly, this is the group which includes Silesia and the West Midlands.

Table 9. ANOVA for regions with average annual SF allocation between 100 and 499 million €.

ANOVA [100<SF≤499 M€]						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
SF allocation	891.25	5	178.25	1.08	0.37	2.25
Regions	8137.21	49	166.06	1.00	0.48	1.41
Total	49600.98	299				

The final ANOVA was calculated for a handful of regions whose average annual allocation of SF in the period 1999-2009 exceeded 500 million Euros (Table 10). This was the smallest group out of the four groups subject to ANOVA analysis and consisted only of a number of Southern-European regions: Attiki (Greece), Campania, Puglia, and Sicilia (Italy), Norte and Centro (Portugal), and Galicia, Castilla y León, Comunidad Valenciana and Andalucía (Spain).

Table 10. ANOVA for regions with average annual SF allocation greater than 500 million €.

ANOVA [SF>500 M€]						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
SF allocation	3.28	8	0.41	6.56	0.01	2.07
Regions	0.54	9	0.06	0.95	0.48	2.01
Total	8.31	89				

The findings of the ANOVA analysis for those regions require accepting the null hypothesis of the lack of influence for the factor "regions", yet point to rejecting the null-hypotheses for "SF allocation". In other words, in the case of this group there were no significant intrinsic economic or other characteristics of the regions which would differ from one another and have an impact on the changes of the regional KBE; at the same time the vast amounts of SF allocations did influence the changes in the KBE GI.

Summary of findings for the quantitative analysis

The aim of this chapter was to use quantitative techniques to investigate into the relationship between Knowledge-Based Economy in European Regions and the amount of Structural Funds allocated to them. Firstly, in order to measure the regions' performance in terms of the KBE, a new General Index was created based on an original set of five indicators. The five indicators (Human Resources in Science and Technology; Employment in Technology and Knowledge-Intensive Sectors; Pupils and Students in the Whole of Education; Total Intramural R&D Expenditure; and Patent Applications to the European Patent Office from the areas of hi-tech, ICT and biotechnology) were chosen because they overcome the limitations of KBE indicators proposed by other scholars and international organisations; foremost they are obtainable on regional level for the years 1999-2009 and therefore allow calculating KBE General Index on comparable regional level in the desired timescale.

The chapter included an analysis of the performance of each indicator in European regions over the examined decade which was followed by presenting findings relating to the KBE GI on NUTS-2 level. The next part of the chapter analysed the volumes of Structural Funds' regional allocations. The final part of the quantitative research consisted of performing statistical analysis based on Pearson product-moment correlation coefficients and Spearman's rank coefficients followed by ANOVA analysis to examine possible dependencies between the KBE and Structural Funds.

The findings of the quantitative stage of the research have significantly contributed to answering the research sub-questions: what is the relationship between the amounts of European Funds allocated and the changes in the Knowledge Based Economy calculated as a composite index of its indicators?; and what is the difference in the KBE development and the approach towards the Funds in regions from different Member States?. The quantitative analysis has also provided findings which allow testing all of the thesis' hypotheses:

H1: The Knowledge-Based Economy expressed by the values of KBE General Index (GI) increased in European regions over time;

H2: There is a statistically significant relationship between the amount of European Funds allocated to the given region over time and the changes in the value of the region's KBE.

H3: The performance of the Knowledge-Based Economy and the approach towards the Structural Funds are substantially diverse in the two case-study regions.

Whilst this section summarises the quantitative findings, the detailed interpretation of them in relation to the above quoted research questions and hypotheses is presented in the thesis' Conclusions (Chapter Five).

The findings of the quantitative analysis presented in this chapter showed great disparities in terms of not only the particular KBE indicators, but the Knowledge-Based Economy itself. The highest level of KBE GI (over 4.7 times higher than EU average) was obtained by the Dutch region of Noord-Brabant, which has also been identified as the region with high results for R&D intensity and patent applications indicators. Other regions with notably high values of the KBE are German Oberbayern, Swedish Stockholm, Finnish Etelä-Suomi, and East Anglia. Yet when comparing the outcomes of the exceptionally well performing regions with the results of the remaining regions in their states what can be observed is that there are significant disparities within the states.

Looking at the other end of the scale, particularly low levels of the KBE can observed in the 8 Greek regions (out of 13 regions in the state) with the KBE GI ranging from as little as 19.35 to 29.75, assuming that EU average is equal to 100.

The results of the KBE GI for the West Midlands and Silesia show that whereas the former region's result is slightly above the EU average, the latter exhibits KBE GI values which exceed only half the value of the average. Silesia's relatively low result is not exceptional when

compared to the remaining regions of Poland; Polish regions did in fact obtain lower values of KBE GI than the UK, yet at the same time the disparities between all of the Polish regions were significantly smaller than compared to the UK.

When examining the performance of the KBE GI's changes over time in the West Midlands and Silesia it can be found that besides the fact that the values for both regions fluctuated over the examined time-period, in overall terms Silesia's KBE GI increased and the WM's KBE GI experienced a decrease, although remaining over the EU average.

After investigating into the performance of the KBE in European regions, the chapter focused on the analysis of two different correlation coefficients (Pearson's r and Spearman's ρ). As explained on page 82, for the purpose of the thesis it is assumed that a mathematically meaningful relationship occurs when the correlation coefficient is greater than 0.4 (and $-0.4 > r$, $\rho > -1$ for negative correlation). Based on the analysis of coefficients of the correlation between the Structural Funds' allocation and the Knowledge-Based Economy (defined by its General Index), it was found that only in around one-third of the EU regions the Funds had any meaningful correlation values whatsoever, be it positive or negative. The finding is independent of whether Pearson's r or Spearman's ρ results are taken onto account; for Pearson's r the ratios of significant correlations in relation to all of the regions in t, t+1 and t+2, respectively are: 36.99%, 39.43% and 38.21 %. The values obtained examining Spearman's ρ in the three time-series are: 33.74%, 30.08% and 36.58%. In terms of Pearson's product-moment correlation, in the time-series t there are 55 regions with positive and 36 regions with negative meaningful correlation coefficients; in $t+1$ there are 42 and 55 such regions; and in $t+2$ there are 41 and 53 regions with respectively positive and negative correlations of meaningful strengths. When considering Spearman's rank correlation the number of regions with positive and negative ρ values in time-series t changes to 61 and 22 respectively, in $t+1$ it shifts to 32 meaningful positive and 42 meaningful negative results, and takes the values of 48 (positive) and 42

(negative) in *t+2*. The concise summary table of the correlations' results is included in Chapter Five on page 223.

Despite the individual results changing slightly in the three time-scales the key conclusion remains that, regardless of the used method of calculating correlation coefficients, it is only in about 30% of the cases when the Structural Funds are correlated in any meaningful way with the changes in the regional KBE. This makes it evident that in mathematical terms the linear or monotonic functional dependencies are present in only approximately one-third of the cases. Nonetheless, the finding remains of interest from the point of view of the thesis' main research question and therefore it is subject to more in-depth analysis in Chapter Five.

The statistical relation between the regional Knowledge-Based Economy and the Structural Funds was also examined by performing two-way ANOVA tests for regions divided into four groups depending on the volume of average annual allocation of SF. The findings of ANOVA analyses suggest that in cases of allocation between 10 and 499 million Euros neither the amount of allocated Structural Funds nor the internal socio-economic structure of the regions have an impact on the changes in regional KBE. What is very interesting, however, are the cases of regions with relatively small annual allocations (less than 10 million Euros) and annual allocations exceeding 500 million Euros. In the first instance the results of ANOVA suggest that both the particular regional features and the Structural Funds allocated have an impact on the changes in the values of regional KBE. In the second case, whereas the particularities of the regions seem to have no influence on regional KBE, the Funds are identified as having a statistically significant impact. The possible reasons behind the distinctly interesting results of ANOVA analyses are discussed in greater detail in Chapter Five (pages 223-226).

In relation to Silesia and the West Midlands which are the two case-study regions, the quantitative analysis brought forward particular challenges.

Firstly, the patterns of correlation in the three time-scales (*t, t+1* and *t+2)* were relatively weak, mostly negative and –in the case of Silesia – did not exhibit any clear trend (see Table 6 on page 148 and the results presented in Appendix 4). This stipulates a lack of clear dependencies between the variables which could approximate functional (linear and monotonic) dependencies. Secondly, the results of ANOVA analysis require accepting the hypothesis of the lack of influence of the Funds on the changes of KBE in the two regions at the level of statistical significance = 0.05. However, it is acknowledged that further research elements are required in order to reach conclusions which would be more exhaustive.

What is also taken into account is that the quantitative analysis was based on the amounts of Structural Funds which were allocated to the regions, not actually spent within them. Such an is prevailing in the field of studies of Structural Funds' impact (see e.g. Rodríguez-Pose, Fratesi, 2004; Dall'erba, Le Gallo, 2008), however, the fact already recognised in the subject literature that the amounts of allocation depend to some extent on factors which may have an effect on various aspects of regional development independently of the SF allocation (Cappelen *et al.,* 2003:623) further complicates drawing exhaustive conclusions out of the purely quantitative analysis.

Therefore in order to give deeper perspective to the findings of the quantitative analysis and thus be able to reach a more comprehensive and detailed conclusions leading to answering the thesis research question to the fullest possible extent, after carrying out the quantitative analysis and summarising its findings, the next Chapter of the thesis includes an in-depth qualitative analysis of the issues relating to the regional Knowledge-Based Economy and the Structural Funds.

As already indicated in the Methodology section, the qualitative analysis focuses only on the two case-study regions: the West Midlands and Silesia; the results of the second stage of the analysis combined with the quantitative findings are then discussed in depth in Chapter Five.

Chapter Four: Qualitative Analysis

The qualitative part of the research presented in this chapter stems from the interest in whether the Funds in fact enhance the KBE in the case-study regions, and intends to shed more light on some of the findings of the previously presented quantitative study.

This chapter consists of three main parts: firstly, it gives a brief description of the remaining part of the puzzle and concisely recalls the methodological approach already presented in detail on pages 85-95; the second part showcases the key issues which came to light as a result of the interviews divided into appropriate sub-headings in the two case-study regions; the final part of the chapter summarises the findings derived from the performed qualitative study.

The quantitative chapter shed light on the performance of the Knowledge-Based Economy (KBE) in European regions, with the particular interest focused on the UK's West Midlands and Polish Silesia (*Śląsk*). The findings of the quantitative chapter led to answering the thesis' main research question: *what is the nature of the relationship between the Knowledge Based Economy and the European Funds?* from a quantitative perspective; it explored the statistical relation between the KBE and the amount of Structural Funds allocated to the regions. What is more, the quantitative chapter included the definition and calculations of a new, unique General Index of the KBE which, contrary to the previously proposed composite indicators, can be used on a regional scale, is based on the data which are being collected annually and are relatively easily obtainable from the Eurostat.

The previous chapter presented and analysed the changes over time (from 1999 to 2009) in the values of particular indicators used for calculating the KBE General Index in all of the EU regions, and the changes over time in the KBE GI value itself. The core part of the quantitative research consisted of statistically analysing the relationships between the European Funds and the Knowledge-Based Economy (defined by the General Index) using the Pearson

product-moment correlation and Spearman's rank correlation coefficients (r and ρ). The analyses proved *vast* disparities across all of the European Union[12].

For Silesia and the West Midlands which are the two main case-study regions[13], the only correlations of meaningful strength (i.e. exceeding the value of |0.4|, as explained in greater detail in the previous chapter) have taken place: for Silesia in the time scale *t+1*, i.e. when r and ρ are calculated as the correlation of funds from year *t* and KBE GI from the following year (for example the Funds from the year 1999 to the KBE GI from the year 2000 and so forth) and for the West Midlands in *t+2* (i.e. Funds from 1999 and KBE GI from 2001). This brings an important observation: as can be concluded from the previous sentence, the Funds-KBE relationship is strongest in a time-scale with a time lag. Also, the West Midlands region exhibits negative correlation values in all three time-scales; yet a statement that the quantitative results lead to the conclusion that the use of Structural Funds led to a decline in KBE regional performance would be an unjust oversimplification. However, the author acknowledges that correlation (or lack thereof) does not imply causation or its lack[14]; hence there is a need for a detailed qualitative analysis in order to investigate the matter deeper; especially given the fact that the results of the ANOVA for both regions would suggest lack of statistically significant impact of the Funds.

What is also of importance and was already discussed on pages 143 and 147, the quantitative study took into account the amounts of Structural Funds allocated, not spent within the regions.

Taking all this into consideration, the qualitative part of the research seeks to investigate in greater depth the main research question by explaining the counter-intuitive finding of the previous chapter, i.e. the mostly weak and negative correlation between the

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[12] For the detailed methodology of performing the quantitative analysis please see pages 71 to 84. The summary of the quantitative analysis' findings is included in the previous chapter, pages 158- to 163.

[13] For the reasoning behind choosing the two regions for the case-study, please see pages 57-67.

[14] A comprehensive comment on this issue is offered by e.g. Aldrich, 1995:364-376.

Funds and the regional KBE in the West Midlands and Silesia. The chapter stems from the interest in whether the Funds in fact enhance the KBE in the case-study regions, and intends to shed light on the conclusions on the large-*N* study by finding out about the way the Funds are put into practice.

Based on the reasoning described in greater depth in the respective Methodology section of the thesis (pages 85-95), the author decided that for the purpose of this research the best methodology would be based on the technique of 'stakeholder interviews', which takes into account the interviews with people directly involved in spending the Structural Funds and partially, in the regional KBE in the West Midland Region and Silesia.

The data obtained from the interviews were then analysed in five stages: *data reduction*, followed by *clustering* represented in the chapter's main body by dividing the interviews into two main parts which relate to the West Midlands and Silesia respectively; the next stage of the analysis involved *identifying salient themes in the data*, i.e. categorising common themes and presenting the most notable quotes of the interviewees regarding the highlighted issues; and subsequent *comparative analysis* of the parallels and differences within the two clusters and between them. The final stage included *drawing conclusions* from the data which were regarded as significant as the result of previous phases of the analysis[15].

The coded names of the interviewees are used in accordance with their description in the Methodology section (Tables 4 and 5 on pages 94 and 95)

The opinions expressed by the interviewees regarding various issues surrounding European Funds undoubtedly are the core of this qualitative analysis. Analysing them facilitates deeper understanding of the underlining implications of the quantitative chapter findings, especially taking into account the two case-study regions. The matters raised allowed for deeper

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[15] Please refer to page 87 of the thesis for more details of the adopted methodology.

investigation into the perception of the Funds in the West Midlands and Silesia, from

perspectives of funding advisors, intermediary organisations and private sector beneficiaries.

This section also allows exploring whether the interviewees' opinions and perceptions differed

significantly depending on the two case-study regions and the interviewees' professional origin.

Interviews in the West Midlands

Due to the vastness of the topic, the issues tackled by the interviewees from the West Midlands are divided into four groups. The first one includes the broad area of motivation for applying and perceived appeal of the Funds; second group explores the recognised flaws and implications for desirable future changes in the Funds; this is followed by inquiry into the recognised (or not) significance of Funding for executing given projects. The final group includes the analysis of the opinions on mutual relations between the Funds and the KBE.

Funds' appeal and motivations for applying

Many of the interviewees (HL, SF, MH, MS, PW, JF and AV) gave very similar opinions on why in their view organisations, be it public, university-affiliated or private, would be interested in applying for EU funding. The key element seemed to be the decrease over the years of available national and regional funding. One of the interviewees (EB) made a very interesting observation regarding the British situation: in her opinion, despite being an important source of obtaining financial support, the use of European Funds served rather for filing the gaps left by the lack of national funding than as a conscious long-term alternative financing strategy. It can be assumed that if the Funds were in fact treated only as a "gap-filler" and applicants would rather pursue national or regional funding for potential KBE-related activities, then this may explain the negative correlation between the EU Funds and the KBE in the West Midlands as shown by the analysis performed in the quantitative chapter.

Yet despite few rather bitter observations that the key appeal of applying for the funding was simply taking advantage of a financing source in a form or an un-returnable grant rather than a bank loan which would need to be paid back (HL, SF), the interviewees agreed that the appeal may be deeper than just an acute need of money. It was also admitted that some organisations within the West Midlands who had "a greater vision and greater insight of benefits of Europe in terms of networking, in terms of promotion" (MH) had pursued the EU Funding. A

similar opinion was also expressed by TP, who agreed that whereas for smaller organisations the main incentive for applying is the money, the universities and bigger organisations regard it as somewhat prestigious to get a European grant. The view that some organisations see a commercial and "internationalisation" effect in applying for EU funding was also confirmed by EB, MS and SF. On top of that, the Structural Funds obtained were considered to be a great 'lever' for the companies who were their beneficiaries.

Shifting the focus from organisations to a project level it became clear that from the perspective of the interviewees (most of all HL, a member of the Regional Development Agency) the best projects were those which had in mind tackling a particular issue prior to pursuing the Funds; unlike the projects conceived only as a response to the available Funds for a particular theme.

The dichotomy of the two motivational approaches ('money-oriented' versus 'project oriented') seemed to be confirmed by most of the interviewed beneficiaries. Especially two of the beneficiaries who were involved in significant (in financial terms) projects seem to confirm what was said by HL, i.e. that the best projects followed the "project oriented" approach. Notably, both of them admitted that despite having the project idea in place first, they pursued EU Funds because of lack of other sources for obtaining funding:

MH recalled that "our [funding stream] was very unique and explicit and was around where our [organisation's] aims were in that area. It matched our strengths and we had partners in place who already met the criteria, so meeting our strategy and long term aims. And there was no funding for that [particular activity] on national level".

A situation when the project idea was in place prior to applying for the funding, and after conceptualising the project it became clear that the EU Funds were the only possible source, was also described by AH:

"When I started with the mission to create EBRI [European Biomass Research Institute] I was just facing the decision where to get the money from. So I got into the ERDF. You don't get elsewhere 7 million, 8 million. Just impossible. You can't get that amount of money for one institution elsewhere".

Despite acknowledging the benefits, mainly financial, stemming from applying for European Funds, the interviewees were also very keen on naming the Funds' perceived flaws. Analysis of those can contribute to shedding light on the essential question emerging from the quantitative analysis, namely: why did the correlation analysis return results which may suggest the lack of Funds' intended effect on the KBE?

Perceived flaws and proposed changes

The structure of this section is a result of the author drawing upon the issues that were raised most often in the interviews, in a systematic way. What is important is that the key themes around which the section is structured emerged unprompted. Due to the vastness of this particular topic, a summary of major issues is presented in a table form on page 178.

The flaw that was named most often was undoubtedly the bureaucracy which the interviewees came across when applying for the funding and executing their projects (HL, AW, MH, TP, JnB, PW, XX, TM, AV). However what should be noted, this is not a flaw which could be in the whole attributed to the design of the policies behind the Funds. The flaws which the interviewees recognised as wider policy and programme design problems are explored in an independent sub-section on pages 176-178. Furthermore, in particular aspects the identified flaws link closely to the issue of strengths and weaknesses of regional institutions and the trust (or lack thereof) in them.

The struggle with bureaucracy procedures was generally attributed to the generic term of "excessive paperwork" However, the interviewees also named a fair amount of more particular obstacles, which are described in greater detail in the subsequent parts of the section together with proposed changes relating to those particular aspects. The analysis of the flaws' potential implications for the development of the regional KBE is presented in the final parts of the section.

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Hermetic Language

On the very basic level, one of the obstacles named by a number of the interviewees in the West Midlands was the need to use the very specific and technical language required for applying for the Funds. The fact that individual organisations require external support to cope with the complicated terminology and specific language used in EU Funding application process was also considered to be troublesome. As it has been stated rather bitterly by TM:

"There is a 'Euro-English' out there. People (…) are employed to actually almost translate. And the fact that European Union is 'over there'. How do you talk to "them"?

Notably, at the same time the interviewees observed that the struggle with the technical terms diminishes when the applicants decide to apply for further EU grants. This may as well be true, however taking into account the opinions of other interviewees it becomes clear the level of bureaucracy was a deterrent strong enough to prevent some organisations from applying in the first place.

Excessive auditing

A particularly deterring aspect of the bureaucracy involved in Funds' processing in the interviewees' opinions was the problems with projects' auditing culture and the issues and liabilities because of keeping records. There were a number of examples given by the interviewees to confirm this, e.g.

"People have been caught up in audits. Couple of universities were caught up, so even though the funding was there a lot of partners would have preferred to stay away from EU funding because of the risks attached" (HL);

or with regards to the private sector:

"If we took one of our entrepreneurs and told him: go for a training organised by the EU, it's all free, but then you'll need to write a report and be audited, then not a single one would go" (JF);

The fact that in situations when an organisation would apply for a relatively small amount of funding the monitoring and administrative burden might be bigger than the benefit obtained seems to confirm the point made already in the previous paragraph regarding the level of bureaucracy acting as a deterrent for new applicants.

However the interviewees also expressed some level of understanding towards the possible reason behind the complexity and amount of bureaucratic processes and audits; this being preventing cheating and fraud in EU funded projects. Yet at the same time it was acknowledged that the onerous auditing and increasing the amount of rules are not the best solution to prevent fraud, and what could be used instead is re-focusing the control on the programme, not the project level, with an emphasis on aggregation and increasing trust towards beneficiaries.

Inflexible rules and timing issues

Another flaw distinguished by the interviewees (SS, AW, PW) was the lack of flexibility in the rules, in other words the rules' perceived 'rigidness'. The interviewees complained that there is seldom a way to change even the most minor details of their project proposals once the project has already been approved and started, even if the changes would improve the carrying out of the project and its outputs. What has also been underlined is the need for the applicants to be very specific at the very outset about exactly what the project would involve; this can prove problematic given the fact that it can take up to seven months after approving the project before the successful applicants receive the funding.

The fact that the time which passes between writing the application and receiving the grant is tremendously long was also commented on very bitterly by AQ, MS, SS, JF and GD. The issues of timing were among the problems named most often by the interviewees, a typical example being the comment of EB:

"It's a year, or one-and-a-half years from the time of developing a project, writing an application to the time the projects get implemented. You can't expect businesses to sit there for a year and a half to hear the decision".

Taking this into account it is not surprising that one of the key proposed changes related to issuing the project calls more often. In the present situation calls for particular projects applications can come out only once every calendar year, which eventually leads to a vast amount of applications submitted in a short period of time, and this results in a few month long evaluation process followed by weeks of negotiations with the winners (see e.g. the call for ERDF projects in the West Midlands, Department for Communities and Local Government, 2011).

This can obviously be a problem for innovative projects, which in order to be carried out effectively would need to receive the funding and implement the solutions intended as soon as possible after completing and submitting the application. A real-life example on how prolonged assessment may lead to desisting from carrying out an EU-funded project was given by TM:

"I've had experience of actually writing a very appropriate and good application which took probably nearly a year to approve by the European funders, by which time it was totally out of date and obsolete. I then had to re-invent what was done by that project to make it relevant again. But the opportunity [for the innovation] was lost because of their inflexibility and the bureaucracy associated with it".

Risk-aversion

Another problem named by the interviewees was the apparent risk-averseness of the funding bodies. The interviewees identified it both as the need of re-defining the concepts of 'excellence' and 'innovation', and reconsidering the values of Funds' intervention rates, i.e. the maximum percentage of EU funding for a project. A number of interviewees elicited an opinion that if the bodies administering EU Funding consider a given project worth funding, they should invest 100 per cent, without the need of the beneficiary to provide any match-funding. At the same time, however, what should be taken into account is that erasing the rule of match-

funding altogether would lead to less projects being funded due to more risks being taken on an

individual project level. Nevertheless, as observed by AH:

"If your project is great, if it's challenging, then you also have the higher risk, if you like, but perhaps you get out of it something new and absolutely brilliant. And that is completely forgotten".

This point seems to be of extreme value, considering the fact that the EU is striving to

become a Knowledge-Based Economy which could compete on the global scale.

Business-specific problems

The obstacles named by the West Midlands' interviewees who had been involved with

projects carried out by private sector organisations were the ERDF rules regarding generating

revenue (article 55 of the Council Regulation (EC) No 1083/2006). In practice the regulation

makes it difficult for the ERDF funding to support a project which actually makes money. This

was confirmed by AH, who claimed that his organisation:

"had to change our original idea to fit in the programme, sure, and it was a significant change. I came (...) to make a business out of my ideas. But ERDF was completely pulling us back. We have to find ways around to make a business. So again, ERDF is not business-oriented even though they say they want the business".

Relating more to the problems faced by SMEs[16], the interviewees found the Structural

Funds thoroughly discouraging and exhibiting an anti-involvement of SMEs approach, despite

the fact that it was believed that a significant number of SMEs are very well positioned to take

forward innovative ideas, yet they are very poorly positioned to apply. This seems mainly to

stem from the fact that in the UK the SMEs can apply for EU funding only through

intermediaries; what is more when applying for grants the small-and-medium enterprises are

also faced with the issues of state aid rules, preferential treatment and what was called the "*de*

minimis hel" (JnB), which all can be a significant drawback.

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[16] Please refer to the definition presented on p. 83.

Another issue related to the time which a given organisation's staff needs to spare to prepare a funding application that would be good enough to pass the very competitive application process. The interviewees who run their own SMEs recognised that whereas big companies usually have the resources to build up their own staff strictly for writing proposals, or can afford hiring external consultancies to write the proposals, in projects run by small organisations it proves very difficult to provide match funding in staff time. In other words, small companies can't usually sustain their staff to stop doing their daily jobs and focus on writing the proposal and then managing the project for a few months.

Policy issues

The problems relating to wider policy issues included the perception that the Funds are not necessarily complemented with national programmes and that there are too many European funding streams, many of which are overlapping and competing; very similar projects can be funded by Structural Funds but also the FP7[17], or by Community Initiatives'. As observed by one interviewee (SF) who had a number of years' experience working as a project broker in Brussels:

"DG Regio, DG Enterprise, DG Research all want to have their own little pots of money and don't always work together".

One of the potentially beneficial changes suggested in this area was to integrate the various funding streams as the split between some funding streams is rather artificial, and to stop duplicating funding options, as this could potentially prove very advantageous, especially for funding innovative projects.

Another issue seemed to be the financial dimension of the Funds, with a number of interviewees complaining that the Funds are too small in terms of the volume of finance, and what was also emphasized by the interviewees was the need of well-functioning coordinating

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[17] Seventh Framework Programme for Research.

agencies on a regional level. The representatives of such agencies stressed the importance of 'hiding the wiring' from potential applicants in order to make the funding more attractive, easier to navigate through, and subsequently to have the West Midlands' beneficiaries securing more EU funding. The regional organisations that played the role of coordinators seemed of particular importance, as they took on a part of the dialogue with the EU, so that the beneficiaries, be it enterprises or other, could see an already 'digested' pack of funding opportunities and would not be deterred from applying. This appears to be a very important issue, especially when taking into consideration the recent closure of AWM (Advantage West Midlands) and other Regional Development Agencies and replacing them with LEPs (Local Enterprise Partnerships)[18].

The problem of effective regional intermediary agencies also feeds into the wider point about the strength of regional institutions. There are studies which provide evidence that the level of Funds' implementation on the regional level is dependent on the level of regional bureaucracy's administrative capacity (see e.g. Milio, 2007). Taking into account the previous paragraphs which suggested that the level of 'undigested' bureaucracy tends to act as a deterrent for potential applicants, the role of regional organisations which coordinate the funding and facilitate the application process is of paramount importance.

The final problem somewhat relating to the programme design and the policy behind it was the lack of anonymity of the project applications. As AH recalled:

"In the Framework 5 anonymous process was proposed. This was an opportunity for everybody with ideas to go forward. And the big organisations, like Max Planck [Institute] in Germany, they were very much against this because their success rate was dropping so dramatically. Because it was not anymore: 'Oh, it's Max Planck! Let's tick the box!'".

If such situations did occur, it would become genuinely more viable to return to the anonymous submissions of proposals, especially in the EU funding destined for innovative

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[18] For more details please refer to page 60.

actions, due to the fact that the best projects may be proposed by organisations which do not yet have a well-regarded position.

The next paragraphs provide a summary of the flaws identified by the West Midlands' interviewees and relate these findings to the results of the previous chapter and look into some of the flaws' possible implications.

Table 11. Perceived flaws in the SF system (West Midlands)

Bureaucracy:	Hermetic language
	Excessive auditing
	Inflexible rules
	Prolonged wait for approval
	Risk averseness
Business- specific:	Against generating revenue
	Problems of staff time in SMEs
Policy issues:	Funding opportunities scattered over too many programmes
	Too small financial-wise
	Lack of applicants' anonymity

As it seems obvious judging from the amount of complaints relating to the rigid rules and timing, most of the interviewees would be very much in favour of changes which could be dexterously described using the words of MH: "simpler application, less complication in the rules and responding more quickly".

From the point of view of this research the above described flaws may be considered as one of the key reasons behind the negative correlation between the amount of allocated Funds and the KBE in the region. The level of bureaucracy involved in carrying out an EU-funded project acted as a great deterrent for applicants, especially smaller organisations who would potentially be interested in pursuing European funding. What is more, it is possible that the extensive auditing attached to carrying out EU-funded projects may also intimidate smaller

organisations (especially the SMEs) or prevent bigger organisations from carrying out projects which would require multiple-partners participations (e.g. specialised IT or bio-tech companies which would contribute to WM's KBE development).

The mentioned issues relating to timing, particularly the infrequency of the application rounds and long evaluation and negotiation processes, shed particular light on the findings of the quantitative analysis. As reasoned in greater detail in the previous chapter, the analysis of correlation of the KBE and European Funds took into account three time series: *t*, *t+1* and *t+2*[19]. Due to the significant prolongation of the funding process, especially for innovative projects which are big in terms of financial means required, it is possible that the expected positive changes in terms of the KBE occurred beyond the assumed time series and that is why in the time series taken into account the correlation was negative.

The findings stemming from the analysis of the perceived flaws and proposed changes expressed by the WM's interviewees will be combined with the respective findings on the same topic from Silesian interviewees and further developed in the qualitative conclusions at the end of this chapter.

As a final remark, the closing of the Advantage West Midlands[20] will certainly have significant implications for the use of European Funds in the region and the future development of the West Midlands' KBE. However due to the fact that the closure took place after the year 2009 the qualitative analysis did not take this factor into account. Nonetheless this issue would surely need to be taken into account in any potential future research which would analyse more recent time period.

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[19] For the explanation of the time series *t, t+1* and *t+2* please refer to page 83.
[20] Please refer to the footnote on page 60.

Significance of funding for project realisation

The interviewees who were known to be beneficiaries of EU funding were asked about the perceived impact of the funds on the feasibility of the project, i.e. would they have managed to execute their projects had it not been for the EU funding support they obtained; and whether or not they believed that the Funds had any added value.

A significant majority of the interviewees conceded that without the EU funding their projects would not have been carried out in their attended format. A few concluded they would have needed for their projects to be significantly limited, e.g. HL (a representative of the West Midlands' RDA) stated that:

"Without the EU funding some things, particularly the capital projects, would have either not happened or happened on a significantly smaller scale. We've built a number of facilities (...). And in terms of portraying an image of the WM as forward looking region actually some of these capital developments are actually quite important".

Some of the interviewees believed they would not be able to execute their projects at all, would not be able to afford the structuring and management costs. Examples which are of particular importance from the point of view of this research as they included a strong KBE aspect came from AH (a multi-million Euro research facility) and JnB (a Science Park):

"None of the other organisations in Britain will give you millions. That's the point. If you take the UK Bio-char Research Centre supported by EPSRC [*Engineering and Physical Sciences Research Council*] this was something around a million [Euro]? That's nothing compared to stock of 7-8 million we got out of the EU funds." (AH);

"The science park was developed over 10 phases. All the time with the Structural Funds. This was an old industrial site. So this place, which now has got 80 or 90 companies on it was renovated and created by Structural Funds (...) So would these companies be on a brownfield site in a centre of Birmingham? Of course not. And the ESF has also helped in some disadvantaged communities within the city, which otherwise would not happen" (JnB).

The interviewees also stressed the importance of Funding as a "kick-start, a catalyst" (AW, PW); with GD emphasizing that without the initial funding he secured, it would be impossible for him to bid for projects which were bigger in financial terms later on.

As to the difference, or the added value the Funds provide, the interviewees believed that EU-funded projects can be very beneficial. The benefit could be on the organisational level as some businesses may see applying for SF as a first step before obtaining other funding, of being competitive technology-wise; also carrying out one EU-funded project may lead to coming up with several new project ideas, which can then be supported by national funding. This 'funding-patching' approach can ultimately allow the companies to create more investment for themselves.

The funds were also seen as to create much added value from the point of view of the final beneficiaries[21]; as it was enthusiastically put by AW, who ran EU-funded education projects:

"I can name students who got their jobs, gained employment because what set them out was their participation in EU-funded programmes".

On being asked about the Funds' added value one opinion particularly stood out, namely AV's statement that "for every one pound spent, there are seven people checking it". Although the opinion was expressed tongue-in-cheek, it is very important as it once again emphasized the issue of excessive auditing culture being one of the major flaws recognised by the beneficiaries.

Overall, according to the interviewees, the Funds are considered as adding value and being more than a simple substitute for other sources of investment; in most of the explored cases they allowed for the particular projects to be carried out in a wider, more extensive scope than would be otherwise possible.

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[21] Please refer to the footnote on p.91.

EU funding –perceived relations to the KBE

An important issue from the point of the view of this research which was raised by a number of interviewees was their perception of the relation the EU funds had with various aspects of the Knowledge-Based Economy. What should be emphasized is that the comments provided by the interviewees cannot serve as an oversimplified answer to the thesis' main research question. The issues raised by them were used as means of testing the Third Hypothesis (as presented on pages 227-232) and what is vital from the point of view of the research, especially in the light of the mentioned Third Hypothesis, and will be further developed in the subsequent sections of the chapter, is that those opinions were not very much different from the ones expressed by the Silesian interviewees.

What is interesting is that there were a number of interviewees who named EU funds using exactly the same term, namely "useful tools" for building the EU's KBE (AH, AW, TP, EB, MH, XX). However the reasons the interviewees gave to support this opinion were quite diversified.

On the very basic level, the usefulness of Funds as a tool was due to the fact that the EU funds can provide a substantial amount of funding for particular regions (such as West Midlands) in which the decline of industry left massive gaps in the economy and using the Funds in such areas helps re-boosting economic growth. Another observed important feature of the Funds in terms of fostering particular aspects of the KBE was the recognised crucial role they play in promoting R&D and collaboration between academia and enterprises, i.e. providing financial contributions to provide opportunities for collaboration of businesses and universities.

Also, what was underlined was the importance of Funds for fostering the KBE in the more social aspect, as the EU funding was perceived as useful for building social and cultural pan-European knowledge values and disseminating it by various projects outside the EU borders, facilitating international knowledge-flow from which the EU can benefit.

What comes to light when analysing the opinions on the KBE – EU Funds relations, is that they seem to a certain degree to contradict the finding of the section related to the perceived flaws and proposed changes. A possible reason behind this may be that the interviewees spoke of the Funds relating to the KBE from more of a conceptual than a practical approach, i.e. focusing more on the ideas behind the Funds implementation, not the "hands-on" aspects of implementing the Funds through actual projects. It should be observed that at this point all of the interviewees spoke from the point of view of successful beneficiaries, as they were the experts involved in major-scale projects, yet they did not relate too much to the specific projects they were engaged in and rather spoke of Funding as a whole. Their opinions were of much more general character, as opposed to the previous statements relating to the Funds' flaws, which seemed to have evolved in the course of carrying out particular EU-funded projects.

Interviews in Silesia

Following the division of the topic used for presenting the opinions expressed by the West Midlands' interviewees, and due to the vastness of the topic, the section presenting the viewpoints of Silesian interviewees is divided into four sub-sections. The first sub-section tackles the matters of motivation and various reasons for applying (or deciding not to apply) for European Funds; the following sub-section is the enquiry into the perceived flaws of the Funds and the changes the interviewees believe would make a significant difference; the next sub-section presents the opinions on whether the Funds were significant for executing certain projects; the final group of issues relates to the perceived relations between the EU funds and the Knowledge-Based Economy.

Funds' appeal and motivations for applying

The Silesian interviewees were keen on talking about particular motivations rather than general appeal of the funds, however a number of the interviewees spoke of a general appeal, yet of what is of particular interest as it is different from the West Midlands' interviewees, the interviewees from Silesia did not always speak of Funds' appeal in a positive way.

Similarly to the types of appeal discussed by the interviewees from the West Midlands, the Silesian interviewees' opinions on the appeal can be divided into 'money-oriented' and 'project-oriented'. Notably, in the case of Silesia, when talking about the general appeal of Funding, the majority of the interviewees emphasized the importance of the financial aspect. This was either done in a very straight-forward way emphasizing the obvious appeal of the money, or combined with more complex issues, e.g. as stated by BK:

"Every local authority has their tasks defined in the Acts on Local Government[22] and they need to fulfil those tasks sooner or later. And the Funds help to make it sooner".

From the point of view of an interviewee involved in entrepreneurial assistance, the Funds are an appealing source of assistance, because of the possibility they offer of reaching out for new technologies which would be otherwise unobtainable. This relates to the fact that some companies may seem unreliable to the banks, because, especially when they are new and innovative, they have no credit history and, therefore, it is not feasible for them to apply for a bank loan for taking forward their innovative business ideas. As recalled by ZG:

"Sometimes we have people with great experience from working at Universities or R&D centres and now they would like to start their own company, implement their ideas in the industry. And that is why they apply for the Funds".

When discussing further the particular motivations of the interviewed beneficiaries it became clear that it differed slightly depending on the professional background (i.e. education, public organisation, SME) of the interviewees.

The interviewee originating from a publicly-funded higher education institution emphasized the wider context of their decision of applying for EU funding; the so called 'soft' projects (i.e. funded by the European Social Fund) aimed at providing particular specialised training to the end beneficiaries and strengthen the position of the organising institution in the region; the 'hard' (i.e. ERDF-funded) infrastructure projects were used to extend their research facilities base. The interviewee (ES) believed that applying for the two types of projects was essential for the publicly-funded higher education institution she represented,

"because if we don't extend our research, we get pushed to a lower category, so we get even less national financing, so we would invest even less. Vicious circle".

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[22] In Poland the various levels of local government are regulated by the three acts:
Act on the gmina-level local government (*Ustawa z dnia 8 marca 1990 r. o samorządzie gminnym (Dz. U. z 1990 r. Nr 16, poz. 95)),* Act on the poviat-level local government (*Ustawa z dnia 5 czerwca 1998 r. o samorządzie powiatowym (Dz. U. z 1998 r. Nr 91, poz. 578)); and the Act on the voievodeship-level local government (*Ustawa z dnia 5 czerwca 1998 r. o samorządzie województwa (Dz. U. z 1998 r. Nr 91, poz. 576)).*

An interviewee from a private education establishment attributed her organisation's motivation for applying for EU Funds to it being simply a chance for obtaining additional funding, for additional actions her organisation would like to get their students involved in (e.g. additional classes). Another reason mentioned was to allow the employees of the organisation (teachers) to earn extra money by being involved in the extra-curricular project. This, again, suggests following the route of the "money-oriented" approach.

On the other hand, the public-sector interviewees' motivation seemed to be much more 'problem-based', as a number of interviewees confirmed that applying for EU funding was a response to a problem identified in their surroundings, for example:

"We had a problem with unemployment, this is what started it. And then there were the Funds we could use to tackle it, so we did" (ZZ);

"There was a recognised need of our local entrepreneurs for help: So we focused on organisational support and used the Technical Assistance means [part of the Structural Funds] to run a consultation point for entrepreneurs" (ZG);

"In most of the cases we have our projects, which we want to do and thanks to the EU we can do it much faster. Then there are cases when something is not as urgent, but the calls for applications come out and we know it is one call for the whole seven years, so we applied and got the funding" (BK).

The issue of entrepreneurs' motivation is a particularly interesting one. Whereas the interviewees representing the medium-sized enterprises seemed keen on applying as they considered it very tempting to have the possibility of realising their ideas through projects, and to implement some innovative solutions by obtaining financial help from the EU; the micro-and small-entrepreneurs[23] were far less enthusiastic and in terms of motivation for applying. What is interesting- as it shows the disparities in the opinions of interviewees from Silesia- is that in

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[23] as per the definition of the enterprise size included in the Commission recommendation 2003/361/EC, p. 36–41.

a number of instances the entrepreneurs went as far as saying that the Funds present no appeal

whatsoever and would rather talk why *not* to apply (AA, BB, FF, JbK).

For instance, as it was put by JbK:

"I do know about the chances of co-financing enterprises from EU funds, but I did not
use them. Nor do I intend to. I'm not interested in this sort of bureaucracy."

Similar statements made by a number of the micro and small businesses'

representatives pointing towards their apparent disengagement in applying for EU funds lead to

further enquiry in the context of the following section: the perceived flaws of EU funding and

why would they be considered a reason for not applying for the Funding. The problems

identified by the interviewees originating from SME are addressed in the separate sub-section

dedicated specifically to business-related issues.

Perceived flaws and proposed changes

The analysis of flaws in the funding system and the proposed changes which came to light as a result of interviews performed in Silesia are structured following the same method as in the West Midlands' case: they are drawn upon the issues that were raised most often in the interviews, in a systematic way. As in the case of the respective section regarding WM, the interviewees in Silesia were not prompted in any way when giving their opinions on the matters of flaws and changes in the SF system. Also, similarly to the previous section regarding those problems, a summary of major issues is presented in a table form on page 196.

The Silesian interviewees named a number of the flaws they perceived in the European Funds system in their region. Not surprisingly, the issue named most often was the excessive bureaucracy, yet the interviewees approached the subject in a slightly different way than the interviewees from the West Midlands. However, the bureaucracy was not the only flaw named by the Silesian interviewees; other obstacles were also identified and are described in detail in the following parts of the section where the proposed changes to the system of European funding are also presented. The analysis of the flaws and suggested changes relating to them and their possible relation to the research question and hypotheses is presented at the end of this section.

Excessive paperwork

The majority of interviewees from Silesia associated "bureaucracy" attached to pursuing European Funding with what was considered to be disproportionate amount of paperwork required from them. For example it was stated that:

"When we start a project – a training course – we need to submit initial offer conditions before submitting the actual application, then submit the offer conditions before performing certain actions once again, then there are all the sending confirmations, even if it was sent via an e-mail, when did we get the answer, signed protocol of every single team meeting... this is just tonnes and tonnes of paper" (ZZ).

Also mentioned was that fact that when carrying out a project, apart from "producing tonnes of documentation" (PP) which requires a number of days of staff time, the organisations are also required to store all of the documents' hard copies for several years[24].

What is very important and will be further developed in the summary of this chapter and the thesis' Conclusions, is that among the Silesian interviewees the excessive amount of paper work was attributed to the Polish officials and civil servants working in the system of granting EU Funds – especially the Implementing Authority, which in this case is the Marshal's Office of the Silesian Voivodeship – not to the EU regulations. As it was put by RR:

"I can't simply believe that the EU requires so much paperwork, I think it's our officials who came up with all that so they could expand the number of civil servants and clerks".

An analogous opinion was presented by AA, a micro-entrepreneur:

"Somehow other states manage it in a simpler, smarter way. Here we create our own obstacles, which are not ever required by the EU. You need a paper to confirm a paper, a copy confirming a copy".

At the same time few of the interviewees gave specific examples of possible solutions they believe would improve the bureaucratic burden on the applicants. One of those was introducing a single declaration in the place of all permissions which the applicant needs to present at the first stage of applying. This was understood as no longer sending all the required legal permissions to the Managing or Implementing Institution, but instead signing and sending a single declaration of possessing all the necessary permissions which then would be checked during the project control. Another proposed solution was to introduce online forms, as they were considered to be a faster way of communicating between the project conveyors and the institutions responsible for the Funding; and this in turn would allow the beneficiaries to spend

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[24] For example, the application documentations for project bids announced by the Voivodeship Labour Office in Katowice in 2009 state that the border date for storing project-related documents is 3 years from the closure date of the whole Human Capital Operational Programme, i.e. until 31.12.2018 (VLO Katowice, 2009). This ultimately means that an organisation starting a project in 2009 would need to store the hard copies of all the documents for nine years.

less time on bothersome completion of the hard copies of the required documents, allow them to spend more staff time on projects' actions other than administration, and facilitate the faster flow of payments to the beneficiaries.

The issue of prolongation of the payments and its possible relation to the results of KBE-SF correlation results (presented in the Quantitative Chapter on p. 148) is further discussed in the later subsection (page 204).

Assessment and project evaluation

The issues regarding assessment of the applications and projects were another flaw mentioned by a number of interviewees.

A significant assessment-related problem raised was with regards to the assessors, particularly regarding the vast differences in their points of view when assessing the same project application. As it was claimed by AD:

"On a few occasions we had the same application receiving two completely different marks from the two assessors".

A similar experience was shared by RR:

"We sometimes had two completely different marks and when I read the feedback I had the impression that that was not our project at all".

With reference to the assessment process one of the interviewees also observed that:

"The assessors look at the organisations submitting the applications, not at the application itself. So they are told that a given application should pass because the organisation or institution is very important in the region" (AD).

Interestingly, this is a statement similar to the one expressed by AH (p. 177) when discussing the lack of anonymity in project applications.

There were also reservations expressed as to the way of evaluating the project applications, both in the formal and subject-matter stages of assessment[25]. Regarding the formal stage, the greatest problem seems to be that it can be heavily influenced by the assessors' personal judgement, which is not necessarily unbiased. BK complained that the assessors:

"sometimes have their internal decisions that they would want something to be more precise, but it is not written in the guidelines. So they shouldn't be fussy about it, but they are".

He also expressed his discontent with the assessment of content-related criteria:

"If we have a criterion like 'the impact on economic development' one expert can give 3 points, a second one can give 2 points and then when the multipliers are used these points gain more importance and we can lose. And we can't appeal because we don't see who has given us how many points for what, we just see the final mark".

The key proposed change therefore was that the results of the assessment should be published in a very detailed way and all of the applicants could be presented with an explanation why a given project received the marking it did, and for which part of the application the marks were very high, or very low. An interviewee (ZZ) recalled a situation when one of her municipality's projects was evaluated negatively (i.e. did not pass the evaluation) and this was only then when they could appeal. She was very much in favour of changing the rule that allows appeal only in a situation when an application does not pass the evaluation stage, to the possibility of appealing when an application receives a positive evaluation result but not enough points to get the funding.

It can be foreseen that allowing such a change in appeals procedure would allow the potential future beneficiaries to learn more from their mistakes (and insufficiencies in applications) and prepare much better applications and projects in the future and this can ultimately lead to better use of the European Funds.

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[25] In accordance with the Project Selection Procedure included in the Regional Operational Programme for Śląskie Voivodeship (ROP ŚV), the assessment of project proposals is made based on the successive strategic, formal and subject-matter criteria (ROP ŚV, 2007, point 5.8)

There were also a number of potential changes proposed by the interviewed entrepreneurs and these are presented in the subsection relating strictly to business-specific problems.

Financial and payment issues

Another major group of issues identified by the interviewees related to the problems with timely payments to the beneficiaries and favouring the refund system over pre-payments[26]. Those issues were mainly attributed to the lack of effective cooperation between the beneficiaries and the Marshal's Office. There were a number of interviewees complaining about the performance of the Marshal's Office as the Managing Authority of the Regional Operational Programme (EB, RR, AM) and on one occasion (the interviewee asked for not being identified as saying this) the Office was even "the worst Implementing Authority ever", with the speaker complaining that the interviewee's organisation had finished its project in June and at that point had not received the payments from January.

Another flaw considered was the amount of time required by the Managing Authorities (in this particular case, the Ministry of Education) to evaluate the application for payments; this is also very tightly linked to the issue of refunds being favoured over pre-payments. According to ES:

"They didn't keep up when it comes to assessing the application for payments – we weren't getting our instalments on time and we had to spend our own money instead (...) The guidelines say it can be a pre-payment, but these are just empty words. In practice it always comes down to the refund. So if we're doing a massive investment project and we don't have this much money on our account we need to take a bank loan" (ES).

A similar view was also represented by the interviewed municipality mayor (AK):

"There is virtually no chance of getting a pre-payment. The municipality has to pay everything (...) and only then will it see the money. And this waiting for the money is killing us. The municipality is burdened with additional costs of financial services, bank loans and so on... It ends up that from the 75% of co-financing in reality we only end up with 50% tops".

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[26] In the Polish system the Funds for SME entrepreneurs are available in a form of a refund of already spent approved projects' costs, as per point 5.3 of the ROP ŚV (2007).

It can be easily understood that such flaws would surely deter some organisations, especially newly created innovative enterprises which do not yet have a credit history good enough to obtain a favourable bank loan from applying for the funding.

The above mentioned obstacles relate also to another group of financial problems identified by the interviewees, namely the issues regarding the costs involved in the projects. In the broadest aspect, it was observed that the spending of the Funds is not always purposeful. It was recognised that if the Funds are used for simple consumption, they will not bring any significant effect. Examples of such ineffective spending were given by AD:

"Some schools do that. They buy new computers, and then the project finishes and they can't buy the updated software; or they employ people and then when it [the project] is done, they lose their jobs; often [beneficiaries] don't think past the project end-date".

What is also very interesting is that even the interviewees who themselves were beneficiaries admitted the fact that some of the financial means were squandered. It seems that most often this happened through putting in one's application artificially increased catering costs or exorbitant wages for the project personnel. A complaint was also made that

"sometimes when you tell your subcontractors the project is done with the aid of EU funds they increase the prices and there is absolutely no way of negotiating a discount" (AM).

The two above paragraphs are particularly important in the light of the findings of the previous chapter and will be further developed in the thesis' conclusions.

Wider policy issues

Similarly as in the case of the West Midlands, there were a few interviewees who observed flaws in funding in the context of insufficient amount of the financial resources and dispersion of available funding. The wish to have the amounts of funds increased was also expressed by the representative of the Intermediary Agency, but she was quick to add that she understands that the issue of the amount of funds and the policy behind it was linked to the changes on the higher, system level:

"This depends on the politics and policy which tells us in which way the society is to develop and surely not all needs can be fulfilled in the same time" (JK).

The interviewees put forward a number of propositions of changes on the policy level. It included creating one homogenous system and objective and reducing the number of objectives within a single Operational Programme; this seems a very valid point given that the Sectoral Operational Programme - *Improvement of the Competitiveness of Enterprises* for the years 2004-2006 consisted of 13 Measures (SOP ICE, 2004), and the *Human Capital* Operational Programme for the years 2007-2013 consists of ten objectives, divided into over eighty Measures and Sub-Measures (HC OP, 2007).

SME-specific issues

The interviewed SME entrepreneurs raised a specific group of concerns, which, again, related to the bureaucracy involved in applying for and executing EU-funded projects. ZG (a Director of the Entrepreneurship Incubator in Bielsko-Biala) and JB (Investment director of a medium-sized company) acknowledged that due to the amount of required paperwork and often complicated regulations a significant number of small and micro enterprises are discouraged from applying for EU funding altogether. Indeed, these opinions were confirmed by the majority of interviewed micro- and small- entrepreneurs[27], the prime example being the view of JbK (who, notably, was the only micro-entrepreneur who agreed on being recorded and identified by name):

"I know about the funding opportunities, but I have no intention of applying. Because for me that would be a journey through hell, with all the procedures, all the papers I need. All the hassle takes up plenty of time, for example to spend a whole day to get a stamp from some office... and then in the end most likely you won't get any funding anyway".

The interviewees originating from micro and small enterprises found the level of bureaucracy to be the strongest deterrent from applying. At the same time they acknowledged

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[27] as per the definition of the enterprise size included in the Commission recommendation 2003/361/EC, p. 36–41.

that the application process and later- carrying out the EU funded projects- is much easier for

bigger companies who can spare staff time for running the project or employ an external

consultancy to write the project application.

Another flaw identified by the interviewees originating from the SME sector which had

a significant impact on their rather negative perceptions of the Funds was the fierce

competitiveness of the application process for micro and small enterprises. The interviewed

entrepreneurs (AA, EE, EE and FF) emphasized the fact that the application rounds for SMEs

function as an open competitive mode [28] i.e. on a 'first-come, first-served basis'. An example of

such a mode was the application round announced in 2008 by the Polish Agency for Enterprise

Development (an Implementing Authority for the Operational Programme *Innovative Economy*)

for the Measure 5.4 of the OP IE for micro, small and medium entrepreneurs (PARP, 2008b).

One of the entrepreneurs commented on such an application mode that:

"unless you queue outside [the office receiving applications] from the evening the
previous day, there's almost no chance of getting you application approved" (CC).

The lists of successful applicants seem to confirm this statement, as it was only 27

applications from across whole of Poland which were approved for funding under the above

mentioned Measure 5.4. of OP IE (PARP,2008c)

The micro and small entrepreneurs were certain that if there was a greater pool of

funds available for given Measures instead of the money usually finishing on the very first day of

the application round more people would be interested in applying. It was very much

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[28] The so-called "Competitive mode" of applying may be either "open" or "close". In the simplest terms
the former means that the applications are assessed as they come in and all of the applications which
receive a positive assessment are being funded, up to the point of exhausting the financial allocation
for a given Measure. The latter term means that all of the applications are assessed virtually all at
once, only after the closure of the application date, and it is the highest ranked applications of all that
receive the funding (See *Ustawa z dnia 6 grudnia 2006 r.o zasadach prowadzenia polityki rozwoju*
(Law of 6 December 2006 on managing development policy)).

emphasized that most of the micro and small entrepreneurs assume that there is virtually no chance of them getting the funding, therefore they do not apply.

Table 12. Perceived flaws in the SF system (Silesia)

Bureaucracy:	Excessive paperwork
	Inconsistent assessment and project evaluation
	Lack of anonymity
	Prolonged wait for payments
Business- specific:	Favouring refunds over pre-payments
	Approval on "first-come, first-served" basis
Policy issues:	Funding opportunities scattered over too many priorities
	Too small financial-wise

From the above described perceived flaws and proposed changes to the system of EU-funded projects' realisation it becomes clear that the Silesian interviewees' views are similar in a number of aspects to those expressed by the West Midlands' interviewees. Notably, in both regions the key identified flaw was the level of bureaucracy involved.

What should be emphasized though is the fact that most of the Silesian interviewees attributed the bureaucracy to the actions of Polish Managing and/or Implementing Authorities, not to the higher-level, EU regulations. This may indicate a certain level of confidence towards the EU structures expressed by the Silesian interviewees and general favourable perception of the broad idea of Funds. This is in great contrast to what was observed in the West Midlands, where one of the flaws was the perception of European Union as rather an obscure, demanding and remote "them" (see page 172). Another vital contrast is that the Silesian interviewees seemed much more critical towards the Managing and/or Implementing Authorities (who share a number of roles similar to the UK Regional Development Agencies), whereas the West Midlands counterparts presented rather complimentary opinions of the RDAs.

An important observation stemming from the research carried out in Silesia is that the interviewed SME sector entrepreneurs were much more explicit in naming the perceived flaws and seemed far more cynical towards applying. The key issue seems to be the widely spread belief that due to the structure of the application process ("first come, first served" approach) most of the SMEs have virtually no change of receiving any funding. It was also stated multiple times that the process is too bothersome (in times of staff time) for micro and small enterprises, and that this ultimately outweighs the potential benefits of applying. Such approaches are surely one of the reasons reducing the effect the Funds could have on the regional KBE.

Another vital problem from the point of view of the research is the issue of the Managing and Implementing Authorities preferring the refund system over pre-payments, which in practice requires applicants to take bank loans in order to pay off the running costs of their projects. It can be easily understood that such a flaw would surely deter some organisations, especially newly created innovative enterprises which do not yet have a credit history good enough to obtain a favourable bank loan, from applying for the funding and therefore reducing the impact of Funds on the KBE regional development. Also the identified problems with appeal procedures make it very difficult for potential future beneficiaries to learn from the mistakes and insufficiencies they have made in their previous unsuccessful applications. Therefore some of the organisations may find it difficult to prepare better applications and projects for the next application call and this can ultimately lead to the hindering of a more robust use of the European Funds, e.g. developing projects which would bring KBE-related effects even after their completion.

Taking into account the results of the statistical analysis of the KBE and European Funds' relationship, the next identified problem, namely delaying payment rates for the beneficiaries, may be one of the reasons why for Silesia it is only in the *t+2* time series that the Pearson product-moment correlation between the two is positive (see page 148).

Significance of funding for project realisation

Majority of interviewees who did receive any form of European Funding acknowledged its importance for executing their projects, i.e. conceded that without the EU funding they would not have pursued the given type of activity or the project would take significantly more time, or would be done in a limited scope. These two types of opinions correspond to the views presented by the interviewees in the West Midlands'.

It was the interviewees who received EU Funds' support for purchasing tangible goods who seemed to be stressing most the significance the Funding had for their companies. An example of such opinion was expressed by PP, who stated:

"Because the project we had in mind was so massive financial-wise, at that stage our institution had no chances of financing itself. Without the help of the EU, I suspect, we would have never done it."

Similar statements were given by RR and ES (both regarding purchasing of IT equipment for education establishments).

Notably, some of the interviewees whose infrastructure projects were on a slightly smaller scale, conceded that most likely they would have managed without the funding, but their projects would have taken much more time and would certainly be much more difficult. One particular interviewee (JB) brought the matter of Funds significance a bit further and emphasized the additional benefit the obtained Structural Funds provided for his company:

"a great chance of further development and increasing the competitiveness, even on a European market".

The perception of Funds being of great significance for project realisation was also confirmed by the interviewees involved in project revolving around intangible derivatives, such as improvement of skills. On a very crude level, as observed by some interviewees, their organisations would otherwise not have enough capacity to train as many employees.

RR expressed absolute certainty that without the support of the European Funding one of her

organisation's projects would have not taken place:

"The amount we received from the Funds exceeds our monthly income. So without the Funds we couldn't have spent all that money from our budget".

Another reason why Funding allowed for a project to happen was given by ES, whose

project included offering free-of-charge classes of mathematics and physics for first year

students:

"If it wasn't for the Funds, either the students would have to pay, or the University would have to cover the costs, or the lecturers would need to do it for charity; either of which was simply impossible".

She also acknowledged the role of EU-funded social public campaigns which increased

the popularity of technical further education. These opinions seem to confirm the importance

of Funds for developing the regional KBE.

Another group of opinions regarding the significance of Funding for carrying out

particular projects was expressed by interviewees involved in entrepreneurship- and SME-

support projects. JK claimed that her organisation (the Silesian Centre for Entrepreneurship)

would not even exist if it was not for the EU Funding. Exactly the same words were repeated by

ZG. He also believed:

"There could have been maybe other organisations dealing with similar area, maybe funded from the Local Authorities budget, but surely they would not be such wholesome".

However, taking into account the findings of the previous section and the specific flaws

identified by SME-sector entrepreneurs it is worth looking into the opinions on Funds'

significance expressed by them specifically.

Unsurprisingly, most of the representatives of SMEs despite generally acknowledging

the importance of Funds for realising particular projects pointed out the somewhat limited

scope of the Fund's significance. Whereas the micro- entrepreneurs agreed that a positive impact could have been observed in the cases of municipalities, they almost unanimously stated that for small private companies the Funds were of little significance. The micro and small entrepreneurs pointed out that the Funds will be of great significance for SMEs only when they become more accessible, relating back to the issue of application rounds finishing on the first day due to insufficient amount of available funds, as already stated in the "flaws" section.

This leads to the conclusion that the Funds may have an impact on medium- and big-scale KBE-related projects, but are not necessarily that vital for small-scale projects led by the micro- and small- entrepreneurs. The next section intends to shed more light on this issue.

EU funding – perceived relations to the KBE

What is of significant importance for this research, when enquired about the perceived significance of Funds for realisation of the projects (as elaborated upon in the previous section), some interviewees also expressed opinions regarding the relation they believed existed between the Funds and some of the aspects of the regional KBE. Similarly as in the respective section which previously demonstrated the stands of the interviewees from the West Midlands, the issues raised by the Silesian interviewees regarding the KBE-SF relation were not treated as delivering a simple answer to the thesis' main research question. They were, however, vital from the point of view of the Third Hypothesis (see page 227-232).

Regarding the relation between the Funds and the Knowledge-Based Economy from the perception of Silesian interviewees, the most categorical statement was made by KW, who claimed:

"The Funds are one of the strongest impulses for KBE development" and this according to him was due to the fact that "judging from the experience of the last couple of years, if it wasn't for the Funds we would have no expenditure on innovations."

Other interviewees were slightly less categorical, but nonetheless it was believed that the Funds are of certain importance for fostering the KBE. The interviewees believed that in many cases the extent to which the Funds can be of assistance depends on a number of external factors, one of which are the far-reaching objectives of the government - i.e. whether the decisions regarding allocating funding for innovation are *ad hoc* with an added political or economic context. Another potential factor hindering the Fund's impact on developing Silesian KBE was the resistance in cooperation between enterprises and universities:

"The Funds could do much more for the knowledge-based economy, but there are no mechanisms which would prefer the companies who wish to use universities' experiences" (ZG).

Interestingly, this is an issue which was also brought up by some of the interviewees from the West Midlands.

Another opinion worth quoting was expressed by BK, who very strongly felt that the Funds "are useful for the KBE", but observed that very often there is a problem with the practical application of the subsidiary principle[29] which according to him ultimately hinders the full development of national and regional KBE in Silesia:

"in Poland the problem is that the Funds replace the financing from national or local [authorities] budget".

What was also emphasized by the interviewees was the importance of Funds being a very important tool for increasing innovation (and as a result - the KBE) due to the financial support they offer. However, it was also noticed that a problem sometimes lies within the "risk-averseness" of Managing authorities, who are not always keen to fund the necessary tests and pilot projects. Notably, this is an issue which was also raised by the WM's interviewees.

It should be observed that overall the Silesian interviewees took on a slightly different approach than their West Midlands' counterparts when discussing this particular issue: they focused much more on the practical side of the Funds. Whereas they did believe that the Funds in general are a very important tool for fostering the development of the regional KBE, they named a number of factors which could hinder this process on a practical level, and again, attributed this to Poland- and Silesia-specific problems.

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[29] See e.g. the Protocol on the application of the principles of Subsidiarity and Proportionality (2004), according to which under the principle of subsidiarity the Union shall act only if and in so far as the objectives of the proposed action cannot be sufficiently achieved by the Member States, either at central level or at regional and local level.

Summary of findings for the qualitative analysis

The qualitative research presented in this chapter aimed at exploring in greater detail the perceptions of issues relating to the relation between the Structural Funds and the Knowledge-Based Economy in the two case-study European regions: the West Midlands and the Polish region of Silesia.

The chapter consisted of four main sections, doubled to represent the responses of the interviewees from the two case-study regions. The sections were distinguished based on common themes identified in the interviewees' responses and covered the issues of the Funds' perceived appeal and varying motivations for applying; perceived flaws and proposed changes within the system of European funds; recognised significance of funding for project realisation; and the observed relations of EU funding to the regional Knowledge-Based Economy. The analysis of the performed forty expert interviews – twenty in the WM and twenty in Silesia – presented in the chapter allowed to shed more light on some of the previous quantitative findings.

The qualitative analysis of the correlation coefficient proved a rather weak dependency approximating a monotonic function in the three time-scales (t, $t+1$ and $t+2$) over the time period taken into account in this research (1999-2009), what is more the results of ANOVA point towards lack of causal impact of Funds on the regional KBE.

On one level it appears this can be attributed to a number of flaws in the system of EU funding. Firstly, the level of bureaucracy involved in carrying out an EU-funded project acted as a great deterrent for applicants, especially smaller organisations who would potentially be interested in pursuing European funding for the KBE-related projects. Notably, the bureaucracy as a flaw has various dimensions, which allow for explaining some of the previous quantitative findings, and what adds validity to the flaws recognised by the interviewees is the fact that those flaws are to an extent affirmed by official documents (e.g. calls for project proposals) and results of funding application rounds.

The key issue here seems to be problems of timing, which have a number of vital aspects. The application calls for big-scale projects come out far too seldom: once a calendar year or less (see e.g. the call for ERDF projects in the West Midlands, Department for Communities and Local Government, 2011) and because of that all the applications are filed in at the same time and this leads to a very long time needed for approval, negotiations with the approved beneficiaries and ultimate execution of the project. Because of that the innovative aspects of some projects may expire and the new, state-of-the-art (at the time of submitting the application) solutions may go out of date. This surely hinders the EU from becoming the most innovative KBE on the Globe. Also, because of the prolongation of the whole funding process, especially for big-scale innovative projects, it is possible that the expected positive changes in terms of the KBE occurred far beyond the assumed three time-series and that is why in the measured correlation results were mostly negative.

Another timing-related problem is the fact that the Polish Managing and Implementing Authorities prefer refunds over pre-payments; see e.g. The Detailed Description of Priorities of the Regional Operational Programme of Śląskie Voivodeship (*Szczegółowy opis priorytetów Regionalnego Programu Operacyjnego Województwa Śląskiego na lata 2007 – 2013)*, (2007:38) for the priority *R+D, Innovation and Entrepreneurship,* which specifies that the funding can take place as either a pre-payment or a refund; however in accordance with point 5.3 of the ROP ŚV (2007), SMEs can only receive refunds. In practice this requires the applicants to take bank loans in order to pay off the running costs of their projects. This was found to deter newly created innovative enterprises which do not yet have a credit history good enough to obtain a favourable bank loan needed to fund the project in the first place, from applying for the funding. On top of that, the above mentioned authorities are known for delaying their due payments to the beneficiaries. This can be one of the reasons why for the region of Silesia it is only in the *t+2* time series that the correlation between the Funds and the KBE is positive (although very weak).

What is more, the fact that the application rounds for SMEs function as an open competitive mode i.e. on a 'first-come, first-served basis' ultimately leads to only a very small number of applicants receiving the funding (PARP, 2008c); and the funded projects are not the highest-ranked from all of the submitted proposals, but the ones who were submitted the fastest (see p. 195).

The combined lists of the problems identified by the interviewees in both regions are interlinked and presented in a table form and further discussed on page 229 in Chapter Five.

However, from a wider perspective, it can be stated that the named flaws form a list of complaints from those with a keen personal interest in applying and obtaining the Funds. Their views seem to be valid as they were the ones most closely involved in SF and their views shed light on some of the qualitative findings. Yet ultimately, if the changes they proposed took place and the named flaws were tackled this would only make the application process easier for those who apply for the Funds in the future.

When it comes to the significance of the Funds for realisation of given KBE-related projects (which had already secured EU funding), it became clear that had it not been for the Funds' support, the projects would either not take place at all or would be realised to a significantly smaller extent, or would take many more years to achieve the desired output. However, again, if the before mentioned flaws in the system of SF were addressed, it is still rather doubtful if this would be followed by any significant change of the regional KBE; it might be that the pure nature and scale of the challenge means that the Structural Funds are doomed to failure in this respect. Therefore the one flaw for which addressing may result in significantly boosting the regional KBE is the problem of insufficient amount of Funds destined to tackle this issue; however this does not necessarily mean simply increasing the amounts of the aggregated SF allocated to given regions, but rather re-distributing funds within the already allocated amounts in the Operational Programmes and Regional Operational Programmes towards more KBE-oriented Measures (please see also page 226 addressing the Second Hypothesis in the

Conclusions chapter). Another significant point regarding the insufficient volume of Funds relates back to the already mentioned problem of delaying payments.

Another interesting finding resulting from the qualitative research presented in this chapter regards the differences between the two case-study regions. The analysis of the KBE indicators and correlation coefficients in the West Midlands and Silesia over time which was performed in the quantitative chapter may suggest that the performance of the KBE and the use of Structural Funds were substantially diverse in the two regions. However, whereas there have been observed some differences regarding certain issues, none of them was of decisively vital character.

Both the West Midlands and Silesia share an industry-based past and for both regions becoming a Knowledge-Based Economy is a significant challenge. The representatives of the two regions also share similar evaluation of the motivations for applying for the EU funding, both in the "money-oriented" and "project-oriented" approaches; it should also be noted that in both regions the "money-oriented" approach prevails among businesses, especially from the SME sector.

Regarding the use of the Structural Funds in the two regions, in both of them similar flaws of the Funds' system are identified. The key flaw seems to be the bureaucracy involved, although the regions have problems with various aspects of it. The WM's beneficiaries seem to find it particularly difficult to tackle the hermetic language, excessive auditing, inflexible rules, timing issues and risk-averseness of funding bodies; in Silesia the key issues are the excessive paperwork, often present ambiguity of assessment and project evaluation, financial and payment issues, especially related to delaying payments.

Though what deserves emphasis is that in the case of Silesia, the majority of the bureaucracy-related problems are attributed to the actions of Polish Managing and/or Implementing Authorities, not to the higher-level, EU regulations. This can be an indication of a

certain level of confidence towards the EU structures expressed by the Silesian interviewees and general favourable perception of the broad idea of Funds. At the same time, some of the West Midlands' respondents are prone to identifying the EU's Funds-related regulations as rather demanding and remote, and were rather supportive of the actions of the now-abolished RDAs. The further discussion of the flaws' similarity in the two case-study regions is included in Chapter Five as a part of the Third Hypothesis' testing.

Importantly, as it shows a level of similarity, the significance of obtaining EU funding for realisation of projects (i.e. that without the funding most of the projects would have never been realised or be realised to a lesser extent) was recognised in both of the regions. It could be observed that the SME entrepreneurs in Silesia were far more negative towards the Funds as a help for them and seemed frustrated with the process for them, yet at the same time they did not negate the overall effect the Funds can have on the KBE, especially by funding great-scale projects which contribute to the region's development.

Furthermore, additional interesting observations came into light. Among the interviewees from the West Midlands region there has been more focus on European Transnational Funds, i.e. the Lifelong Learning Programme, Marie Curie schemes and Competitiveness and Innovation Programme compared to their Silesian counterparts. Polish interviewees seemed to have significantly smaller awareness of such funds; in parts of the interviews put off the record (or as unexpected final remarks after the recorder has been switched off) many experts from Poland expressed interest in pursuing the opportunities offered by Transnational Funds in the close future. Importantly, this is not a simple reflection of the different professional background of the interviewees in Silesia, as the Transnational Funds listed above offer a range of funding opportunities for various types of organisations.

The matter of Polish interviewees' striking unawareness of types of EU funding different from the Structural Funds would surely require further study, and possibly incorporating the Transnational Funds aspect into an extended quantitative research in a future research project.

The overall findings of the qualitative chapter allowed investigating in greater depth the relation between the KBE and Structural Funds in the West Midlands and Silesia, especially in the light of the quantitative chapter's findings which suggested that the Funds may not have had the intended effect. It came to light that most of the identified problems within the SF system are of the "red tape" type and ultimately the only two flaws which can attribute to the lack of definite positive correlation between the SF and the whole of the regional KBE's performance are the slow responsiveness of the system (i.e. delaying payments) and the insufficient amount of EU funding aimed particularly at enhancing the regional KBE. The importance of the latter flaw seems to be confirmed by the previously carried out ANOVA, as in the cases of regions with significantly greater annual Funding allocation (see Table 10 on page 157) the impact of SF on the regional KBE is confirmed with the significance level of 95%.

Chapter Five: Conclusions

As pointed out in the introduction, by announcing the Lisbon Agenda in the year 2000, the European Union publicly declared its objective to *become the most competitive and dynamic Knowledge-Based Economy in the world* (European Council, 2000 point 5). What should also be recalled at this point are the repeated statements regarding Cohesion Policy and its main instruments, the Structural Funds, as being "in line with the Lisbon Strategy" (European Economic and Social Committee 2004:81-82) and recognising the CP as a "fundamental principle" for achieving the Lisbon Strategy objectives (European Parliament, 2008b:32). Furthermore, taking into account the fact that the European Union's spending on the Cohesion Policy amounts to one-third of its budget, and this proportion keeps increasing (see e.g. European Parliament, 2008a), it becomes particularly interesting to scrutinise the achievements of the Funds with regards to the Knowledge-Based Economy.

This research set out to explore the nature of the relationship between the development of the Knowledge-Based Economy and the Structural Funds in European regions with a particular focus on two regions: the British West Midlands and Polish Silesia (*Śląskie*). The issue of the nature of the relationship between these two factors formed the main research question, which was further divided into two sub-questions:

First, what is the relationship between the amounts of allocated European Funds and the changes in the Knowledge Based Economy calculated as a composite index of its indicators? Second, what is the difference in the KBE development and the approach towards the Funds in regions from different Member States?

The questions were addressed by performing both qualitative and quantitative research in order to give the fullest possible picture. Additionally to this, the robustness of the research design was assured by triangulation both between and within the methods as indicated on page 69 of the Research Design, and pages 92 and 97 relating to the Qualitative and Quantitative analyses, respectively.

The originality and uniqueness of the research lies firstly in its scope, as the quantitative part of the study took into account all of the EU regions. Secondly, the research relied upon a completely new data set: the KBE General Index calculated by the author for all EU regions, for each year. Thirdly, the time-frame for which the regions were examined was a full decade of 1999-2009. Finally, the uniqueness of the research is due to the original methodological solutions adopted.

The author devised a new calculation method for assessing the regional Knowledge Based Economy as a composite index, which consisted of a set of five indicators: (1) Human Resources in Science and Technology; (2) Employment in Technology and Knowledge-Intensive Sectors; (3) Pupils and Students in the Whole of Education; (4) Total Intramural R&D Expenditure; and (5) Patent Applications to the European Patent Office from the areas of hi-tech, ICT and biotechnology. The chosen indicators overcome the limitations of previous attempts of measuring the KBE found in the existing literature, as presented on pages 26-30. What also deserved great emphasis is that the quantitative stage of the research addressed the problem identified previously in the subject literature (see e.g. Martin and Tyler, 2006:206) i.e. the lag between the funding commitment and its measured expected output. This was made by including three time-lag series (*t, t+1* and *t+2*) in the examination of the coefficients of correlation of the regional KBE and the Structural Funds. To the author's best knowledge this was the first time such a methodological approach was used.

As already stated in the previous paragraph, the study was carried out using triangulation both *between* and *within* the methods. The former type of triangulation was obtained by carrying out both quantitative and qualitative types of research. The latter was assured by applying three statistical methods (Person product-moment correlation, Spearman's rank correlation and two-way ANOVA) in the quantitative stage. The triangulation within the qualitative aspect was a result of not only carrying out stakeholder interviews in two regions of different Member States but also counter-checking the assertions of the interviewees with a number of official documents and announcements such as application calls for funding rounds and their results, Regional Operational Programmes, etc.

The thesis produced a number of interesting findings, yet the two worth particular emphasis are: firstly, the research uncovered the disparities in terms of KBE performance across all EU regions in great detail, thanks to the new methodology of calculating the KBE as a composite index based on data obtainable on a regional level (p. 76-80). Secondly, the analysis proved a relatively low impact of the allocated Structural Funds on the regional KBE in the majority of European regions (p. 160-161). The key findings are further discussed in the subsequent parts of this chapter.

Furthermore, the research also delivered outcomes which were rather unexpected or seemed counterintuitive to the assumptions made at the very early stage of the research.

The first unexpected finding was the relatively low proportion of regions for which the coefficients of correlation between the KBE and the SF were of any meaningful strength irrespective of their positive or negative value (i.e. exceeding the values of |0.4|, as per detailed explanation presented on page 82). Furthermore, the proportion was low regardless of the type of correlation coefficient taken into account (Pearson's *r* or Spearman's ρ). Whereas the author acknowledges that the examined correlations are only the indicators of linear or monotonic

dependencies, the overall result was nonetheless surprising, as it contradicts the findings of a number of previous studies discussed in the literature review (e.g. Cappelen *et al.*, 2003; Martin & Tyler, 2006). This finding was also of paramount importance for testing the thesis' Second Hypothesis and as such is discussed in greater detail in the following sections of this chapter.

The second finding which was not anticipated was the fact that the results of the ANOVA for the regions which received the smallest amount of SF allocation (less than € 10 million) suggested a positive impact of the Structural Funds on the development of the regional Knowledge-Based Economy, whereas in the cases of regions whose average annual allocations were between €10 million an €499 million there seemed to be no impact (please see pages 155-157). Since the ANOVA was used as one of the tools of testing the Second Hypothesis, this finding is further incorporated into the results of the Hypothesis' testing presented further on pages 222-226.

Another surprising finding stemmed from the qualitative part of the research. The Silesian interviewees were very keen to attribute most of the problems they identified in the areas of using the Funds to the local Implementing Authorities and believed most of the obstacles and flaws were created by Polish civil servants and institutions, and not resulted from the EU requirements (page 189). However, at the same time, the West Midlands' interviewees seemed very appreciative towards their Regional Development Agency and rather placed the blame for the Funds' various perceived insufficiencies on the EU-level institutions (see p. 171-172).

The subsequent parts of the concluding chapter review the findings of the performed research in four sections.

The first section returns to the research questions and presents the key findings of the thesis. It also includes the summary of both qualitative and quantitative evidence found which the answers to the research questions and the verification of hypotheses are based on. The next section discusses the limitations of the research followed by the third section addressing the broader implications of the research; as well as considering this research contribution to the sum of human knowledge in the field. It also addresses the significance of the research for those with an interest reaching further than the issues of the regional Knowledge-Based Economy and Structural Funds. The final section reiterates the main points addressed in the Conclusions chapter and brings the work to a close.

Findings

The importance of regional development has been widely recognised by scholars and international bodies including the European Commission in its Cohesion Report (European Commission, 2004). The Report emphasised that the disparities in regional development pose significant challenges for the ambitious goal stipulated by the Lisbon Agenda in the year 2000. The wealth of scholarly literature on this subject matter has also underlined the importance of the ex-post evaluation of the Structural Funds' effects with regards to their outcomes (Bachtler, Wren, 2006:143), particularly in terms of facilitating the reduction of regional disparities and enhancing regional development.

Due to knowledge being identified as the major element in achieving regional competitiveness (see e.g. p. 17 and 24), the thesis focused on closely examining the relationship between the Structural Funds and the development of the Knowledge-Based Economies in European regions.

The findings of the thesis become particularly relevant to the recent debate on the effectiveness of the EU Cohesion Policy (e.g. Dąbrowski, 2012:8), especially in the light of the fast approaching new programming period (2014-2020). Also, being aware of the rather disappointing delivery of the Lisbon Agenda (Kok, 2004:6), it becomes ever more important to learn from past experience. Therefore a need for an effective EU Cohesion Policy remains even clearer, and a thorough examination of the relations between the Structural Funds and the regional KBE is undoubtedly of crucial importance.

As defined in the Research Design (p. 53), the thesis' main research question was: what is the nature of the relationship between the development of the Knowledge-Based Economy and the Structural Funds in European regions? This was broken down to two sub-questions: the first part examined the relationship between the amounts of allocated European Funds and the changes in the Knowledge Based Economy calculated as a composite index of its indicators, while the second part looked at the difference in the KBE development and the approach towards the Funds in regions from different Member States.

The questions were answered by testing the following hypotheses:

H1: The Knowledge-Based Economy expressed by the values of KBE General Index (GI) increased in European regions over time;

H2: There is a statistically significant relationship between the amount of European Funds allocated to the given region over time and the changes in the value of the region's KBE.

H3: The performance of the Knowledge-Based Economy and the approach towards the Structural Funds are substantially diverse in the two case-study regions.

Verification of the above hypotheses was carried out by performing both quantitative and qualitative analyses and the key findings are presented as parts of the hypotheses' testing in the following sections of the chapter.

Testing of the hypotheses

The hypotheses were tested based on the research carried out and presented in both quantitative and qualitative chapters of the thesis.

The part of research presented in the quantitative chapter consisted of using a number of independent quantitative techniques to investigate the relationship between regional Knowledge-Based Economies and the amount of Structural Funds allocated to the regions over the years 1999-2009. In order to measure the regions' performance in terms of KBE, a new General Index was created based on an original set of five indicators (Human Resources in Science and Technology; Employment in Technology and Knowledge-Intensive Sectors; Pupils and Students in the Whole of Education; Total Intramural R&D Expenditure; and Patent Applications to the European Patent Office from the areas of hi-tech, ICT and biotechnology), which overcome limitations of previous research in the field as discussed in the Quantitative Methodology section (pages 71-84). The chapter presented the findings of each indicator's regional performance analysis. This was followed by in-depth examination of KBE GI across all of the EU regions. The next section of the chapter focused on analysing the volumes of the Structural Funds' regional allocations. The final part of the quantitative research consisted of performing a statistical analysis of the Funds and KBE relation, and this included firstly, an in-depth examination using Pearson's product-moment correlation coefficients and Spearman's rank coefficients; secondly the ANOVA carried out for the regions divided into four groups depending on the volume of their average annual SF allocation.

The qualitative research presented in Chapter Four explored in greater detail the perceptions of issues relating to the Knowledge-Based Economy and Structural Funds in the two key case-study European regions: the West Midlands and the Polish region of Silesia[30].

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[30] For reasoning behind choosing the two regions please refer to the Research Design, pages 57-67.

The qualitative chapter focused predominantly on the European Funds-related topics including the Funds' perceived appeal and varying motivations for applying; perceived flaws and proposed changes within the system of European funds; recognised significance of funding for project realisation; and the observed relations of EU funding to the regional Knowledge-Based Economy. Apart from being divided into subject sections, the chapter presented its findings in two parts, each dedicated to findings from one of the case-study regions. The analysis of the performed forty stakeholder interviews – twenty in WM and twenty in Silesia – together with scrutinizing the interviewees' assertions against official documents relating to the system of Funds' implementation allowed to shed more light on the findings of the quantitative chapter and substantially contributed to the verification of research hypotheses.

The subsequent paragraphs include the summary of the evidence found on which the answers to the research questions originally posed are based; they also assess to what extent the findings confirm the original hypotheses.

H1: "The Knowledge-Based Economy expressed by the values of KBE General Index increased

in European regions over time"

The hypothesis was tested by analysing in detail the regions' performance firstly, in terms of particular KBE indicators, and secondly, by applying the original methodology of calculating the regions' KBE General Index (extensively discussed in the Methodology section, pages 76-80). The comprehensive analysis of the regional KBE formed the core of the qualitative chapter and is presented on pages 99-132 (analysis of the individual KBE indicators) and 123-141 (analysis of the KBE GI). Importantly, these analyses took into account all of the EU regions. Based on such a comprehensive large-scale study it was found that the First Hypothesis **proved true for the majority of the regions**.

The most significant finding of the extensive qualitative analysis is that the Knowledge-Based Economy expressed and calculated in terms of its General Index did in fact increase in a significant proportion (66.6%) of the regions examined.

However, what deserves particular emphasis is that the proportion of regions whose KBE GI increased was much higher for the 'new' members of the EU: the findings suggest that the increase of KBE GI occurred in 85.7% of the new Member States' regions (i.e. regions of the states who joined the European Union after 2004), opposed to just over 61% of the 'old' regions.

Figure 40 offers visual representation of the exact numbers of regions whose KBE GI increased and decreased during the decade taken into account in the research:

Figure 40. Increase and decrease of KBE GI in 'old' and 'new' regions of the EU
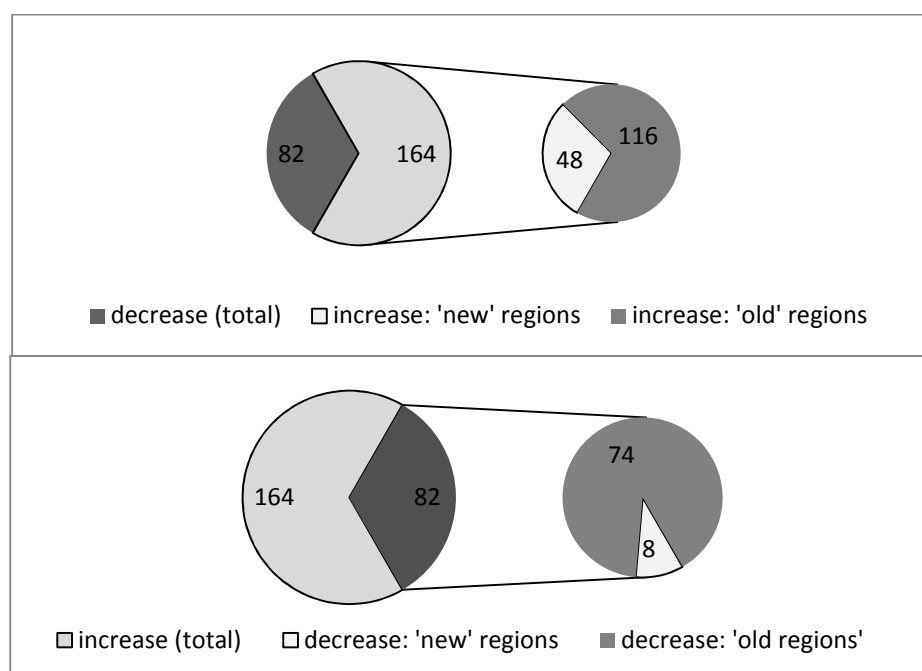
Source: author's own study

This finding seems to confirm the existence of the already discussed *catch-up effect* and *β-convergence*[31] among the regions in terms of the development of their KBEs. Out of the regions of the new Member States, whose KBE GI values were mostly lagging behind the 'old' regions at the beginning of the examined decade, most experienced an increase in the KBE values greater than the regions of the Member States who joined the Union prior to 2004.

The *catch-up effect* is also very much visible in the changes in particular KBE indicators over time. As already stated, the detailed analysis of these particular KBE indicators in European regions is presented on pages 99 to 132 of the quantitative chapter. The following table and graph offer an analytical summary of the findings regarding differences in changes over time in the particular indicators - and the KBE GI itself – by comparing the average value of changes that occurred in the 'old' and 'new regions of the EU in the examined time frame. The abbreviations of the indicators' names correspond to the system introduced on page 72 and adopted throughout the thesis.

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[31] For more details on the catch-up effect (and β-convergence) please refer to page 42.

Table 13. Comparison of the values of multi-annual changes in the KBE GI and the KBE indicators in 'old' and 'new' EU regions.

	KBE GI	HRST	TKIS	EDU	GERD	EPO
'old' regions	0.048	8.443	0.349	0.359	0.181	-14.942
'new' regions	0.276	10.750	1.664	0.900	0.139	0.548

'HRST'- Human Resources in Science and Technology; 'TKIS' - Employment in Technology and Knowledge-Intensive Sectors; 'EDU' - Pupils and Students in the Whole of Education; GERD - Total Intramural R&D Expenditure, EPO - Patent applications to the EPO: hi-tech, ICT and biotechnology.

The much greater rate of increase in the level of KBE GI and KBE indicators in the 'new' EU regions compared to the EU-15 regions is even more visible when presented as a chart (Figure 41). In order to enhance clarity of the chart, the values of HRST and EPO averages were divided by factor 10.

Figure 41. Visual Comparison of the values of multi-annual changes in the KBE GI and the KBE indicators in 'old' and 'new' EU regions.
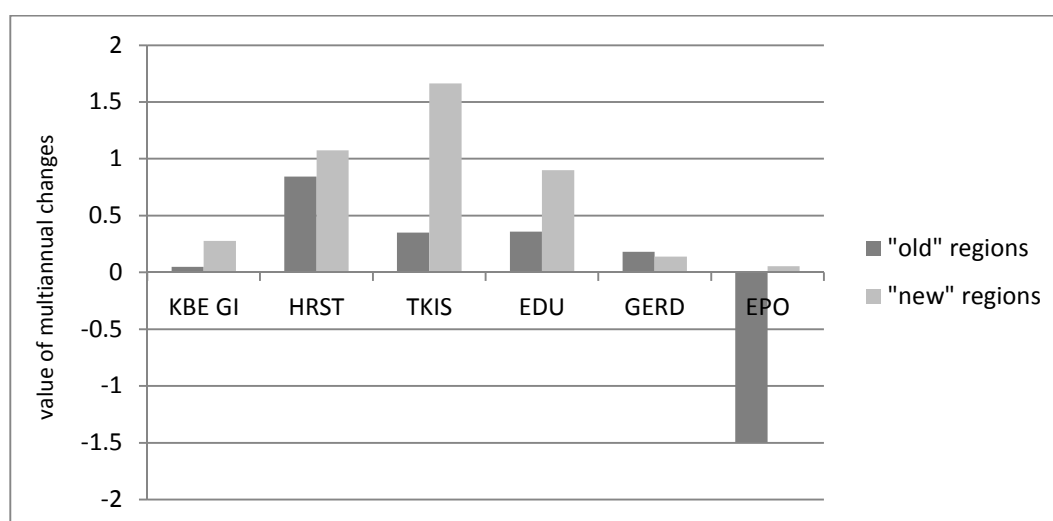
Source: author's own study

The testing of the First Hypothesis with regards to the two key case-study regions seems to prove the already made point: Silesia, a region of a new Member State, kept a rather upward trend, whereas the West Midlands, an "old" region, experienced a downfall (see p. 138 for more details).

The comment on the two regions is deliberately brief, as the in-depth analysis of the differences between the two regions forms the core part of the testing of the Third Hypothesis.

The key significance of confirming the hypothesis regarding the increase of the Knowledge-Based Economy for the majority of the regions relates back to the EU's objective to become "the most competitive KBE in the world" (European Council, 2000). Whilst such an ambitious plan was not in fact realised (see e.g. Wim Kok's Report (Kok, 2004:6)), it is worth noticing that most of the EU regions moved closer towards fulfilment of this objective.

Concluding, the testing of the First Hypothesis proved that the Knowledge-Based Economy did increase in the majority of the EU regions. However, in the light of the thesis' main research question it is worth investigating whether the Structural Funds had in fact any empirically verifiable impact on these changes. Exploring this issue is, therefore, the key component of the Second Hypothesis' testing.

H2: "There is a statistically significant relation between the amount of European Funds

allocated to the given region over time and the changes in the value of the region's KBE

index".

The results which enabled testing of the hypothesis were based on the analysis of firstly, two correlation coefficients (Pearson's *r* and Spearman's ρ) and secondly, carrying out the two-way ANOVA. For the two correlations' analyses the two variables were the KBE General Index, calculated according to the original methodology presented on pages 76-80 and the volume of annual Structural Funds allocations for a given region, extracted from the hard copy of the *Table of Allocation for the years 1999-2009* obtained personally by the author from the DG Regio in February 2011. The ANOVA was carried out as per the methodology presented on pages 154-155, assuming the significance level of α = 0.05. The independent variables were firstly, the average annual volume of Structural Funds' allocations for the given region; and secondly, the characteristics, economical properties intrinsic to the region, any other than the volume of allocated SF. The dependent variables for the ANOVA were the real (i.e. not normalised) values of KBE GI calculated according to the previously presented methodology.

Based on applying the three statistical methods, it was found that the Second Hypothesis **proved false for the majority of the regions**.

The analysis of coefficients of the correlation between the Structural Funds' allocation and the Knowledge-Based Economy (defined by its General Index) proved that only in cases of approximately 30% of the regions either Pearson's *r* or Spearman's ρ had any meaningful value (i.e. exceeding |0.4| - as already explained on page 82) in any of the three examined time-series[32].

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[32] For more details on the calculations of correlation coefficients and the three assumed time-series, please refer to pages 81-84 of the Quantitative Methodology section.

Furthermore, it was found that within the 30% of regions which exhibited any correlations of meaningful strength the ratio of positive to negative correlations varied depending on the time-scale taken into account and the type of correlation coefficient calculated.

Table 14. Summary of *r* and ρ's correlation coefficients' values in the three time scales

	Correlation coefficients' values [CCV]					
	Pearson's *r*			Spearman's ρ		
Time series	Meaningful CCV [% of all regions]	Meaningful positive CCV	Meaningful negative CCV	Meaningful CCV [% of all regions]	Meaningful positive CCV	Meaningful negative CCV
t	36.99%	55 regions	36 regions	33.74%	61 regions	22 regions
t+1	39.43%	42 regions	55 regions	30.08%	32 regions	42 regions
t+2	38.21%	41 regions	53 regions	36.58%	48 regions	42 regions

Source: author's own study

Because the correlation coefficients inform only about functional dependencies (linear and monotonic) and not about the direct influence of one variable on the other, as already stated, the testing of the Second Hypothesis also took into account the results of the two-way ANOVA analysis. Due to the fact that Spearman's rank correlation returned results indicating a relationship between the spread of correlation's strength and the value of SF allocation for a given region (as visible in Figure 38 on page 150), the ANOVA analysis was performed independently for four groups of regions, divided according to the volume of average annual allocation of Structural Funds for the regions: under 10 Million Euros; between 10 and 99 Million Euros; between 100 and 499 Million Euros; and exceeding 500 Million Euros.

The regions with the relatively small average annual allocation values (under 10 million Euros) included Austrian Salzburg and Vorarlberg; Belgian Oost-Vlaanderen and Luxembourg; Finnish Åland; German regions of Stuttgart, Freiburg, Tübingen, Oberbayern, Hamburg, Gießen, Detmold, Koblenz and Trier; Italian Valle d'Aosta and Provincia Autonoma Trento; Dutch Zeeland and Noord-Brabant; Spanish La Rioja; Swedish Stockholm and Sydsverige. The ANOVA

analysis carried out indicates that it is not only the Funds which had an impact on the development of the regional KBE, but that the regions' particular features other than the volume of SF allocation were also of importance in statistical terms. Joining this finding with the previous analysis of the performance of KBE GI and its indicators in the regions allows for an observation that most of those regions (disregarding outermost regions such as Åland, which for the purpose of the analysis can be treated as only a statistical outlier) scored remarkably well in terms of levels of particular indicators and the KBE itself. Therefore it can be concluded that for those regions the impact of the Funds could be due to the already existing KBE-related expertise.

What is particularly interesting is that the results of ANOVA carried out for the two 'middle' groups (the regions whose average annual allocation ranged between 10 and 499 million Euros) allowed for acceptance of the null hypothesis for both independent variables., i.e. stating that both: "SF allocation" and "regions" lacked impact on the changes of the regional KBE GI. This indicates that speaking strictly in terms of statistics, the Funds had no impact on the regional KBE in 86% of the European regions and this is the key finding which constitutes the main source of the Second Hypothesis' failure. What also deserves emphasis is that the two groups (10 – 99 and 100 – 499 million Euros average annual allocations) contain all of the 'new' Member States' regions. Taking into account the conclusions of the First Hypothesis' testing, which proved that the 'new' regions had in general a far greater increase of the KBE in the examined time-frame, in statistical terms it is impossible to say that this increase was dependant on the volume of allocated Structural Funds.

The final group of regions (with average annual allocations exceeding 500 million Euros) is also worth commenting on, as for these regions an impact of the Funds has been identified. The group consisted of the ten Southern-European regions: Attiki (Greece),

Campania, Puglia, and Sicilia (Italy), Norte and Centro (Portugal), and Galicia, Castilla y León, Comunidad Valenciana and Andalucía (Spain). The ANOVA analysis carried out for those regions indicated an impact of the Funds on the changes in regional KBE performance, yet at the same time, contrary to the case of the above discussed regions (whose SF allocation did not exceed 10 million Euros), the ANOVA showed no impact of other distinctive regional features on their KBE. Also, taking into account the previous investigation of the performance of KBE indicators and the KBE GI in particular regions, it can be observed that the performance of the ten Southern-European regions in those terms was far from impressive.

This leads to the conclusion that the Southern regions can be treated as a single "macro-region", sharing similar features and where only vast amounts of funding could help improve their Knowledge-Based economies. This observation seems to confirm to some extent the existence of the *core-periphery* problem, which is a phenomenon widely recognised in the subject literature (and already discussed on p. 32). The finding is in accordance with the perception of the problem as a North-South divide (as suggested by e.g. Neven and Gouyette, 1995), however, the results of the performed ANOVA point towards the fact that these are in fact peripheral *regions*, not states.

In summary, regarding the results of the Second Hypothesis' testing, it can be said that although there have been regions for which the statistical relation expressed in terms of the two correlation coefficients and results of ANOVA was statistically significant (or confirmed on a significance level of 95%) these were only a relatively small proportion of the examined regions.

The finding that in 86% of the EU regions the Funds seem not to have an impact on the regional KBE is particularly striking. A possible explanation for this result may be that within the amount of the Structural Funds allocated to the regions, the volumes destined for specific KBE-enhancing Measures could have been insufficient. Possible confirmation of this hypothesis points towards the need of a future extensive study, focused on an in-depth analysis of the *National Reform Programmes, National Strategic Frameworks, Operational Programmes* and *Regional Operational Programmes* of all the EU Member States.

H3: "The performance of the Knowledge-Based Economy and the approach towards the
Structural Funds are substantially diverse in the two case-study regions".

This hypothesis consists of two elements expressing assumptions regarding the KBE and the Structural Funds, respectively. The various aspects of its verification were included throughout the quantitative analysis (performance in terms of the particular KBE indicators, the KBE General Index, the statistical relationship between the KBE and the Structural Funds), and the two case-study regions had a chapter dedicated especially to them – as they were the sole focus of the Qualitative Analysis (Chapter Four).

Based on the extensive analysis it was found that the hypothesis **proved partially false**. This results from the fact that although the two regions exhibit differences in their performance regarding the KBE GI and its particular indicators and are not perfectly matching in terms of the Pearson product-moment correlation, they share identical results of the ANOVA analysis. Furthermore, the findings of the qualitative analysis yield very similar results for both Silesia and the West Midlands.

The subsequent paragraphs present in detail the thesis' findings which served for analysing the above mentioned elements of the Third Hypothesis.

Regarding the performance of the Knowledge-Based Economy General Index for the West Midlands region and Silesia over time it was found that although the values of KBE GI for the two regions fluctuated over the years, Silesia kept an upward trend, whilst the West Midlands experienced a downfall (p. 138). Yet despite the decline of KBE GI values, and unlike Silesia, the West Midlands remained above the EU average for almost all of the examined time period. What is worth emphasis is that over the examined decade, the disparities in the KBE GI values between the regions have significantly decreased, with the regions obtaining a very

similar result in the final year of the time-frame. The conducted analysis has also shown that for the most of the examined time span both regions followed a rather similar patterns to the ones exhibited by average values of the KBE GI in their respective states (p.140).

The examination of the two regions' performance in terms of the particular KBE indicators seemed, again, to confirm the *catch-up effect* (p. 42 and 219), with Silesia always carrying lower values in the beginning of the examined time-frame but significantly increasing the values over the years.

When investigating the KBE – SF statistical relationship's analysis and focusing on the two case-study regions it can be seen that with regards to the Pearson product-moment correlation (p. 148) both Silesia and the West Midlands yielded negative *r* values in *t*, and *t+1*. However, the *r* value for Silesia in *t+1* was of a greater strength, and whereas in *t+2* the West Midlands' correlation coefficient remained negative, Silesia's *r* became a positive, albeit weak value.

With respect to the performed ANOVA, in which both Silesia and the West Midlands were included in the same group of regions (with 100 to 499 million Euro average annual allocations), the results of this analysis were alike, i.e. allowed for accepting the null hypothesis for both independent variables, stating that both of "SF allocation" and "regions" lacked impact on the changes of the regional KBE GI (p. 156).

With regards to the qualitative findings, it was observed that the representatives of the two regions also share similar evaluation of the motivations for applying for the EU funding, both in the "money-oriented" and "project-oriented" approaches (p.169, 184). It should also be noted that in both regions the "money-oriented" approach prevails among businesses, especially from the SME sector.

After examining the approach towards the Structural Funds in the two regions, it comes to light that in both of them similar types of flaws in the Funds' system are identified.

The key flaw seems to be the bureaucracy involved, although, as presented on pages 171-178 and 188-196 of the qualitative chapter, it can be observed that the two regions had problems with various aspects of it.

Table 15. Comparison of flaws in the Funding system perceived in the WM and Silesia.

Flaws' themes	in the WM	in Silesia
Bureaucracy:	Hermetic language	Excessive paperwork
	Excessive auditing	Inconsistent assessment and project evaluation
	Inflexible rules	Lack of anonymity
	Prolonged wait for approval	Prolonged wait for payments
	Risk averseness	
Business- specific:	Against generating revenue	Favouring refunds over pre-payments
	Problems of staff time in SMEs	Approval on "first-come, first-served" basis
Policy issues:	Funding opportunities scattered over too many programmes	Funding opportunities scattered over too many priorities
	Too small financial-wise	Too small financial-wise
	Lack of applicants' anonymity	

The West Midlands' beneficiaries seemed to find it particularly difficult to tackle the hermetic language, excessive auditing, inflexible rules, timing issues and risk-averseness of funding bodies (see p. 171-178). In Silesia the key issues were the excessive paperwork, frequent ambiguity of assessment and project evaluation, and financial and payment issues - especially related to delaying payments (see p. 188-196). Silesian interviewees also identified the lack of anonymity as one of the key bureaucratic issues (p.190); the same problem was identified in the West Midlands (p. 177).

The interviews in the two case-study regions point towards accentuating the importance the Regional Development Agency (in the UK) and the various Implementing Authorities (in Poland) had with regards to the perception of the Funds. What deserves emphasis is that in the case of Silesia, the majority of the bureaucracy-related problems were attributed to the actions of Polish Managing and/or Implementing Authorities, not to the higher-level, EU regulations (p. 189). This can be an indication of a certain level of confidence in the EU structures expressed by the Silesian interviewees (see e.g. p. 189) and general favourable perception of the broad idea of Funds. At the same time, some of the West Midlands' respondents were prone to identifying regulations relating to European funds as rather demanding and remote (p. 172), and were rather supportive of the actions of the now-abolished RDAs (p. 176-177).

A document which deserves recalling at this point is the study undertaken by the Committee of the Regions (2005), which investigated to what extent the need for a closer and more developed partnership between the different levels of government in order to successfully implement the Lisbon Agenda's objective[33] has materialised in the individual Member States. The study focused on the National Reform Programmes (NRP) which served as action-plans for reaching the Lisbon objectives. It has revealed that in the UK no systematic involvement of Local and Regional Authorities (RDAs and Devolved administrations) was foreseen in the implementation of the NPR; similarly in Poland the NPR did not mention the role or potential role of Local and Regional Authorities and institutions in its implementation (CoR, 2005:142,143,161-163).

Nonetheless, the importance of regional institutions' strength for effective implementation of the Cohesion Policy measures on a regional level has long been recognised in scholarly literature. One of the key studies was undertaken by Hughes et.al (2004), which proved

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[33] *"to become the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion"* (European Council, 2000,p.5)

that it was the difference in *administrative capacities* that accounted for proper management (or lack thereof) of the Funds in European regions (Hughes et al. 2004:532); this finding was also confirmed by more recent studies such as MIlio (2007). Looking at the former scholarly studies regarding e.g. the cases of Mezzogiorno and Ireland[34] it is difficult not to agree that the administrative capacities are indeed a decisive factor of how effectively the Funds are spent within the regions.

However, it should be emphasized that this study's core element i.e. the quantitative analysis took into account the volumes of *allocated* amounts of the Structural Funds, not the values *spent* within the regions. This distinction is of great importance, as the amounts spent in the regions may vary from the allocated amounts, and this in turn may lead to completely different results of the quantitative analysis, even if the same statistical methods were to be used. Focusing on the amounts spent, not allocated, would therefore require re-formulating the thesis' main research question and the results of the hypotheses' testing would potentially yield different results.

For those reasons, the flaws in the system of Structural Funds' implementation identified by the interviewees in the West Midlands and Silesia were used exclusively as a mean of comparing the two regions' approach towards the SF. Although the author acknowledges the role the regional institutions play in exploiting the Structural Funds and possibly enhancing the regional Knowledge-Based Economy, due to the already mentioned fact that this study was based on the allocated, not spent, SF amounts, it would be implausible to offer any definite statements on this matter. Nevertheless, examining the impact the regional institutions may have had on the Structural Funds' relationship with the development of the regional KBE is certainly an issue worth investigating in the possible future studies proposed by the author (see).

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[34] See p. 58

In conclusion, the testing of the Third Hypothesis showed differences between the two case-study regions in the aspects of their KBE GI and KBE indicators' performance. The regions have also exhibited certain dissimilarities with regards to the Pearson product-moment correlation coefficients. However, the carried out ANOVA presented the same results for the two regions and the qualitative analysis proved similarities in the approach towards the Structural Funds in the West Midlands and Silesia.

Limitations of the Data

The research has revealed a number of interesting and important findings regarding the Knowledge-Based Economy in European regions and its relationship with the Structural Funds, some of which may have broader significance, as discussed in greater depth the next section. However, the author recognises certain limitations to the project and the data it is based on.

Firstly, the study only took into account a part of the financial assistance offered for various projects by the EU, namely the Structural Funds. As mentioned later in the paragraphs addressing the potential for future research, including other groups of European funds into the analysis, such as Transnational funds (e.g. INTERREG, the Sixth and Seventh Framework Programme, Lifelong Learning Programme etc.) could yield results which would be even more robust.

Secondly, the analyses included in this research took into account the amounts of Structural Funds which were allocated to the regions, not spent within them. This relates back to the point made when discussing the test results of the Third Hypothesis (p. 231) and is also further addressed in the section exploring future challenges.

Furthermore, when examining the performance of the Knowledge-Based Economy across the regions, the research relied exclusively on the data obtained from the Eurostat database. For this reason, any methodological or factual flaws included in Eurostat's database impinged on the findings presented in this thesis. However, taking into account the generally acclaimed reliability of Eurostat as a data source, the chances of this occurring are minute.

The penultimate limitation relates to the qualitative stage of the analysis. The potential limitation here is related to the fact that the statements made by the interviewees in the two regions may have been considered as reflecting misperceptions or self-serving prejudices rather

than reflecting valid and truthful points. This potential limitation was addressed by referring to official documents (such as funding calls' announcements, their results, the Regional Operational Programme, etc.) in order to ascertain and support a number of observations and claims made by the interviewees.

Finally, because of the time-span the research focused on, any changes in both the use of the Structural Funds and the changes in regional KBE which surely have occurred due to the recent financial crisis, were not taken into account. Although it must be noted, expanding the time-frame of the study to include the effects of the economic crisis would certainly lead to very interesting findings.

Broader implications and future challenges

The research presented in this thesis makes a distinctive and original contribution to the field of regional studies in the aspect of examining both the Knowledge-Based Economy and Structural Funds, and their mutual relationship. It identified important gaps in existing scholarship in this area through the preceding review of existing literature and aimed to fill them. The particular aspects of this research will be of particular interest to anyone who wonders whether public expenditure, whether by the state or a supra-national organisation like the EU, can help foster a Knowledge-Based Economy. The findings of the thesis also allow broader reflections on the topics of the KBE, Structural Funds and economic development as a whole.

As noted in the introduction, despite of the existence of a significant number of studies regarding the KBE both in the scholarly environment and official publications of the EU and the OECD, there is no commonly agreed definition of the Knowledge-Based Economy and how it could be measured, with individual scholars (e.g. Castells, 1996; Cooke, 2002; Godin, 2006), as well as various organisations (e.g. OECD, 1996; European Council, 2000; Eurostat 2005; Technopolis, 2006) proposing their own measurements and indicators for evaluating the Knowledge-Based Economy (p. 26-30). The concept of the KBE remains in the state of constant flux, suffice to mention the fact that the classical Triple-Helix Model (see p. 29) has recently (2012) been 'updated' by Leydesdorff himself to take into account multiple-helix relationships. In this respect this research contributes to the ongoing debate how KBE can be understood and measured.

The analysis of KBE performance in European regions carried out as a part of this study shows that in the majority of the 'new EU' regions, the KBE is increasing (p. 218-221). This is mostly due to the increasing proportion of Human resources in Science and Technology (HRST) and the rising Employment in Knowledge Intensive Sectors. This has implications both for them

as well as for the 'old' regions. First of all, it is an important message for the 8 'new' regions for which the KBE has not increased in the past decade as it can be treated as a warning signal and an impulse for strategic change if those regions wish to become more knowledge-based in the future. Secondly, the 'old' regions in which the KBE has increased should by no means rest on their laurels; this would entail the risk of falling back behind the European *catch-up* regions in the long run, and what is more, taking into account the current development trends, also behind other parts of the world[35] (cf. the most recent research on the KBE in the Arab States of the Gulf, e.g. Hossain, 2013 or Osman & Nour, 2013).

Furthermore, the thesis has a broader significance for the future discussion of development of the KBE. After all, the notion of KBE's importance for EU's development did not end in the year 2010, and in fact this was the year when the new debate about shaping the future of the EU begun being shaped in the form of the Europe 2020 Strategy. This new ten-year agenda has put forward three mutually reinforcing priorities, one of which is the "smart growth" defined as developing an economy based on knowledge and innovation (European Commission, 2010:3). It should be also underlined that in the present debate surrounding the implementation of the Europe 2020 Strategy, the emphasis has somewhat shifted from the KBE to the notion of "sustainability". One can remain hopeful that the EU has learned from its past ineffectuality in tackling the KBE development, and also recognised the important contribution of studies such as this; to author's delight it was recognised that there is a need for a clear definition of objectives which are to be achieved, well-defined indicators and setting their precise target values. However, whether or not these will be reached remains to be seen.

Another implication of this study is that it contributes to the evidence base of significant disparities among European regions. This leads to the issue of the already recognised uneven patterns of development and their impact not only on the EU's overall economic development, but also the potential negative results it may lead to – including but not limited to

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[35] The author consciously avoided the term 'region' as throughout the thesis this has been used in a different, very specific context.

distorted migration flows and subsequent desolation of regions with lower KBE-levels. As a broader reflection it should be concluded that the EU shifting its focus from strictly developing the KBE for the sake of it to including the notion of sustainability in the new Strategy seems to be a reasonable path to avoid the just mentioned downsides of unbalanced economic development.

With regards to the original contribution of this thesis to research on Cohesion Policy, it should be once again reiterated that hitherto most of the literature on European Funds focuses on assessing the Funds' impact on the development of the whole economy, whether on a national or regional level - not on chosen topics "within" the economy (see p. 48). What is more, regardless of some studies focusing on comparing particular regions (e.g. Huggins & Strakova, 2012), what has mostly been taken into consideration in the subject literature was the general macroeconomic performance of given regions (e.g. Farole *et al.*, 2011). Bearing all of this in mind, the uniqueness of the study lies firstly in examining the relation of Structural Funds to a specific issue: the development of the regional Knowledge-Based Economy; secondly, in applying an original methodology which allows quantitative assessment of the KBE for all regions of the European Union. In addition, the study not only includes an extensive overview of the KBE-Structural Funds relation across all of the EU regions, but provides new empirical evidence shedding light on this particular relationship in two regions which had not been thoroughly covered by previous studies: Silesia (Poland) and the West Midlands (UK) over a time scale of a decade: 1999 to 2009.

Moreover, the qualitative analysis can be read as a guide for future SF applicants, because it pin-points the flaws and problems other applicants encounter most often. It can make clear what an applicant organisation can expect and possibly allow it to prepare to counteract the flaws already at the application stage.

The final implication is aimed at Polish policy-makers involved in all of the stages of bureaucratic process necessary for the Funds' implementation. As the research demonstrated, the perception prevails that most of the obstacles faced by the applicants are due solely to what is seen as the poor performance of Polish bureaucrats, which obviously is not always the case. Therefore, the research concludes with a recommendation that the image of the national and regional agencies directly involved with the distribution and management of European Funds in Poland be improved.

What also deserves an extended comment is the fact that at first glance the results of the interviews and the statistical modelling seem to point in in different directions about the impact of Structural Funds. It needs to be reiterated, that while testing of the First Hypothesis proved that there was an increase in the KBE in majority of European regions, the mathematical analysis pointed out that in strictly statistical terms it is impossible to say unequivocally that this increase was dependant on the volume of Structural Funds allocated to the regions. Due to its nature, statistical analysis always includes so-called disturbances of an observed value: deviations of the observed value from the (unobservable) *true* function value. The author took into account this inherent error factor and in order for the thesis to deliver a thorough picture of the issue, a research method not dependent on the use of statistics was included. Furthermore, relying only on the results of statistical analysis would make one highly sceptical about the impact of Structural Funds on the KBE, especially given the fact that these were based on the amounts of SF allocated, not spent. For those reasons the qualitative analysis was included in this research; it also allowed investigating the SF-KBE relationship from the point of view of beneficiaries and practitioners who deal with the SF's spending. The findings of the qualitative analysis suggest that the Funds spent are perceived to have a positive effect on the KBE. Therefore the key problem lies with the way the Funds are allocated, not spent. If the desired economic outcomes are to be reached, greater attention should be paid to assigning the funds to relevant actions within the allocated budget.

The methodological implications of including the two methods in the analysis confirm that triangulation is crucial for arriving at comprehensive conclusions in complex studies. Had the author only stopped at the statistical analysis or conducted only the qualitative research, the results and potential implications of those could have been much different, and much worse- incomplete and erroneous.

Based on the aforementioned limitations of the data and the broader implications of the research, there are three key challenges for possible future research in the areas addressed by the thesis.

Firstly, it was hypothesised that the striking finding of over 86% of EU regions showing no impact of the SF on the KBE (p. 223) could be attributed to the possibility that the amounts destined for specific KBE-enhancing Measures in the regions could have been insufficient. This assumption points towards the need for an extensive future study consisting of an in depth-analysis of the *National Reform Programmes*, *National Strategic Frameworks*, *Operational Programmes* and *Regional Operational Programmes* of all the EU Member States.

The second possible future challenge relates to the fact that this study focused on the amount of Structural Funds allocated, not spent within the regions. Therefore as a part of a potential future study it could be worthwhile to return to the statistical analysis of the KBE-SF relationship and while maintaining the KBE General Index as the first variable, instead of the volume of allocated SF, apply as the second variable the amounts spent in the regions.

Finally, an additional interesting observation came to light. Among the interviewees from the West Midlands region there has been more focus on European Transnational Funds, i.e. Marie Curie schemes and Competitiveness and Innovation Programme compared to their Silesian counterparts. Polish interviewees seemed to have significantly less awareness of such funds; in parts of the interviews put off the record (or as unexpected final remarks after the

recorder had been switched off) many experts from Poland expressed interest in pursuing the opportunities offered by Transnational Funds in the near future.

Undoubtedly, the funds classified as Transnational, together with the Structural Funds form what can be broadly defined as 'European Funds'. A number of them also have a strong KBE-related focus, with the prime examples being the Lifelong Learning Programme and the Seventh Framework Programme, which aim to enhance the skills of Europeans and research potential of the EU as a whole. The inclusion of certain Transnational Funds into the study would surely alter the general volume of funds taken into account in this research and this could potentially provide findings contrary to the results yielded by the present quantitative analysis.

This potential aspect could warrant further study and could also be of research value to incorporate the Transnational Funds into an extended quantitative research in a future research project.

Concluding Remarks

The research presented in this thesis investigated the nature of the relationship between the development of the Knowledge-Based Economy and Structural Funds in European regions, with a particular focus on the West Midlands (UK) and Silesia (Poland). The two research sub-questions were: first, what is the relationship between the amounts of allocated European Funds and the changes in the Knowledge Based Economy calculated as a composite index of its indicators? Second, what is the difference in the KBE development and the approach towards the Funds in regions from different Member States?

This concluding chapter reviewed the findings of both quantitative and qualitative parts of the research and, returning to the research questions, summarised the findings of the whole thesis. In essence, the two main results were as follows: first, the impact of Structural Funds on the regional KBE with 95% significance level occurs only in a minority of the European regions and any form of functional dependency between the two can be observed only in 30% of the regions. Second, the pattern of development of the regional KBE in the West Midlands may be a valuable lesson for future KBE development in Silesia. What is more, an important product of the research is the creation of an original methodology which to the author's best knowledge, for the first time allowed assessing the Knowledge-Based Economy on regional level across the entire EU.

Subsequently, the chapter considered the broader implications of the research. It concluded by addressing the future challenges for further research in this field.

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Appendices

Appendix 1: Examples of indicators used for evaluating the Knowledge-Based Economy

OECD *Indicators for the knowledge-based economy:*	World Bank: *Knowledge Economy Index (KEI)*
1. Knowledge-based economy a. Investments in capital and knowledge b. Human resources (education) c. GERD d. Fundamental research e. Business R&D f. R&D in manufacturing industries g. R&D in services h. Innovation i. Venture capital	1.The Economic Incentive and Institutional Regime: a. Tariff & Non-tariff Barriers b. Regulatory Quality c. Rule of Law
2. Information and communication technologies (ICT) a. ICT spending as a percentage of GNP b. Use of computers c. Internet and e-commerce d. ICT sector e. Innovation in ICT	2.Education and Human Resources a. Adult Literacy Rate b. Secondary Enrolment c. Tertiary Enrolment 3. The Innovation System ** a. Researchers in R&D b. Patent Applications Granted c. Scientific and Technical Journal Articles
3. S&T policies a. Public R&D/GNP b. Socio-economic objectives of R&D c. Share of public R&D d. R&D financial flows between sectors e. Public support to R&D f. Business R&D by size g. Tax subsidies	4. Information and Communication Technology (ICT) a. Telephones per 1,000 people b. Computers per 1,000 people c. Internet Users per 10,000 people **These three variables are available as scaled by population and in absolute values.
4. Globalization a. R&D abroad b. Patent ownership c. Technological alliances d. Co-signatures and co-inventions	
5. Output and impact a. Scientific publications b. Patents c. Innovation d. Productivity e. Share of knowledge industries in added value f. High technology trade g. Technological balance of payments	

European Commission:	PRO – INNO EUROPE
European Innovation Scoreboard:	*European Regional Innovation Scoreboard*

European Commission:
European Innovation Scoreboard:

I. Innovation Inputs

a. Innovation drivers
• New graduates per 1000 population aged 20-29
• Population with tertiary education per 100 population aged 25-64
• Broadband penetration rate
• Participation in life-long learning per 100 population aged 25-64
• Youth education attainment level

b. Knowledge creation
• Public R&D expenditures
• Business R&D expenditures
• Share of medium-high-tech and high-tech R&D
• Share of enterprises receiving public funding for innovation
• Share of university R&D expenditures financed by business sector

c. Innovation & entrepreneurship
• SMEs innovating in-house
• Innovative SMEs co-operating with others
• Innovation expenditures
• Early-stage venture capital
• ICT expenditures
• SMEs using non-technological change

II. Innovation Outputs:

a. Application
• Employment in high-tech services
• Exports of high technology products as a share of total exports
• Sales of new-to-market products
• Employment in medium-high and high-tech Manufacturing

b. Intellectual property
• New EPO patents per million population
• New USPTO patents per million population
• New Triad patents per million population
• New community trademarks per million population
• New community industrial designs per million Population

PRO – INNO EUROPE
European Regional Innovation Scoreboard

ENABLERS
• Human resources
1.1.1 S&E and SSH graduates
1.1.2 S&E and SSH doctorate graduates
1.1.3 Tertiary education
1.1.4 Life-long learning
1.1.5 Youth education
• Finance and support
1.2.1 Public R&D expenditures)
1.2.2 Venture capital
1.2.3 Private credit
1.2.4 Broadband access by firms

FIRM ACTIVITIES
• Firm investments
2.1.1 Business R&D expenditures
2.1.2 IT expenditures
2.1.3 Non-R&D innovation expenditures
• Linkages & entrepreneurship
2.2.1 SMEs innovating in-house
2.2.2 Innovative SMEs collaborating with others
2.2.3 Firm renewal (SMEs entries + exits)
2.2.4 Public-private co-publications
• Throughputs
2.3.1 EPO patents
2.3.2 Community trademarks
2.3.3 Community designs

OUTPUTS
• Innovators
3.1.1 Product and/or process innovators
3.1.2 Marketing and/or organisational innovators
3.1.3 Resource efficiency innovators
3.1.3a Reduced labour costs
3.1.3b Reduced use of materials and energy
• Economic effects
3.2.1 Employment in medium-high & high-tech manufacturing
3.2.2 Employment in knowledge-intensive services
3.2.3 Medium and high-tech exports
3.2.4 Knowledge-intensive services exports
3.2.5 New-to-market sales
3.2.6 New-to-firm sales
3.2.7 Technology Balance of Payments flows

Synthesis Report to: The EC & DG Regio	Universität Trier (project funded under FP 6)
	Knowledge Economy Indicators
1. Higher education (% of population completed higher education degree)	A1 Production and diffusion of information and communication technology (ICT)
	A1a Economic impact of ICT sector
2. Knowledge workers (% of population that has a S&T education & is occupied in the research sector)	A1b Internet use by firms
	A1c Internet use by individuals
	A1d Government information and communication technology (ICT)
3. High-tech services (% of employment, (Knowledge intensive high-technology services)	
	A2 Human resources, skills and creativity
4. Public R&D (Expenditures as % of GDP)	A2a General education
	A2b Human resource in science and technology (HRST) - education
5. % Value-added services (% share of services in total gross value added at basic prices at NUTS level 2)	A2c Skills
	A2d Creativity
	A2e Mobility
6. % Value-added industry (% share of manufacturing industry in total gross value added at basic prices at NUTS level 2 in Millions of Euro)	A3 Knowledge production and diffusion
	A3a Research and experimental development family
7. Government (Employment in public administration as % in total employment)	A3b Bibliometrics
	A3c Knowledge flows
	A3d Total investment in intangibles
8. Population density, per square Km	
9. High-tech manufacturing (High-tech and medium/high-tech manufacturing employment, % of total employment)	A4 Innovation, entrepreneurship and creative destruction
	A4a Entrepreneurship
	A4b Demand for innovative products
10. % Value-added agriculture (% share of agriculture in total gross value added at basic prices at NUTS level 2 in millions of euro)	A4c Financing of innovation
	A4d Market innovation outputs
	A4e Organizational indicators
11. Business R&D (Business R&D expenditures as % of GDP)	B1 Economic outputs
	B1a Income
12. S&T workers (% of population that has an occupation in S&T)	B1b Productivity
	B1c Employment
13. Youth (% share of population under 10 years of age)	B2 Social performance
	B2a Environmental
14. Life-long learning (% of adults having recently enjoyed training or courses)	B2b Employment and economic welfare
	B2c Quality of life indicators
15. Activity rate females (% of total)	C1 Internationalisation
	C1a Trade
	C1b Knowledge production and diffusion
	C1c Economic structure
	C1d Human resources

Knowledge Based Economy Development Index (KDI)
 	
 1. Computer Infrastructure
  a) Share of worldwide computers in use
  b) Computers per 1,000 population
  c) Share of total worldwide millions of instructions per second (MIPS)
  d) Computer power per capita
  e) Connections to the Internet
 	
 2. Info-structure
  a) Investment in telecommunication
  b) Main telephones in use per 1,000 population
  c) Cellular mobile telephone subscribers per 1,000 population
  d) Television sets per 1,000 population
  e) Radios per 1,000 population
  f) Fax machines per 1,000 population
  g) International call cost
  h) Newspaper circulation
 	
 3. Education and Training
  a) Total expenditure on education per capita
  b) Literacy rate
  c) Student-teacher ratio (primary)
  d) Student teacher ratio (secondary)
  e) Secondary enrolment
  f) Higher education enrolment
 	
 4. Research and Development (R&D) and Technology
  a) High-technology exports as a proportion of manufacturing exports
  b) Number of scientists and engineers in R&D
  c) Total expenditure on R and D personnel nationwide per capita
  d) Total expenditure on R and D as a percentage of GDP
  e) Average annual number of patents granted to residents
  f) Business expenditure on R and D per capita	

Appendix 2. : Calculation of the weights of the KBE indicators used for the KBE General Index

List of indicators (organisation)	n°1 (OECD)	n°2 (WB)	n°3 (EIS)	n°4 (ERIS)	n°5 (EC& DGR)	n°6 (Uni.Trier)	n°7 (KDI)	Amount of organisations taking a given indicator into account	Σ α	t_i	weight (w_i)
α = 1/m	0.030	0.083	0.040	0.032	0.067	0.036	0.038		0.327		
Indicator 1: HRST	x		x	x	x	x	x	6	0.243	0.745	4.68
Indicator 2: TKIS			x	x	x	x	x	5	0.213	0.652	4.10
Indicator 3: EDU	x	x	x	x		x	x	6	0.260	0.796	5.00
Indicator 4: GERD	x		x	x	x		x	5	0.208	0.636	3.99
Indicator 5: EPO	x	x	x	x				4	0.186	0.569	3.57

WB – World Bank, EIS – European Innovation Scoreboard, ERIS – European Regional Innovation Scoreboard, EC&DGR – European Commission and the DG Regio, Uni.Trier – Universität Trier, KDI – Knowledge Development Index; HRST Human Resources in Science and Technology, TKIS - Employment in Technology and Knowledge-Intensive Sectors, EDU - Pupils and Students in the Whole of Education, GERD - Total Intramural R&D Expenditure, EPO - Patent applications to the EPO: hi-tech, ICT and biotechnology.

Appendix 3: The regional Knowledge-Based Economy General Index in real [R] and normalised [N] values (1999-2009).

Note: the regions are presented alphabetically.

	1999		2000		2001		2002		2003		2004		2005		2006		2007		2008		2009		average	
regions	R	N	R	N	R	N	R	N	R	N	R	N	R	N	R	N	R	N	R	N	R	N	R	N
Abruzzo	0.67	81.38	0.71	85.46	0.74	84.04	0.77	88.77	0.74	81.85	0.78	82.88	0.77	82.11	0.77	84.59	0.74	77.20	0.79	85.59	0.74	79.17	0.75	83.00
Åland	0.33	40.12	0.53	64.36	0.32	36.30	0.23	26.73	0.52	57.06	0.99	105.09	0.51	54.20	0.52	56.95	0.51	53.42	1.07	115.44	0.52	55.60	0.55	60.48
Alentejo	0.15	18.57	0.35	42.19	0.36	40.88	0.27	30.72	0.34	37.50	0.39	41.79	0.39	41.55	0.40	43.63	0.43	44.75	0.62	67.34	0.53	57.43	0.38	42.39
Algarve	0.16	19.11	0.13	15.73	0.12	13.11	0.13	14.80	0.34	38.01	0.37	39.58	0.38	40.51	0.43	46.82	0.43	45.50	0.39	42.46	0.53	57.05	0.31	33.88
Alsace	1.14	137.65	1.11	134.92	1.04	118.15	1.07	123.49	1.19	131.25	1.06	112.38	1.07	115.08	1.11	121.46	1.08	113.02	0.98	105.42	0.97	104.73	1.08	119.78
Anatoliki Makedonia, Thraki	0.20	23.95	0.11	13.93	0.23	25.50	0.13	14.60	0.18	20.07	0.48	51.11	0.39	41.82	0.19	20.95	0.48	50.21	0.40	42.93	0.21	22.19	0.27	29.75
Andalucía	0.63	75.50	0.63	76.49	0.61	69.27	0.62	71.76	0.66	72.72	0.65	69.27	0.69	73.92	0.70	77.10	0.71	73.90	0.69	73.92	0.68	73.47	0.66	73.39
Antwerpen	1.42	171.84	1.39	167.96	1.46	165.48	1.72	197.27	1.44	159.44	1.53	162.58	1.55	165.67	1.52	166.24	1.52	159.29	1.56	167.85	1.58	170.00	1.52	168.51
Aquitaine	0.95	114.69	0.93	112.93	0.93	105.51	0.92	105.91	0.86	95.56	0.87	92.80	0.94	100.53	0.96	104.73	0.93	97.59	0.88	94.93	0.86	92.94	0.91	101.65
Aragón	0.65	78.02	0.67	80.84	0.67	76.15	0.67	77.32	0.70	77.34	0.73	77.19	0.75	80.20	0.83	90.59	0.75	78.38	0.76	82.22	0.79	85.32	0.72	80.32
Arnsberg	0.95	114.52	0.97	117.98	0.96	109.08	0.96	110.46	1.00	110.07	0.94	99.93	0.91	97.40	0.94	102.59	0.94	98.13	0.99	107.01	0.94	101.66	0.95	106.26
Attiki	0.51	61.08	0.37	45.33	0.48	54.46	0.41	46.85	0.54	59.39	0.74	78.20	0.72	77.21	0.56	61.01	0.74	77.95	0.62	67.28	0.44	47.92	0.56	61.52
Auvergne	1.03	123.91	1.01	122.83	0.97	109.92	0.98	113.14	1.03	113.88	1.00	106.83	1.01	108.10	1.06	116.65	1.16	122.07	1.09	117.57	1.16	124.55	1.05	116.31
Basilicata	0.51	61.10	0.58	70.31	0.54	61.34	0.56	64.31	0.58	63.93	0.58	61.84	0.60	64.37	0.62	67.69	0.63	65.62	0.60	65.06	0.62	66.44	0.58	64.73
Basse-Normandie	0.81	97.87	0.82	99.95	0.83	94.24	0.83	94.84	0.93	102.49	0.89	94.60	0.82	87.78	0.84	91.96	0.87	91.25	0.89	96.25	0.85	91.19	0.85	94.77
Berlin	1.75	211.39	1.91	231.64	1.84	208.43	1.91	219.38	1.90	209.68	1.82	193.55	1.88	201.45	1.89	207.64	1.91	199.63	1.75	188.23	1.81	194.60	1.85	205.97
Border, Midland and	0.95	115.10	0.93	112.78	0.90	102.48	0.91	104.11	0.93	102.81	0.99	105.54	1.02	109.03	1.02	111.34	1.02	107.41	1.02	109.55	0.97	104.41	0.97	107.69

Western																								
Bourgogne	0.85	102.21	0.89	108.17	0.84	95.52	0.77	88.87	0.88	97.27	0.83	88.16	0.73	78.73	0.70	77.10	0.83	87.21	0.77	82.80	0.84	90.12	0.81	90.56
Brabant Wallon	3.64	439.41	2.45	296.69	1.87	212.24	1.86	213.53	1.60	176.64	1.87	198.90	2.16	231.21	1.93	211.23	2.02	212.02	1.92	206.98	2.32	250.30	2.15	240.83
Brandenburg - Nordost	0.45	53.93	0.38	45.89	0.50	56.60	0.46	52.89	0.41	45.32	0.87	91.98	0.68	73.19	1.02	111.48	0.65	68.11	0.58	62.93	0.68	73.63	0.61	66.90
Brandenburg - Südwest	0.63	76.44	0.49	59.73	0.66	74.68	0.65	74.20	0.66	72.85	1.11	118.15	1.08	115.44	0.93	102.46	1.08	113.43	1.05	113.65	1.10	118.31	0.86	94.49
Bratislavský kraj	1.18	142.53	1.11	134.40	1.16	130.93	1.28	147.37	1.13	125.00	1.10	117.48	1.08	115.92	1.09	119.32	1.10	114.83	1.12	120.69	1.09	117.62	1.13	126.01
Braunschweig	2.00	241.34	1.85	224.17	1.92	218.03	1.94	223.10	2.39	264.64	1.97	209.78	1.75	187.22	1.71	187.43	1.86	194.58	1.92	207.45	1.84	198.16	1.92	214.17
Bremen	1.09	131.00	1.11	134.93	1.15	130.53	1.10	126.55	1.31	145.20	1.22	130.17	0.96	102.36	1.00	110.18	0.94	98.43	1.02	110.41	0.99	106.90	1.08	120.61
Bretagne	1.19	144.18	1.37	166.34	1.47	166.14	1.46	168.09	1.66	184.05	1.51	160.57	1.55	166.24	1.49	163.87	1.60	167.99	1.49	160.49	1.59	171.47	1.49	165.40
Brussels	1.43	172.96	1.38	166.98	1.42	160.75	1.31	150.18	1.28	141.26	1.38	146.84	1.32	140.99	1.32	145.20	1.39	145.42	1.40	150.37	1.36	146.72	1.36	151.61
Bucureşti - Ilfov	0.89	107.06	0.87	105.22	0.89	101.03	0.92	105.65	0.96	106.70	1.00	105.83	0.98	104.47	1.02	111.56	1.04	108.57	1.11	119.75	1.05	112.75	0.97	108.05
Burgenland	0.49	58.96	0.46	55.93	0.64	73.00	0.71	81.69	0.68	75.11	0.76	80.89	0.47	50.81	0.66	72.04	0.63	65.74	0.57	61.42	0.49	53.03	0.60	66.24
Calabria	0.55	65.85	0.57	69.59	0.60	67.45	0.60	68.58	0.57	63.46	0.63	66.64	0.59	63.20	0.58	63.48	0.60	63.28	0.59	63.50	0.60	64.43	0.59	65.40
Campania	0.71	86.00	0.71	85.86	0.76	85.86	0.77	88.71	0.74	81.33	0.78	83.21	0.77	82.59	0.79	86.26	0.78	81.68	0.78	83.58	0.76	82.11	0.76	84.29
Canarias	0.56	68.17	0.58	70.61	0.57	64.26	0.58	67.18	0.57	63.20	0.59	62.70	0.63	67.86	0.62	67.99	0.60	63.35	0.56	60.75	0.56	59.83	0.59	65.08
Cantabria	0.58	70.08	0.50	60.99	0.58	66.26	0.59	67.64	0.59	65.12	0.59	63.13	0.59	63.54	0.67	73.95	0.67	70.23	0.63	68.43	0.68	73.25	0.61	67.51
Castilla y León	0.66	79.60	0.64	77.86	0.66	74.92	0.67	77.26	0.67	74.20	0.67	71.14	0.68	72.55	0.68	75.08	0.73	75.99	0.75	81.09	0.75	80.25	0.69	76.36
Castilla-La Mancha	0.50	59.88	0.55	66.64	0.52	58.92	0.52	59.18	0.52	56.99	0.50	52.76	0.54	57.69	0.55	60.38	0.61	63.44	0.59	63.64	0.58	62.92	0.54	60.22
Cataluña	0.82	99.07	0.84	102.08	0.83	93.62	0.85	97.64	0.87	96.24	0.86	91.97	0.90	95.89	0.93	102.26	0.88	92.26	0.88	95.17	0.88	94.45	0.87	96.42
Centre	1.01	121.46	0.95	115.34	0.93	105.47	0.94	107.63	1.03	113.41	0.94	99.49	1.00	107.52	0.98	107.89	0.92	96.73	0.94	101.41	0.90	96.63	0.96	106.63
Centro	0.23	27.53	0.22	27.01	0.23	25.79	0.23	26.36	0.44	48.43	0.44	47.11	0.47	50.01	0.49	54.27	0.53	56.01	0.56	60.39	0.58	62.92	0.40	44.17
Centru	0.49	58.66	0.44	53.89	0.44	50.25	0.45	51.70	0.42	45.91	0.46	48.38	0.44	47.49	0.46	50.91	0.45	47.24	0.46	49.40	0.48	52.04	0.45	50.53
Champagne-	0.64	77.05	0.66	79.42	0.64	72.78	0.63	71.98	0.76	84.55	0.73	77.11	0.66	70.80	0.64	70.08	0.63	66.45	0.61	66.17	0.61	65.78	0.66	72.92

Ardenne																								
Chemnitz	0.44	53.51	0.87	105.50	0.83	93.93	0.84	96.93	0.82	90.34	0.85	90.33	0.87	92.94	0.88	96.66	0.90	94.42	0.63	68.26	0.88	94.72	0.80	88.87
Ciudad Autónoma de Ceuta	0.20	24.51	0.17	21.03	0.23	26.11	0.19	21.85	0.50	55.21	0.44	47.04	0.46	49.00	0.49	53.97	0.51	52.95	0.44	46.90	0.52	56.44	0.38	41.36
Ciudad Autónoma de Melilla	0.24	29.50	0.26	30.93	0.24	27.48	0.23	26.69	0.50	55.65	0.48	50.81	0.54	57.33	0.55	60.52	0.53	55.13	0.53	57.36	0.49	53.11	0.42	45.86
Comunidad de Madrid	1.18	142.73	1.17	142.02	1.26	143.23	1.23	140.92	1.10	121.59	1.19	126.61	1.23	132.24	1.23	135.09	1.25	130.70	1.23	132.22	1.29	138.93	1.21	135.11
Comunidad Foral de Navarra	0.70	84.35	0.71	86.29	0.78	88.63	0.77	88.55	0.79	87.29	0.91	97.15	0.93	99.97	0.92	100.69	0.88	92.58	0.88	95.36	0.94	100.73	0.84	92.87
Comunidad Valenciana	0.63	76.35	0.65	79.04	0.64	73.01	0.62	71.50	0.63	70.23	0.67	70.93	0.71	76.01	0.73	80.02	0.68	71.02	0.67	72.37	0.68	72.72	0.67	73.93
Corse	0.44	53.26	0.45	54.08	0.50	56.78	0.41	47.53	0.47	52.07	0.47	49.70	0.43	45.86	0.54	59.52	0.46	48.68	0.43	46.37	0.39	41.67	0.45	50.50
Cyprus	0.59	71.62	0.61	73.62	0.66	75.20	0.65	74.77	0.71	78.55	0.65	69.14	0.64	68.49	0.66	72.05	0.73	76.40	0.65	70.01	0.66	71.27	0.66	72.83
Darmstadt	1.73	208.73	1.87	226.21	1.78	202.18	1.74	200.09	1.77	195.33	1.85	197.23	1.71	182.89	1.71	187.51	1.81	190.16	1.81	194.57	1.72	185.40	1.77	197.30
Dél-Alföld	0.38	45.92	0.39	47.47	0.58	66.20	0.62	71.32	0.62	68.67	0.65	69.03	0.70	75.00	0.68	74.24	0.66	69.57	0.68	73.45	0.67	72.19	0.60	66.64
Dél-Dunántúl	0.39	46.93	0.48	58.51	0.68	77.48	0.71	81.86	0.70	77.20	0.67	71.68	0.73	77.80	0.74	80.91	0.77	80.68	0.74	79.75	0.78	83.62	0.67	74.22
Detmold	1.10	133.04	1.20	145.90	1.16	131.77	1.03	118.75	1.10	122.21	1.02	108.79	1.03	110.40	1.04	114.58	1.06	111.26	1.27	136.68	1.08	116.28	1.10	122.70
Dolnośląskie	0.26	31.37	0.25	29.94	0.52	59.22	0.49	56.83	0.49	53.67	0.59	63.07	0.65	69.54	0.67	73.21	0.75	79.10	0.50	54.13	0.72	77.05	0.54	58.83
Drenthe	0.59	71.34	0.76	91.83	0.75	85.43	0.72	82.52	0.78	86.72	0.72	76.15	0.88	93.92	0.86	93.83	0.75	78.14	0.78	83.77	0.94	101.15	0.77	85.89
Dresden	0.90	108.17	1.59	192.55	1.60	181.45	1.50	172.12	1.39	153.98	1.49	158.40	1.55	166.23	1.61	176.73	1.60	167.77	1.50	161.98	1.62	174.06	1.49	164.86
Düsseldorf	1.15	139.08	1.14	138.11	1.12	126.90	1.20	137.87	1.13	125.44	1.17	124.01	1.15	123.68	1.13	123.57	1.18	124.16	1.23	132.29	1.18	127.39	1.16	129.32
Dytiki Ellada	0.30	36.62	0.19	23.19	0.30	33.72	0.20	22.85	0.33	36.47	0.57	60.15	0.58	62.55	0.33	36.29	0.54	56.86	0.43	46.65	0.20	21.27	0.36	39.69
Dytiki Makedonia	0.15	17.76	0.12	14.72	0.17	18.90	0.14	15.89	0.16	17.54	0.38	40.93	0.43	46.25	0.19	20.52	0.39	41.06	0.39	42.30	0.14	15.48	0.24	26.49
East Midlands	1.12	134.67	1.08	130.92	1.04	117.79	1.05	120.63	1.01	111.88	0.98	104.69	1.01	107.69	0.90	98.69	0.86	89.65	0.97	104.39	0.79	85.12	0.98	109.65
East of England	2.00	241.55	1.83	221.44	1.88	212.83	1.74	199.76	1.68	185.79	1.57	167.41	1.76	188.23	1.59	174.55	1.50	157.01	1.20	128.90	0.99	106.35	1.61	180.35

Region																									
Eesti	0.85	102.56	0.84	101.43	0.86	97.95	0.81	93.49	0.85	94.43	0.87	92.51	0.88	94.59	0.89	97.88	0.90	94.73	0.87	93.31	0.63	68.13	0.84	93.73
Emilia-Romagna	0.72	86.62	0.76	92.56	0.76	86.22	0.80	91.52	0.80	88.07	0.78	83.21	0.81	86.31	0.82	89.93	0.89	93.19	0.83	88.93	0.84	90.62	0.80	88.83
Észak-Alföld	0.41	50.01	0.42	51.32	0.70	79.60	0.69	79.68	0.71	78.51	0.72	76.56	0.75	80.85	0.73	79.93	0.72	75.50	0.73	78.40	0.70	75.78	0.66	73.29
Észak-Magyarország	0.38	45.50	0.41	49.31	0.67	76.25	0.67	77.36	0.63	69.81	0.73	77.27	0.69	74.09	0.67	73.86	0.68	71.58	0.68	73.13	0.69	74.32	0.63	69.32
Etelä-Suomi	2.38	286.94	2.23	270.37	2.24	254.43	2.26	260.25	2.59	286.94	2.62	278.11	2.58	276.20	2.42	265.33	2.16	225.86	2.74	295.57	2.72	293.05	2.45	272.10
Extremadura	0.52	62.80	0.53	63.71	0.53	60.14	0.54	62.02	0.56	61.62	0.54	57.70	0.60	64.43	0.60	66.16	0.62	64.62	0.63	67.59	0.61	65.28	0.57	63.28
Flevoland	1.24	149.38	1.49	181.10	1.18	133.48	1.22	139.70	1.14	125.91	1.14	121.05	1.10	117.40	1.04	113.90	1.09	114.12	1.14	123.35	1.11	119.83	1.17	130.84
Franche-Comté	1.12	135.54	1.07	129.79	1.09	123.45	1.10	126.63	1.11	123.21	1.02	108.01	1.00	106.63	0.98	107.63	1.03	107.42	0.93	100.61	1.02	109.76	1.04	116.24
Freiburg	1.67	201.39	1.57	190.71	1.58	178.91	1.69	194.73	1.75	193.77	1.68	178.92	1.80	193.21	1.64	179.39	1.97	206.52	1.84	197.81	1.88	202.98	1.73	192.58
Friesland	0.80	96.03	0.72	86.78	0.75	84.78	0.75	86.60	0.80	88.37	0.79	84.36	0.80	85.86	0.71	77.98	0.79	82.38	0.74	79.81	0.80	86.24	0.77	85.38
Friuli-Venezia Giulia	0.73	87.94	0.76	91.66	0.83	93.69	0.80	92.40	0.76	84.17	0.84	89.75	0.85	90.80	0.86	93.86	0.84	88.45	0.84	90.79	0.84	90.31	0.81	90.35
Galicia	0.55	66.86	0.55	66.89	0.56	63.97	0.59	67.67	0.63	70.09	0.63	66.74	0.65	69.85	0.66	72.41	0.68	71.68	0.64	68.99	0.68	73.06	0.62	68.93
Gelderland	1.29	155.31	1.17	141.68	1.23	139.30	0.91	104.37	1.17	129.09	1.31	139.52	1.32	141.04	1.24	136.51	1.19	124.95	1.31	141.19	1.29	138.61	1.22	135.60
Gießen	1.49	180.04	1.45	175.63	1.39	157.87	1.29	148.30	1.38	152.43	1.33	141.26	1.30	139.03	1.03	113.42	1.23	128.79	1.36	146.12	1.28	138.14	1.32	147.37
Groningen	1.18	142.42	1.25	151.86	1.17	132.81	1.24	142.29	1.23	135.74	1.30	137.94	1.29	138.32	1.23	135.32	1.39	145.32	1.24	133.99	1.26	136.02	1.25	139.28
Guadeloupe	0.46	55.45	0.53	64.72	0.52	59.20	0.51	59.07	0.53	58.52	0.45	47.63	0.50	53.35	0.51	55.38	0.50	52.20	0.48	51.93	0.48	52.07	0.50	55.41
Guyane	0.47	57.02	0.56	67.99	0.54	61.40	0.55	62.75	0.54	59.64	0.48	50.88	0.54	57.75	0.54	59.10	0.54	57.09	0.53	56.74	0.53	57.34	0.53	58.88
Hainaut	1.03	123.74	1.04	125.97	1.06	119.86	1.02	117.01	1.02	112.71	1.04	110.23	0.99	105.63	1.04	113.91	1.07	111.74	0.98	105.65	0.98	105.99	1.02	113.86
Hamburg	1.24	150.22	1.29	156.74	1.28	145.18	1.41	161.68	1.37	151.24	1.41	149.41	1.44	154.51	1.40	154.06	1.30	135.81	1.47	158.06	1.46	157.71	1.37	152.24
Hannover	1.66	199.82	1.54	187.23	1.50	170.55	1.56	178.92	1.69	187.14	1.71	182.17	1.53	164.14	1.32	145.17	1.44	150.69	1.78	191.36	1.59	171.71	1.58	175.35
Haute-Normandie	0.92	110.65	0.91	110.61	0.86	97.71	0.88	101.36	0.93	102.77	0.91	96.68	0.83	88.43	0.90	98.84	0.91	95.13	0.76	81.46	0.84	90.71	0.88	97.67
Hovedstaden	0.69	83.15	0.69	83.41	0.69	78.11	0.72	83.30	0.72	79.81	0.71	75.58	0.00	0.00	0.00	0.00	2.43	254.82	0.97	105.03	0.96	103.90	0.78	86.10
Île de France	2.20	265.68	2.10	254.01	2.11	239.60	2.10	240.88	2.13	235.92	2.07	219.88	2.07	221.94	2.04	223.19	1.98	207.31	2.10	226.25	1.94	208.87	2.08	231.23
Illes Balears	0.53	63.49	0.50	60.99	0.49	56.05	0.49	55.87	0.46	50.81	0.48	51.43	0.49	52.45	0.51	55.69	0.55	57.27	0.52	55.69	0.49	53.05	0.50	55.71

Ionia Nisia	0.12	14.92	0.13	15.33	0.12	13.96	0.09	10.48	0.11	11.92	0.27	28.91	0.29	31.51	0.13	14.46	0.29	30.73	0.27	29.48	0.10	11.21	0.18	19.36
Ipeiros	0.28	34.32	0.14	16.74	0.23	26.14	0.16	18.13	0.25	27.73	0.45	47.38	0.49	53.02	0.24	25.81	0.49	50.97	0.38	40.63	0.15	16.60	0.30	32.50
Itä-Suomi	0.73	88.36	0.74	89.66	0.79	89.83	0.77	88.96	0.93	102.72	1.15	122.59	1.00	107.50	1.02	111.74	1.03	107.88	1.14	123.11	0.97	104.22	0.93	103.32
Jihovýchod	0.60	72.58	0.58	70.36	0.85	96.37	0.82	94.46	0.80	88.45	0.83	88.71	0.92	98.30	0.88	96.33	0.93	97.19	0.86	92.76	0.89	95.98	0.81	90.14
Jihozápad	0.52	62.64	0.49	59.53	0.71	80.42	0.72	83.18	0.70	77.49	0.73	77.97	0.74	79.40	0.77	84.15	0.78	81.59	0.80	85.97	0.79	85.03	0.70	77.94
Karlsruhe	1.79	216.34	1.83	221.42	2.04	231.70	2.15	246.80	2.14	236.27	2.08	221.61	2.05	219.21	2.01	220.44	1.98	207.12	2.22	239.53	2.02	217.45	2.03	225.26
Kärnten	0.92	110.92	0.81	98.38	1.00	112.95	1.25	143.85	1.14	126.60	1.13	119.92	1.17	124.94	1.11	121.72	1.18	123.20	1.14	122.51	1.14	122.72	1.09	120.70
Kassel	0.85	102.43	0.83	101.13	0.75	85.53	0.81	93.21	0.83	92.24	0.88	93.41	0.84	89.97	0.67	73.59	0.66	68.64	0.73	79.03	0.67	71.70	0.78	86.44
Kentriki Makedonia	0.33	39.78	0.25	30.57	0.34	38.34	0.28	31.84	0.35	38.52	0.56	59.46	0.57	60.88	0.34	37.72	0.57	59.91	0.50	54.36	0.27	29.26	0.40	43.69
Koblenz	0.89	107.32	0.40	48.59	0.41	46.78	0.83	95.56	0.84	92.52	0.85	90.58	0.84	90.50	0.83	91.12	0.60	63.32	0.82	87.92	0.69	74.80	0.73	80.82
Köln	1.74	210.43	1.70	205.64	1.77	201.07	1.83	210.28	1.68	186.20	1.80	191.92	1.68	180.03	1.54	169.38	1.46	153.46	1.74	187.15	1.72	185.31	1.70	189.17
Közép-Dunántúl	0.59	71.69	0.62	74.84	0.83	94.57	0.84	96.61	0.79	87.22	0.82	87.48	0.75	80.58	0.76	83.21	0.74	77.73	0.78	84.17	0.74	79.37	0.75	83.41
Közép-Magyarország	0.79	95.69	0.81	97.65	1.08	122.82	1.07	123.32	1.14	126.06	1.12	119.29	1.11	119.24	1.22	133.68	1.16	121.21	1.11	119.40	1.11	119.38	1.07	117.98
Kriti	0.33	39.66	0.15	18.08	0.31	35.58	0.21	24.40	0.32	34.87	0.55	58.21	0.60	64.65	0.37	40.43	0.56	59.19	0.45	48.08	0.22	23.49	0.37	40.60
Kujawsko-pomorskie	0.21	24.97	0.20	24.34	0.45	50.81	0.44	50.38	0.45	50.03	0.60	63.59	0.55	59.02	0.56	60.88	0.54	56.55	0.44	47.17	0.55	59.64	0.45	49.76
La Rioja	0.47	56.81	0.51	61.93	0.48	54.54	0.50	57.00	0.53	58.81	0.51	54.36	0.62	65.92	0.56	61.67	0.71	74.34	0.54	58.10	0.67	72.64	0.55	61.46
Languedoc-Roussillon	1.07	128.67	1.05	127.46	1.06	119.61	1.10	126.13	1.16	128.21	1.10	116.46	1.15	122.84	1.14	124.72	1.09	114.38	1.00	107.63	1.13	121.95	1.09	121.64
Länsi-Suomi	1.71	206.87	1.71	207.49	1.72	195.29	1.76	201.85	2.19	241.75	2.23	237.31	2.24	240.42	2.08	227.53	1.70	177.84	2.41	259.69	2.37	255.22	2.01	222.84
Latvija	0.62	74.84	0.64	77.29	0.62	70.01	0.66	75.29	0.63	69.66	0.66	69.93	0.68	72.63	0.69	75.87	0.69	72.07	0.69	74.73	0.64	69.42	0.66	72.89
Lazio	1.10	132.57	1.12	136.03	1.09	123.38	1.08	124.24	1.13	125.04	1.14	121.07	1.16	123.84	1.14	125.50	1.09	114.32	1.15	123.79	1.14	123.22	1.12	124.82
Leipzig	0.52	62.43	1.02	123.93	0.97	110.38	1.10	126.21	1.08	118.95	1.06	112.73	1.01	108.36	1.12	122.64	1.11	116.68	0.76	82.32	1.08	115.95	0.98	109.14
Liège	1.09	131.83	1.09	132.10	1.09	123.75	1.07	122.68	1.07	118.50	1.12	118.74	1.09	116.40	1.07	117.19	1.18	124.14	1.10	118.80	1.11	119.26	1.10	122.13
Lietuva	0.80	96.58	0.80	97.54	0.70	79.55	0.69	79.50	0.70	77.20	0.74	79.20	0.76	81.45	0.76	83.63	0.76	79.92	0.75	80.62	0.73	79.06	0.75	83.11

Liguria	0.75	90.75	0.77	93.08	0.82	92.87	0.81	92.91	0.83	92.22	0.86	91.94	0.82	88.28	0.86	94.38	0.89	93.29	0.90	96.71	0.83	89.32	0.83	92.34
Limburg	1.03	123.97	1.08	130.94	1.12	126.52	1.13	129.38	1.16	127.88	1.10	116.53	1.09	116.35	1.14	125.13	1.13	118.48	1.03	110.87	1.03	110.75	1.09	121.53
Limburg	1.33	160.80	1.18	142.93	1.20	136.04	1.20	137.37	1.21	133.88	1.34	142.66	1.33	141.95	1.27	138.78	1.38	144.18	1.36	146.20	1.34	144.15	1.28	142.63
Limousin	0.70	84.59	0.73	88.40	0.69	78.59	0.70	80.98	0.79	87.53	0.67	71.57	0.76	81.19	0.73	80.30	0.75	79.05	0.61	65.73	0.72	77.08	0.71	79.55
Lisboa	0.50	60.18	0.49	59.88	0.54	60.86	0.52	59.50	0.75	82.84	0.80	84.95	0.92	98.92	0.89	97.52	0.90	94.53	0.95	102.27	1.00	107.55	0.75	82.64
Łódzkie	0.25	29.79	0.29	34.78	0.50	56.36	0.50	57.01	0.50	55.72	0.60	63.90	0.63	67.98	0.64	70.01	0.63	65.83	0.50	54.41	0.64	68.95	0.52	56.79
Lombardia	0.91	110.39	0.94	114.46	0.89	100.86	0.98	112.05	0.96	105.89	0.94	99.45	0.96	102.39	0.97	106.60	0.96	100.87	0.99	106.39	0.98	105.73	0.95	105.92
London	1.27	152.66	1.21	146.20	1.25	141.73	1.20	138.31	1.13	125.45	1.16	123.78	1.11	118.50	1.06	115.89	1.05	109.85	0.97	104.46	0.72	77.44	1.10	123.11
Lorraine	0.88	106.77	0.85	103.10	0.89	100.68	0.85	98.22	0.80	88.16	0.82	87.46	0.77	82.57	0.77	84.28	0.76	79.35	0.75	80.72	0.71	76.78	0.81	89.83
Lubelskie	0.24	29.51	0.23	27.65	0.49	55.65	0.49	56.20	0.49	54.73	0.63	66.79	0.62	66.46	0.58	63.05	0.61	63.62	0.50	54.40	0.61	65.92	0.50	54.91
Lubuskie	0.22	26.00	0.19	23.45	0.42	48.10	0.44	50.01	0.48	53.46	0.60	63.56	0.60	63.97	0.55	60.67	0.57	59.32	0.54	58.01	0.58	62.68	0.47	51.75
Lüneburg	0.87	105.50	0.88	106.72	0.81	92.19	0.82	94.14	0.83	91.54	0.96	101.62	0.85	90.72	0.91	99.36	0.91	95.67	1.01	108.49	0.90	97.01	0.89	98.45
Luxembourg (BE)	1.03	123.70	1.13	136.61	1.07	121.77	0.99	113.68	0.98	108.43	1.06	112.32	0.99	105.54	1.07	117.53	1.10	115.49	1.01	109.17	1.01	108.53	1.04	115.71
Luxembourg (Grand-Duché)	0.71	85.47	0.95	115.68	0.69	77.82	0.65	74.28	0.89	98.92	1.07	113.27	1.04	111.27	1.12	123.26	1.00	105.09	1.03	111.31	0.88	95.05	0.91	101.04
Małopolskie	0.34	41.42	0.30	36.43	0.57	64.66	0.58	66.70	0.58	63.77	0.70	74.79	0.72	76.95	0.74	80.82	0.76	79.78	0.60	64.25	0.76	81.56	0.60	66.47
Malta	0.24	28.67	0.76	91.77	0.68	76.55	0.76	87.12	0.68	75.09	0.80	85.52	0.82	88.25	0.81	89.06	0.77	80.22	0.77	83.39	0.78	84.39	0.72	79.09
Marche	0.59	71.26	0.60	72.51	0.63	71.84	0.60	68.83	0.67	74.02	0.66	69.76	0.62	66.52	0.66	72.59	0.65	67.86	0.65	70.35	0.62	66.45	0.63	70.18
Martinique	0.44	53.40	0.53	64.34	0.51	58.01	0.51	58.71	0.50	55.25	0.45	48.36	0.49	52.68	0.49	53.31	0.48	50.37	0.48	52.19	0.46	49.73	0.49	54.21
Mazowieckie	0.41	49.42	0.42	50.41	0.70	78.85	0.68	78.28	0.68	74.95	0.94	99.53	0.92	98.87	0.94	103.47	0.95	99.59	0.70	75.61	0.96	103.24	0.75	82.93
Mecklenburg-Vorpommern	0.80	96.01	0.85	102.80	0.82	93.46	0.82	93.65	0.79	87.57	0.83	88.15	0.84	90.34	0.81	88.48	0.93	97.26	0.72	77.36	0.90	96.39	0.83	91.95
Mellersta Norrland	1.03	123.89	0.85	102.67	1.07	121.31	0.81	92.66	0.89	98.74	0.86	91.91	1.02	109.70	0.67	73.99	0.81	84.70	0.64	69.49	0.85	91.37	0.86	96.40
Midi-Pyrénées	1.58	190.71	1.47	177.59	1.50	169.65	1.54	177.51	1.54	170.42	1.58	168.04	1.58	169.26	1.58	173.69	1.37	143.82	1.53	164.49	1.49	160.47	1.52	169.60

Midtjylland	0.18	22.15	0.19	23.01	0.21	23.32	0.23	26.30	0.23	25.96	0.22	23.65	0.00	0.00	0.00	0.00	0.90	94.81	0.75	81.09	0.75	80.63	0.33	36.45
Mittelfranken	1.85	223.71	1.94	235.19	2.23	253.01	2.14	245.59	2.08	229.78	2.04	217.12	2.09	224.25	2.45	269.08	2.75	288.27	2.21	237.76	2.16	232.43	2.18	241.47
Molise	0.40	48.45	0.44	52.88	0.45	50.59	0.46	52.75	0.44	48.84	0.45	48.02	0.46	48.81	0.45	49.72	0.46	48.33	0.47	50.38	0.46	49.05	0.45	49.80
Moravskoslezsko	0.44	52.70	0.43	52.21	0.66	74.70	0.66	76.19	0.72	80.18	0.65	69.59	0.67	72.04	0.85	93.64	0.75	78.43	0.73	78.31	0.76	81.54	0.67	73.59
Münster	0.89	107.66	0.95	114.57	0.91	103.05	0.97	111.60	0.92	101.63	0.85	90.68	0.90	95.89	0.87	95.46	0.92	96.24	0.86	92.41	0.99	106.90	0.91	101.46
Namur	1.22	147.18	1.38	166.67	1.13	127.54	1.21	139.21	1.39	153.62	1.34	142.55	1.30	139.36	1.28	140.86	1.24	129.58	1.30	139.81	1.34	143.90	1.28	142.75
Niederbayern	1.57	188.92	1.53	185.23	1.45	164.37	1.45	166.70	1.03	114.17	1.51	160.80	1.02	109.31	1.32	145.15	1.36	142.35	0.93	100.15	1.06	113.68	1.29	144.62
Niederösterreich	0.68	82.55	0.69	83.70	0.90	101.45	0.91	104.36	0.86	95.02	0.84	89.85	0.95	101.93	0.95	103.66	0.86	90.40	0.90	97.23	0.95	101.95	0.86	95.65
Noord-Brabant	3.99	481.90	4.61	558.80	5.90	669.17	4.69	539.49	3.38	373.55	4.10	436.33	3.75	402.23	3.27	358.30	2.07	217.18	4.45	479.63	4.02	433.38	4.02	450.00
Noord-Holland	1.23	147.84	1.33	161.29	1.16	130.96	1.17	134.61	1.20	132.95	1.25	133.34	1.19	127.55	1.16	126.74	1.21	126.39	1.25	134.58	1.20	129.72	1.21	135.09
Nord - Pas-de-Calais	0.80	96.52	0.77	93.08	0.77	86.82	0.80	92.32	0.77	85.44	0.82	87.69	0.76	81.92	0.82	90.41	0.74	77.90	0.83	89.30	0.72	77.66	0.78	87.19
Nord-Est	0.38	45.94	0.38	45.48	0.39	44.23	0.40	45.56	0.38	41.97	0.39	41.86	0.40	43.36	0.43	46.78	0.42	43.58	0.44	47.25	0.39	42.34	0.40	44.40
Nordjylland	0.10	11.62	0.10	12.58	0.12	13.86	0.14	16.46	0.15	16.67	0.14	14.68	0.00	0.00	0.00	0.00	0.92	96.67	0.68	73.42	0.73	78.65	0.28	30.42
Nord-Vest	0.45	53.89	0.45	54.02	0.43	48.42	0.47	53.68	0.46	50.97	0.46	48.47	0.45	48.06	0.46	50.19	0.48	50.50	0.52	56.13	0.47	50.20	0.46	51.32
Norra Mellansverige	1.06	127.81	0.82	99.23	1.03	116.56	0.73	84.31	0.93	102.84	0.89	94.26	0.93	99.30	0.64	70.32	0.91	95.03	0.70	75.69	0.86	93.01	0.86	96.22
Norte	0.24	28.63	0.19	23.02	0.20	22.22	0.22	25.33	0.47	52.42	0.48	50.82	0.48	51.45	0.50	55.30	0.53	55.65	0.58	62.87	0.62	67.23	0.41	44.99
North East (UK)	0.82	98.77	0.86	104.82	0.86	98.00	0.86	98.90	0.86	95.68	0.86	91.64	0.86	92.29	0.86	93.79	0.82	86.25	0.78	83.69	0.60	65.04	0.82	91.72
North West (UK)	1.07	129.61	1.15	139.89	1.05	118.97	1.07	122.80	1.03	113.50	1.07	113.48	1.12	120.01	0.92	100.87	0.97	101.23	0.91	98.00	0.68	73.45	1.00	111.98
Northern Ireland	0.77	93.02	0.87	105.29	0.81	91.91	0.86	99.24	0.84	93.39	0.88	93.77	0.84	90.40	0.82	90.02	0.74	77.47	0.84	90.45	0.60	64.62	0.81	89.96
Notio Aigaio	0.11	13.12	0.14	17.09	0.12	13.56	0.10	12.01	0.12	13.67	0.33	34.62	0.32	33.79	0.13	14.69	0.30	31.88	0.32	33.98	0.10	10.56	0.19	20.81
Nyugat-Dunántúl	0.42	51.10	0.49	58.97	0.73	82.81	0.71	81.13	0.73	80.59	0.73	78.06	0.71	76.40	0.77	84.39	0.76	79.77	0.72	77.53	0.77	83.10	0.69	75.80
Oberbayern	3.24	391.11	3.25	394.31	3.16	358.67	3.00	344.72	2.96	327.29	2.67	284.18	2.72	291.62	2.82	309.22	2.80	292.90	2.80	301.85	2.76	297.65	2.93	326.68
Oberfranken	1.02	122.98	1.04	125.65	1.05	119.22	1.09	125.35	1.11	122.58	1.02	107.97	1.13	121.18	1.04	113.93	1.61	168.43	1.19	128.53	1.24	133.02	1.14	126.26
Oberösterreich	0.62	74.56	0.62	74.89	0.94	106.68	0.93	106.52	0.95	105.32	0.94	99.94	1.04	111.74	1.04	113.92	0.97	101.16	0.97	104.97	1.02	110.19	0.91	100.90

Oberpfalz	1.36	164.19	1.48	179.59	1.52	172.05	1.64	187.94	1.69	187.23	1.73	183.49	1.66	178.36	1.57	172.61	1.86	194.69	1.89	203.74	1.86	200.11	1.66	184.00
Oost-Vlaanderen	1.45	175.16	1.40	169.45	1.41	159.45	1.42	163.36	1.44	159.74	1.51	160.30	1.58	169.54	1.44	158.18	1.61	168.87	1.56	167.68	1.60	172.55	1.49	165.84
Opolskie	0.17	20.39	0.19	23.24	0.42	47.98	0.42	47.90	0.43	47.22	0.55	59.01	0.50	54.08	0.52	56.79	0.54	56.74	0.43	46.61	0.53	57.50	0.43	47.04
Östra Mellansverige	1.92	231.72	1.40	169.99	1.94	219.33	1.25	143.11	1.72	190.22	1.76	187.11	1.83	196.30	1.53	167.33	1.71	178.94	1.48	159.26	1.74	186.92	1.66	184.57
Overijssel	0.98	118.13	0.94	114.03	1.03	116.93	0.96	109.90	0.94	103.79	0.96	102.22	0.99	106.13	0.96	105.21	1.21	126.29	0.96	103.30	0.97	104.15	0.99	110.01
Övre Norrland	1.35	162.54	1.10	133.87	1.43	161.96	1.03	118.19	1.45	160.33	1.38	146.46	1.44	154.64	1.26	138.61	1.39	145.75	1.22	131.51	1.41	152.09	1.32	146.00
País Vasco	0.80	96.72	0.83	101.03	0.88	100.00	0.85	97.49	0.87	95.90	0.95	100.52	0.96	103.29	1.01	110.74	1.06	111.32	1.05	113.71	1.03	111.44	0.94	103.83
Pays de la Loire	0.87	105.32	0.88	107.16	0.87	98.27	0.84	96.93	0.90	99.18	0.93	98.70	0.93	99.37	0.84	92.43	0.90	94.11	0.86	92.92	0.88	94.84	0.88	98.11
Peloponnisos	0.25	30.64	0.18	21.44	0.20	22.92	0.18	20.55	0.13	14.48	0.36	38.70	0.37	39.65	0.19	20.96	0.43	45.01	0.32	34.81	0.17	18.25	0.25	27.95
Picardie	0.79	95.53	0.74	90.21	0.85	95.96	0.83	95.71	0.85	93.71	0.79	84.26	0.94	100.54	0.81	89.17	0.81	85.39	0.83	89.51	0.83	89.51	0.83	91.77
Piemonte	0.89	107.79	0.91	109.83	0.92	103.81	0.98	112.30	1.02	113.36	1.01	107.84	1.04	111.10	1.05	114.63	0.99	103.88	1.05	113.48	1.06	114.40	0.99	110.22
Podkarpackie	0.24	28.58	0.22	26.48	0.46	51.98	0.47	53.67	0.48	52.70	0.55	58.92	0.55	58.58	0.56	61.23	0.59	61.58	0.48	51.64	0.60	64.89	0.47	51.84
Podlaskie	0.22	26.23	0.19	22.96	0.50	57.03	0.46	53.14	0.46	51.43	0.48	50.66	0.56	59.52	0.58	63.36	0.58	60.82	0.47	50.63	0.59	63.81	0.46	50.87
Pohjois-Suomi	2.08	251.30	1.97	238.92	1.88	212.94	1.85	212.51	2.26	249.89	2.30	244.71	2.44	261.83	2.39	261.95	2.16	226.54	2.52	271.72	2.62	281.83	2.23	246.74
Poitou-Charentes	0.72	87.34	0.74	89.35	0.67	75.76	0.71	81.88	0.71	78.74	0.72	76.75	0.71	76.39	0.66	72.85	0.71	74.91	0.70	75.48	0.67	71.99	0.70	78.31
Pomorskie	0.29	34.87	0.26	31.87	0.50	57.20	0.49	56.04	0.51	56.09	0.70	74.03	0.76	81.86	0.73	80.46	0.76	79.89	0.54	58.69	0.78	84.09	0.58	63.19
Praha	0.96	115.98	1.00	121.70	1.32	149.63	1.25	143.63	1.30	144.10	1.38	146.76	1.40	149.91	1.39	152.90	1.43	150.06	1.39	149.59	1.40	150.85	1.29	143.19
Principado de Asturias	0.60	72.62	0.65	78.63	0.62	70.09	0.63	72.73	0.63	69.66	0.63	66.84	0.65	70.14	0.68	74.59	0.70	72.92	0.64	69.52	0.68	73.44	0.65	71.93
Provence-Alpes-Côte d'Azur	1.20	144.68	1.24	150.58	1.21	137.56	1.22	139.94	1.33	146.76	1.32	140.47	1.32	141.04	1.25	136.96	1.31	137.60	1.26	135.59	1.24	133.45	1.26	140.42
Provincia Autonoma Bolzano	0.34	40.88	0.40	47.92	0.33	37.14	0.28	32.42	0.42	46.91	0.55	58.47	0.59	62.77	0.63	69.51	0.64	67.02	0.61	65.43	0.64	68.51	0.49	54.27
Provincia Autonoma Trento	0.48	57.83	0.55	66.53	0.53	59.61	0.63	71.86	0.77	85.15	0.70	74.56	0.84	89.55	0.78	85.00	0.83	86.72	0.77	83.43	0.90	96.59	0.71	77.89

Puglia	0.58	69.41	0.60	72.29	0.59	66.75	0.60	68.98	0.60	66.50	0.63	66.47	0.62	66.14	0.62	68.25	0.64	66.71	0.62	66.77	0.62	67.11	0.61	67.76
Região Autónoma da Madeira	0.12	14.02	0.20	24.53	0.13	14.83	0.15	17.50	0.42	46.87	0.40	42.55	0.40	42.91	0.45	49.23	0.48	50.27	0.42	45.04	0.53	56.83	0.34	36.78
Região Autónoma dos Açores	0.41	49.43	0.16	18.99	0.15	16.82	0.20	22.42	0.40	44.71	0.40	42.22	0.38	40.95	0.66	72.76	0.68	71.16	0.37	39.39	0.71	76.22	0.41	45.01
Región de Murcia	0.59	70.66	0.62	75.52	0.61	69.51	0.63	72.40	0.61	67.66	0.61	64.77	0.62	66.70	0.66	72.04	0.64	66.88	0.61	65.73	0.61	66.14	0.62	68.91
Réunion	0.48	58.14	0.57	69.12	0.56	62.91	0.55	63.46	0.58	64.09	0.49	52.40	0.56	59.84	0.55	59.94	0.57	60.02	0.52	56.08	0.54	57.70	0.54	60.34
Rheinhessen-Pfalz	1.62	195.92	1.05	127.09	1.12	126.91	1.60	183.83	1.48	164.04	1.63	173.32	1.45	155.30	1.46	159.56	1.42	148.72	1.49	161.09	1.52	163.79	1.44	159.96
Rhône-Alpes	1.55	186.54	1.48	179.09	1.54	174.42	1.68	192.77	1.58	174.81	1.52	161.56	1.52	163.16	1.47	160.97	1.55	162.47	1.52	163.97	1.54	165.34	1.54	171.37
Saarland	0.86	104.29	0.86	104.53	0.83	94.52	0.90	103.18	0.86	95.65	0.89	94.58	0.66	70.62	0.93	102.12	0.99	104.06	0.68	73.04	0.97	104.60	0.86	95.56
Sachsen-Anhalt	0.67	80.36	0.70	84.76	0.70	79.18	0.74	84.78	0.84	92.88	0.80	84.63	0.78	83.84	0.85	93.20	0.61	64.38	0.78	83.67	0.67	71.97	0.74	82.15
Salzburg	0.57	69.03	0.60	72.62	0.81	91.98	0.89	102.67	1.08	119.58	0.90	95.56	0.98	105.19	1.06	116.76	1.07	112.35	0.93	99.85	1.00	107.32	0.90	99.36
Sardegna	0.60	72.91	0.59	71.20	0.63	71.49	0.62	71.18	0.60	66.04	0.60	63.27	0.57	60.84	0.62	68.51	0.62	65.30	0.67	72.10	0.60	64.37	0.61	67.93
Schleswig-Holstein	1.03	124.02	1.03	124.65	0.96	109.36	0.82	94.59	1.04	115.05	1.00	106.07	0.95	102.17	0.97	106.22	0.98	102.60	1.00	107.51	0.96	103.68	0.98	108.72
Schwaben	1.03	124.20	1.10	133.46	1.05	119.25	1.08	123.59	1.08	119.00	1.05	111.23	1.02	109.75	1.00	109.27	1.19	125.00	1.02	110.26	1.11	119.39	1.07	118.58
Scotland	1.05	126.41	1.05	127.03	1.09	123.80	1.08	124.54	1.07	118.01	1.00	106.68	0.99	106.53	0.93	101.70	0.97	101.99	0.82	88.76	0.65	70.10	0.97	108.69
Severen tsentralen	0.02	2.43	0.31	38.02	0.33	37.46	0.37	41.97	0.34	38.09	0.52	54.98	0.51	54.27	0.48	53.06	0.50	52.73	0.37	40.14	0.51	54.94	0.39	42.56
Severoiztochen	0.04	4.54	0.30	36.45	0.33	36.87	0.28	32.36	0.27	30.37	0.50	52.74	0.49	52.74	0.48	53.09	0.47	49.60	0.39	42.57	0.48	51.21	0.37	40.23
Severovýchod	0.49	59.68	0.51	62.12	0.73	82.70	0.72	82.29	0.76	84.18	0.79	84.31	0.79	84.71	0.80	87.51	0.78	82.11	0.77	82.72	0.77	82.60	0.72	79.54
Severozápad	0.34	40.44	0.34	40.69	0.56	63.61	0.54	62.10	0.54	60.07	0.55	58.54	0.59	63.46	0.57	62.98	0.56	58.55	0.58	62.17	0.56	60.10	0.52	57.52
Severozapaden	0.03	3.66	0.21	25.57	0.18	20.17	0.18	20.33	0.34	37.17	0.49	51.70	0.45	48.25	0.47	51.17	0.44	45.62	0.32	34.72	0.43	45.88	0.32	34.93
Sicilia	0.66	79.71	0.70	85.10	0.69	78.47	0.72	82.72	0.71	78.67	0.72	76.18	0.71	75.64	0.72	79.28	0.70	72.99	0.74	80.25	0.73	78.16	0.71	78.83
Sjælland	0.10	11.62	0.10	12.58	0.12	13.86	0.14	16.46	0.15	16.67	0.14	14.68	0.00	0.00	0.00	0.00	0.77	80.49	0.76	81.86	0.76	81.43	0.28	29.97
Śląskie	0.25	30.72	0.20	23.75	0.46	52.64	0.47	54.54	0.48	53.37	0.59	62.91	0.62	66.72	0.64	70.46	0.66	68.71	0.48	51.53	0.65	69.96	0.50	55.03

Småland med öarna	0.91	109.88	0.71	86.62	0.99	111.79	0.68	78.48	0.86	95.03	0.87	92.32	0.87	93.57	0.63	68.65	0.92	96.26	0.76	81.63	0.89	96.04	0.83	91.84
South East (UK)	1.83	221.25	1.76	213.09	1.61	182.97	1.69	194.26	1.73	190.84	1.58	167.52	1.54	164.85	1.50	164.91	1.37	143.40	1.09	117.00	0.87	94.04	1.51	168.56
South West (UK)	1.25	151.03	1.19	144.17	1.20	136.08	1.19	136.48	1.17	128.94	1.13	120.14	1.12	120.39	1.00	110.14	0.98	102.78	1.01	108.97	0.75	81.16	1.09	121.84
Southern and Eastern	1.22	147.22	1.15	139.60	1.22	137.97	1.19	137.07	1.15	127.60	1.14	121.03	1.11	119.39	1.14	124.92	1.11	116.73	1.14	122.78	1.11	119.92	1.15	128.57
Steiermark	0.89	107.01	0.94	114.02	1.15	130.50	1.30	148.95	1.29	142.86	1.28	135.72	1.27	136.02	1.41	155.00	1.31	136.79	1.28	137.69	1.27	136.64	1.22	134.65
Sterea Ellada	0.19	23.46	0.18	21.29	0.11	12.27	0.08	9.71	0.11	12.12	0.30	31.82	0.33	35.85	0.14	14.94	0.31	32.20	0.35	37.51	0.13	13.48	0.20	22.24
Stockholm	2.95	355.71	2.32	281.50	2.74	310.52	1.88	215.62	2.53	280.03	2.65	281.40	2.63	281.68	2.56	280.92	2.55	266.86	2.73	294.32	2.60	279.97	2.56	284.41
Stredné Slovensko	0.72	86.32	0.71	86.07	0.68	76.67	0.66	75.51	0.64	70.73	0.65	69.38	0.67	71.63	0.65	70.76	0.62	64.48	0.62	66.62	0.62	66.53	0.66	73.15
Střední Čechy	0.78	94.56	0.76	92.69	1.01	114.20	1.01	116.33	0.94	103.82	0.91	96.24	1.03	110.20	0.92	101.09	0.94	98.48	0.91	98.01	0.92	99.22	0.92	102.26
Střední Morava	0.50	60.56	0.51	62.37	0.70	78.84	0.69	79.72	0.71	78.52	0.67	71.32	0.74	79.03	0.74	81.12	0.73	76.81	0.70	75.08	0.72	77.51	0.67	74.63
Stuttgart	2.25	271.12	2.29	277.19	2.09	237.43	2.21	254.46	2.12	234.81	2.20	234.08	2.18	233.13	2.00	219.41	2.32	243.33	2.32	249.99	2.24	241.17	2.20	245.10
Sud - Muntenia	0.41	49.44	0.41	50.14	0.41	46.40	0.42	48.83	0.43	47.38	0.41	43.42	0.40	42.33	0.41	44.53	0.41	42.83	0.39	41.54	0.40	43.55	0.41	45.49
Sud-Est	0.43	51.45	0.39	47.54	0.41	46.22	0.44	50.72	0.39	42.73	0.37	39.28	0.37	40.12	0.39	42.87	0.38	40.23	0.39	42.12	0.38	41.37	0.40	44.06
Sud-Vest Oltenia	0.36	42.88	0.34	40.74	0.39	43.80	0.38	43.16	0.36	40.29	0.41	43.60	0.39	41.82	0.40	43.56	0.39	41.14	0.40	42.67	0.39	42.21	0.38	42.35
Świętokrzyskie	0.20	24.00	0.15	17.57	0.42	47.07	0.43	49.90	0.45	50.04	0.45	47.52	0.53	56.26	0.49	53.47	0.51	53.07	0.46	49.18	0.56	60.31	0.42	46.22
Syddanmark	0.05	5.63	0.05	6.65	0.07	8.48	0.09	10.86	0.10	11.38	0.09	9.58	0.00	0.00	0.00	0.00	0.53	55.11	0.66	71.07	0.66	70.77	0.21	22.69
Sydsverige	2.49	300.31	1.73	209.16	2.30	260.52	1.80	206.87	2.41	266.19	2.36	250.43	2.52	270.24	2.61	286.46	2.72	284.92	2.24	241.05	2.68	289.11	2.35	260.48
Thessalia	0.19	22.37	0.13	16.12	0.19	21.67	0.19	21.47	0.19	21.18	0.41	43.14	0.40	42.46	0.27	29.08	0.40	41.43	0.38	40.69	0.19	20.64	0.27	29.11
Thüringen	0.95	114.37	1.04	126.31	1.02	115.74	0.85	98.08	1.10	121.14	1.09	115.81	1.08	115.44	1.07	117.67	1.06	111.59	1.13	122.24	1.14	123.06	1.05	116.49
Tirol	0.74	88.83	0.72	87.76	0.98	110.61	0.98	113.15	1.15	127.63	1.01	107.31	1.15	123.07	1.08	118.30	1.16	121.79	1.01	108.99	1.12	120.10	1.01	111.59
Toscana	0.73	88.24	0.72	87.72	0.75	84.49	0.74	85.41	0.79	87.42	0.84	89.65	0.82	87.54	0.78	85.51	0.76	79.82	0.80	86.31	0.82	88.50	0.78	86.42
Trier	0.65	78.91	0.37	45.39	0.39	43.97	0.81	93.01	0.78	86.45	0.82	87.06	0.62	66.18	0.68	74.36	0.68	71.32	0.68	72.79	0.70	75.23	0.65	72.24
Tübingen	1.79	215.40	1.84	222.54	1.93	218.86	2.02	232.23	1.87	207.27	1.87	198.99	1.74	186.36	1.81	198.96	1.60	167.84	1.74	188.04	1.64	176.87	1.81	201.21

Umbria	0.70	84.50	0.77	92.95	0.67	76.33	0.67	76.84	0.72	79.46	0.74	78.94	0.68	73.00	0.70	76.31	0.74	77.70	0.70	75.47	0.68	73.56	0.71	78.64
Unterfranken	1.05	126.67	1.11	134.61	1.09	123.61	1.22	139.80	1.22	134.70	1.28	135.63	1.07	114.77	1.14	124.46	1.23	129.05	1.37	147.40	1.07	115.66	1.17	129.67
Utrecht	1.57	189.67	1.76	213.43	1.59	179.69	1.57	179.98	1.65	182.77	1.67	177.42	1.64	175.30	1.62	177.76	1.54	161.71	1.65	177.58	1.57	169.24	1.62	180.41
Valle d'Aosta	0.47	57.20	0.64	77.83	0.51	58.24	0.62	71.41	0.44	48.52	0.44	46.79	0.71	75.80	0.66	72.81	0.42	43.84	0.45	49.01	0.76	81.33	0.56	62.07
Västsverige	1.90	228.71	1.12	135.90	1.76	200.02	1.10	126.54	1.91	211.81	1.93	204.82	1.90	203.97	1.55	169.45	1.54	161.03	1.44	154.76	1.67	179.50	1.62	179.68
Veneto	0.62	75.13	0.63	75.86	0.67	76.34	0.67	76.90	0.67	73.79	0.71	75.62	0.71	75.62	0.73	79.83	0.80	83.49	0.74	80.13	0.76	81.85	0.70	77.69
Vest	0.47	56.42	0.46	55.96	0.46	52.32	0.48	54.68	0.54	59.58	0.51	54.27	0.51	54.84	0.52	56.56	0.59	61.73	0.59	64.03	0.59	63.39	0.52	57.62
Vlaams-Brabant	1.70	205.60	1.58	190.98	1.76	199.06	1.68	192.82	1.68	186.04	1.70	180.37	1.80	192.34	1.65	180.43	1.93	202.08	1.78	192.12	1.90	204.13	1.74	193.27
Vorarlberg	0.68	81.57	0.70	84.87	0.87	98.28	0.82	94.16	0.87	96.55	0.93	98.40	0.86	92.66	0.83	90.72	1.02	107.01	0.93	100.62	0.87	93.49	0.85	94.40
Voreio Aigaio	0.17	20.62	0.17	20.64	0.20	22.16	0.15	17.28	0.20	21.75	0.38	40.37	0.43	46.26	0.23	25.07	0.36	37.59	0.37	40.31	0.19	20.64	0.26	28.43
Východné Slovensko	0.63	75.84	0.63	76.45	0.59	67.28	0.63	71.99	0.59	65.12	0.59	62.94	0.64	68.38	0.64	70.56	0.66	69.18	0.61	65.93	0.61	66.12	0.62	69.07
Vzhodna Slovenija	0.09	10.53	0.10	12.06	0.40	45.08	0.45	52.26	0.40	43.86	0.40	42.54	0.46	49.46	0.46	50.90	0.72	75.21	0.54	58.10	0.69	74.49	0.43	46.77
Wales	0.93	112.81	0.94	113.58	0.93	104.96	0.90	103.25	0.88	97.45	0.96	102.35	0.88	94.38	0.78	85.08	0.74	77.90	0.76	82.13	0.59	64.02	0.85	94.35
Warmińsko-mazurskie	0.20	24.70	0.19	22.99	0.45	51.24	0.47	53.62	0.48	52.85	0.54	57.76	0.58	62.25	0.56	61.58	0.56	59.07	0.46	50.01	0.58	62.08	0.46	50.74
Weser-Ems	0.69	83.41	0.75	90.45	0.74	83.47	0.71	81.79	0.70	77.91	0.73	77.84	0.72	77.00	0.74	80.74	0.70	73.84	0.67	71.73	0.75	81.05	0.72	79.93
West Midlands	1.22	147.37	1.19	143.99	1.17	132.39	1.25	143.64	1.20	133.24	1.20	127.76	1.09	116.61	1.09	119.30	1.02	107.28	0.88	95.31	0.66	70.80	1.09	121.61
West-Vlaanderen	1.10	132.76	1.10	132.94	1.12	127.26	1.08	124.15	1.13	125.39	1.20	127.50	1.14	122.30	1.14	124.58	1.12	116.87	1.24	133.28	1.11	119.86	1.13	126.08
Wielkopolskie	0.27	32.04	0.22	26.51	0.50	56.98	0.50	57.75	0.51	55.94	0.60	63.73	0.63	68.01	0.64	70.70	0.63	66.35	0.52	55.56	0.62	67.19	0.51	56.43
Wien	1.39	167.93	1.41	171.17	1.74	197.41	1.93	221.23	1.97	218.34	1.94	206.11	2.08	223.10	2.14	235.08	2.07	217.24	1.94	208.80	2.09	224.84	1.88	208.30
Yorkshire and The Humber	0.92	111.45	0.92	111.35	0.89	100.84	0.87	99.89	0.92	101.23	0.87	92.76	0.86	91.99	0.72	79.44	0.73	76.60	0.71	76.61	0.48	51.78	0.81	90.36
Yugoiztochen	0.03	3.89	0.42	50.53	0.43	48.44	0.42	48.69	0.32	35.56	0.48	51.01	0.50	53.09	0.45	49.46	0.41	43.04	0.35	37.88	0.41	44.43	0.38	42.37
Yugozapaden	0.13	15.38	0.51	61.40	0.52	59.09	0.54	62.32	0.64	71.07	0.90	95.61	0.89	95.72	0.85	93.60	0.84	88.25	0.57	61.90	0.85	91.55	0.66	72.35

Yuzhen tsentralen	0.04	4.90	0.30	36.87	0.24	26.74	0.19	22.25	0.29	31.91	0.45	47.33	0.46	49.06	0.47	51.63	0.45	46.67	0.37	39.68	0.46	49.47	0.34	36.96
Zachodniopomorskie	0.20	24.71	0.22	26.29	0.48	54.82	0.48	55.05	0.47	52.01	0.63	66.88	0.59	63.21	0.65	71.74	0.69	72.02	0.50	53.59	0.65	69.92	0.51	55.48
Zahodna Slovenija	0.31	37.28	0.33	39.97	0.81	92.07	0.81	93.07	0.81	89.97	0.85	90.14	0.86	92.03	0.86	94.74	1.16	121.78	0.88	94.76	1.11	119.83	0.80	87.78
Západné Slovensko	0.60	72.42	0.61	74.44	0.63	71.24	0.62	71.46	0.60	66.12	0.61	65.37	0.66	70.59	0.68	74.70	0.69	72.10	0.65	70.14	0.66	71.20	0.64	70.89
Zeeland	0.77	92.47	0.63	75.97	0.61	69.30	0.79	91.07	0.60	66.60	0.63	67.26	0.59	63.50	0.61	66.81	0.56	58.22	0.62	66.51	0.61	65.22	0.64	71.18
Zuid-Holland	1.32	159.46	1.29	156.37	1.21	137.24	1.23	141.49	1.25	138.17	1.28	135.90	1.32	141.22	1.33	145.44	1.32	138.40	1.26	135.64	1.32	141.87	1.28	142.84

Appendix 4: Table of Pearson product-moment correlation coefficients and Spearman's rank coefficients of Structural Funds and the KBE in European regions.

Note: the regions are listed alphabetically

	Pearson's *r*			Spearman's ρ		
region Time-scale:	t	t+1	t+2	t	t+1	t+2
Abruzzo	-0.031	0.238	-0.044	0.459	-0.055	-0.283
Åland	0.334	0.544	-0.109	0.886	0.800	0.600
Alentejo	-0.113	0.131	0.058	0.205	0.418	0.258
Algarve	0.254	0.486	0.156	0.509	0.200	0.325
Alsace	0.008	-0.662	-0.520	0.001	0.001	0.001
Anatoliki Makedonia, Thraki	0.550	0.160	-0.369	0.182	-0.370	0.167
Andalucía	-0.413	0.005	0.352	0.500	-0.333	0.008
Antwerpen	0.138	-0.355	0.266	0.100	-0.261	-0.167
Aquitaine	-0.012	0.235	0.423	0.055	0.127	0.417
Aragón	-0.489	-0.061	0.360	-0.943	-0.600	0.400
Arnsberg	-0.652	-0.285	-0.111	0.755	0.673	0.433
Attiki	0.447	-0.059	-0.516	0.336	-0.030	0.500
Auvergne	0.534	0.391	0.448	-0.282	0.152	-0.183
Basilicata	0.412	0.379	0.388	0.829	0.001	0.400
Basse-Normandie	0.242	-0.338	-0.633	0.001	0.001	0.001
Berlin	0.327	-0.280	-0.230	-0.055	-0.188	-0.150
Border, Midland and Western	-0.249	-0.227	-0.265	0.036	0.224	-0.450
Bourgogne	-0.023	-0.264	-0.339	0.001	0.001	0.001
Brabant Wallon	-0.242	0.015	0.289	0.001	0.001	0.001
Brandenburg - Nordost	0.723	0.525	0.386	-0.373	-0.321	-0.100
Brandenburg - Südwest	0.747	0.669	0.609	-0.355	-0.297	0.001
Bratislavský kraj	0.562	0.608	-0.210	-0.618	-0.612	-0.667
Braunschweig	-0.350	-0.417	-0.349	0.182	0.285	0.583
Bremen	-0.364	-0.646	-0.626	-0.055	0.273	-0.083
Bretagne	0.023	-0.290	-0.269	0.482	0.091	0.300
Brussels (capital reg.)	0.394	0.234	0.538	0.100	-0.103	-0.483
Bucureşti - Ilfov	-0.408	-0.396	-0.775	-0.200	0.001	0.800
Burgenland	0.218	0.007	-0.622	-0.714	0.200	0.001

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	Pearson's *r*			Spearman's ρ		
Calabria	-0.073	0.357	-0.283	0.268	0.418	0.225
Campania	-0.029	0.414	0.291	-0.218	0.406	0.275
Canarias	0.078	0.504	0.666	-0.095	0.042	-0.033
Cantabria	-0.313	-0.398	0.098	0.541	0.527	0.375
Castilla y León	-0.473	-0.487	-0.425	0.445	0.394	-0.217
Castilla-La Mancha	-0.729	-0.600	-0.209	0.543	-0.100	0.001
Cataluña	-0.340	0.277	0.481	0.209	0.406	0.408
Centre	0.145	-0.396	-0.512	-0.771	-0.900	-0.600
Centro	0.235	0.405	0.117	-0.655	-0.648	-0.733
Centru	-0.770	-0.697	-0.214	0.023	-0.527	0.258
Champagne-Ardenne	0.056	-0.625	-0.936	-0.218	-0.261	-0.142
Chemnitz	0.563	-0.371	0.013	0.714	0.261	0.383
Ciudad Autónoma de Ceuta	-0.113	0.047	0.472	-0.143	-1.000	-1.000
Ciudad Autónoma de Melilla	-0.177	0.187	0.450	-0.286	-0.309	0.275
Comunidad de Madrid	-0.404	-0.605	-0.138	0.264	-0.164	-0.433
Comunidad Foral de Navarra	-0.156	0.057	0.443	-0.145	0.079	0.167
Comunidad Valenciana	-0.444	0.148	0.644	0.382	0.018	0.083
Corse	0.013	0.018	-0.192	0.055	-0.164	0.792
Cyprus	0.105	-0.110	-0.473	-0.245	-0.212	-0.700
Darmstadt	-0.086	0.353	0.004	0.527	0.418	0.067
Dél-Alföld	-0.116	-0.337	-0.077	0.100	0.491	-0.133
Dél-Dunántúl	0.855	0.414	0.591	-0.400	-0.152	-0.850
Detmold	-0.558	-0.015	0.136	0.543	-0.200	-0.400
Dolnośląskie	0.236	-0.401	0.088	-0.257	-0.300	0.400
Drenthe	0.331	0.619	-0.045	0.441	-0.030	-0.067
Dresden	0.471	0.091	0.449	0.657	0.300	-0.400
Düsseldorf	-0.020	0.468	0.323	0.241	0.782	0.117
Dytiki Ellada	0.401	-0.142	-0.588	0.300	0.152	0.400
Dytiki Makedonia	0.547	0.113	-0.394	0.429	-0.300	-0.600
East Midlands	-0.144	-0.544	-0.470	0.055	-0.285	0.050
East of England	-0.012	-0.209	-0.509	0.236	0.115	0.417
Eesti	-0.925	-0.571	-0.967	0.282	-0.212	-0.267
Emilia-Romagna	0.248	0.214	0.468	-0.055	0.333	0.125
Észak-Alföld	-0.704	-0.612	-0.892	0.001	-0.212	0.758

	Pearson's *r*			Spearman's ρ		
Észak-Magyarország	-0.411	-0.018	0.828	0.145	0.418	-0.533
Etelä-Suomi	0.016	0.289	-0.061	0.382	0.709	0.567
Extremadura	-0.483	-0.194	0.024	-0.318	-0.467	-0.150
Flevoland	-0.022	-0.424	0.015	-0.445	-0.600	-0.483
Franche-Comté	-0.544	-0.736	-0.201	-0.645	-0.345	0.300
Freiburg	0.474	0.506	0.674	0.082	-0.236	0.200
Friesland	-0.427	0.144	-0.461	-0.427	-0.600	-0.483
Friuli-Venezia Giulia	0.015	0.722	0.432	-0.257	-0.900	-0.600
Galicia	-0.198	-0.071	0.315	0.001	0.001	0.001
Gelderland	0.547	0.348	-0.447	-0.143	-0.300	-0.400
Gießen	-0.662	-0.564	-0.507	0.568	-0.721	-0.433
Groningen	0.167	0.158	0.162	-0.673	-0.273	-0.267
Guadeloupe	-0.413	-0.306	0.236	-0.536	-0.224	0.133
Guyane	-0.241	-0.009	0.638	0.001	0.001	0.001
Hainaut	-0.354	-0.233	0.407	0.573	-0.139	-0.433
Hamburg	0.238	0.486	0.344	0.364	0.285	-0.133
Hannover	-0.423	-0.099	-0.186	0.709	0.503	0.650
Haute-Normandie	-0.059	-0.577	-0.394	0.136	0.576	0.167
Hovedstaden	-0.143	-0.342	-0.188	0.891	0.564	0.483
Île de France	-0.212	-0.425	-0.520	0.264	0.406	-0.117
Illes Balears	-0.478	-0.553	-0.047	0.591	0.152	0.350
Ionia Nisia	0.591	0.093	-0.391	0.759	0.588	0.550
Ipeiros	0.442	-0.056	-0.520	-0.173	-0.636	-0.033
Itä-Suomi	0.337	0.584	0.025	-0.029	-0.600	-0.800
Jihovýchod	0.076	-0.433	-0.080	0.550	-0.297	-0.267
Jihozápad	0.894	0.718	0.421	0.618	-0.067	0.517
Karlsruhe	0.176	0.368	-0.295	0.318	-0.224	-0.200
Kärnten	0.556	0.405	0.109	0.500	-0.018	-0.283
Kassel	-0.338	-0.395	-0.802	-0.782	-0.321	0.300
Kentriki Makedonia	0.504	-0.006	-0.504	0.923	-0.127	-0.375
Koblenz	0.116	0.516	0.060	-0.482	-0.673	-0.650
Köln	-0.612	-0.450	-0.620	-0.023	0.430	0.642
Közép-Dunántúl	-0.608	0.314	-0.376	0.505	0.018	-0.283
Közép-Magyarország	-0.195	-0.577	-0.710	0.143	-0.300	0.400
Kriti	0.420	-0.070	-0.576	0.001	0.001	0.001
Kujawsko-pomorskie	-0.495	-0.614	0.142	0.627	0.503	0.617

	Pearson's *r*			Spearman's ρ		
La Rioja	-0.349	-0.358	0.201	-0.155	0.127	0.567
Languedoc-Roussillon	-0.083	-0.423	-0.212	-0.109	-0.152	0.350
Länsi-Suomi	0.108	0.334	0.002	0.514	-0.042	-0.267
Latvija	-0.223	-0.308	-0.996	0.136	0.091	-0.400
Lazio	0.422	0.332	-0.029	-0.273	-0.321	-0.933
Leipzig	0.538	-0.346	-0.002	-0.486	-0.300	0.200
Liège	0.410	0.015	0.289	0.527	0.091	0.117
Lietuva	-0.700	-0.962	-0.890	0.001	0.001	0.001
Liguria	0.331	0.443	-0.076	0.509	0.418	0.517
Limburg	-0.698	-0.406	-0.079	-0.257	-0.700	-0.800
Limburg	0.303	0.453	0.096	0.136	-0.600	0.200
Limousin	0.003	-0.434	-0.136	0.045	0.079	-0.733
Lisboa	0.196	0.459	0.265	-0.082	-0.018	-0.533
Łódzkie	-0.212	-0.603	0.137	0.209	0.345	0.233
Lombardia	0.137	-0.122	0.453	0.236	0.382	-0.083
London	-0.066	-0.286	-0.414	0.091	0.370	0.425
Lorraine	-0.490	-0.377	-0.266	0.001	0.001	0.001
Lubelskie	-0.351	-0.482	0.271	0.001	0.001	0.001
Lubuskie	-0.479	-0.319	0.618	0.600	-0.100	0.200
Lüneburg	0.237	0.568	0.543	0.445	0.224	-0.242
Luxembourg	0.153	0.194	0.603	-0.200	-0.900	0.001
Luxembourg (Grand-Duché)	0.502	0.227	0.560	0.600	-0.200	-0.400
Małopolskie	0.002	-0.481	0.129	0.205	0.103	0.317
Malta	-0.952	-0.661	-0.067	0.482	0.018	0.350
Marche	0.467	0.113	-0.587	0.218	0.273	0.283
Martinique	-0.409	-0.227	0.184	-0.245	-0.661	-0.167
Mazowieckie	-0.228	-0.554	0.129	0.700	0.648	0.750
Mecklenburg-Vorpommern	0.495	-0.261	0.259	0.001	0.345	0.083
Mellersta Norrland	0.061	-0.159	-0.143	0.627	0.055	-0.067
Midi-Pyrénées	-0.157	-0.192	-0.432	0.657	-0.100	0.200
Midtjylland	-0.298	0.164	-0.273	0.382	0.418	-0.083
Mittelfranken	0.688	0.519	0.505	0.600	-0.100	0.200
Molise	-0.030	0.398	0.599	-0.200	0.100	-0.800
Moravskoslezsko	0.180	-0.105	-0.221	0.336	0.297	0.150
Münster	-0.320	-0.554	0.131	-0.009	0.176	-0.117

	Pearson's *r*			Spearman's ρ		
Namur	0.192	-0.001	-0.579	0.029	-0.100	-0.400
Niederbayern	-0.161	-0.479	-0.473	0.482	0.527	0.567
Niederösterreich	0.581	0.448	0.399	-0.143	-0.200	-0.400
Noord-Brabant	-0.062	-0.080	-0.236	-0.145	0.370	0.083
Noord-Holland	0.415	-0.388	-0.107	0.091	0.055	0.542
Nord - Pas-de-Calais	0.032	-0.096	-0.347	0.073	-0.188	-0.550
Nord-Est	-0.058	-0.018	0.828	0.473	-0.006	-0.317
Nordjylland	-0.243	-0.612	-0.892	0.341	-0.091	-0.267
Nord-Vest	-0.107	-0.337	-0.077	0.600	0.300	0.200
Norra Mellansverige	0.118	-0.136	-0.199	0.445	0.067	0.317
Norte	0.317	0.423	0.051	0.355	0.067	0.292
North East (UK)	0.285	-0.146	-0.365	0.659	0.321	0.425
North West (UK)	0.230	-0.409	-0.421	-0.036	-0.503	-0.183
Northern Ireland	0.264	-0.199	-0.612	0.491	0.697	0.350
Notio Aigaio	0.560	0.061	-0.409	0.082	-0.588	-0.600
Nyugat-Dunántúl	0.550	-0.048	0.159	0.001	0.001	0.001
Oberbayern	-0.759	-0.645	-0.506	-0.400	-0.345	-0.650
Oberfranken	0.520	0.374	0.559	0.682	0.648	0.800
Oberösterreich	0.717	0.559	0.698	-0.029	-0.300	0.001
Oberpfalz	0.476	0.504	0.662	-0.218	0.091	-0.333
Oost-Vlaanderen	0.598	0.230	-0.101	0.518	-0.297	-0.367
Opolskie	-0.201	-0.446	0.116	0.150	-0.115	0.192
Östra Mellansverige	0.234	0.218	0.192	-0.429	-0.700	-0.800
Overijssel	-0.169	0.410	0.222	0.001	0.001	0.001
Övre Norrland	0.429	0.255	0.184	0.371	-0.100	0.200
País Vasco	-0.443	-0.344	0.089	0.257	-0.100	0.200
Pays de la Loire	0.478	-0.012	-0.628	0.245	0.030	0.175
Peloponnisos	0.530	0.105	-0.421	-0.491	-0.152	-0.233
Picardie	-0.165	-0.014	0.036	0.491	0.588	0.300
Piemonte	0.178	0.127	0.178	0.309	0.127	-0.050
Podkarpackie	0.177	-0.238	0.325	0.257	-0.400	0.400
Podlaskie	0.259	-0.448	0.194	-0.555	-0.770	0.001
Pohjois-Suomi	0.219	0.413	0.184	0.001	0.001	0.001
Poitou-Charentes	0.337	-0.366	-0.605	0.600	-0.100	0.200
Pomorskie	-0.105	-0.513	0.222	-0.145	-0.552	0.217
Praha	0.209	-0.283	-0.211	0.327	0.636	0.550

	Pearson's *r*			Spearman's ρ		
Principado de Asturias	-0.572	-0.353	0.249	0.736	0.467	0.567
Provence-Alpes-Côte d'Azur	0.490	-0.230	-0.711	0.491	0.006	-0.233
Provincia Autonoma Bolzano	0.528	0.597	0.241	-0.400	-0.552	-0.700
Provincia Autonoma Trento	0.290	0.162	0.298	0.464	-0.406	-0.533
Puglia	0.407	0.468	0.160	0.455	-0.055	-0.150
Região Autónoma da Madeira	0.266	0.526	0.075	-0.173	-0.176	-0.200
Região Autónoma dos Açores	0.103	0.310	0.218	0.036	-0.285	0.767
Región de Murcia	-0.312	-0.014	0.376	0.391	0.188	-0.050
Réunion	-0.186	-0.292	0.226	0.486	-0.300	0.400
Rheinhessen-Pfalz	0.146	0.407	0.174	0.659	-0.115	-0.233
Rhône-Alpes	-0.645	-0.723	0.024	0.001	0.001	0.001
Saarland	0.149	-0.375	0.286	0.309	0.115	0.317
Sachsen-Anhalt	0.116	0.213	-0.250	0.709	0.176	0.600
Salzburg	0.769	0.538	0.586	0.177	0.200	0.333
Sardegna	-0.150	0.273	0.229	0.509	0.394	0.750
Schleswig-Holstein	-0.043	-0.077	0.271	0.143	-0.200	-0.400
Schwaben	0.215	-0.276	0.279	0.391	-0.091	-0.367
Scotland	-0.052	-0.303	-0.403	0.791	0.685	0.600
Severen tsentralen	-0.772	0.453	0.096	-0.486	-0.300	0.200
Severoiztochen	-0.426	-0.529	0.137	0.264	-0.030	0.458
Severovýchod	-0.958	-0.910	-0.617	0.200	0.430	0.317
Severozápad	-0.243	-0.470	-0.501	0.459	-0.055	-0.283
Severozapaden	-0.273	-0.481	0.129	0.886	0.800	0.600
Sicilia	-0.034	0.106	0.209	0.205	0.418	0.258
Sjælland	-0.351	-0.482	0.271	0.509	0.200	0.325
Śląskie	-0.065	-0.556	0.086	0.001	0.001	0.001
Småland med öarna	0.089	-0.092	-0.060	0.182	-0.370	0.167
South East (UK)	-0.019	-0.399	-0.510	0.500	-0.333	0.008
South West (UK)	-0.106	-0.427	-0.488	0.100	-0.261	-0.167
Southern and Eastern	0.426	0.195	0.659	0.055	0.127	0.417
Steiermark	0.700	0.625	0.453	-0.943	-0.600	0.400
Sterea Ellada	0.579	0.164	-0.273	0.755	0.673	0.433
Stockholm	0.038	0.489	0.401	0.336	-0.030	0.500

	Pearson's *r*			Spearman's ρ		
Stredné Slovensko	-0.943	-0.640	-0.315	-0.282	0.152	-0.183
Střední Čechy	-0.404	-0.492	-0.220	0.829	0.001	0.400
Střední Morava	-0.061	-0.697	-0.214	0.001	0.001	0.001
Stuttgart	-0.158	0.105	0.293	-0.055	-0.188	-0.150
Sud - Muntenia	-0.397	0.423	0.051	0.036	0.224	-0.450
Sud-Est	-0.264	0.486	0.156	0.001	0.001	0.001
Sud-Vest Oltenia	-0.367	0.405	0.117	0.001	0.001	0.001
Świętokrzyskie	0.374	-0.002	0.734	-0.373	-0.321	-0.100
Syddanmark	-0.108	0.131	0.058	-0.355	-0.297	0.001
Sydsverige	0.419	0.337	0.645	-0.618	-0.612	-0.667
Thessalia	0.537	0.118	-0.422	0.182	0.285	0.583
Thüringen	0.416	0.280	0.594	-0.055	0.273	-0.083
Tirol	0.787	0.480	0.563	0.482	0.091	0.300
Toscana	0.209	0.297	-0.294	0.100	-0.103	-0.483
Trier	0.261	0.295	0.114	-0.200	0.001	0.800
Tübingen	-0.448	-0.468	-0.835	-0.714	0.200	0.001
Umbria	0.743	0.044	-0.618	0.268	0.418	0.225
Unterfranken	0.160	0.402	0.002	-0.218	0.406	0.275
Utrecht	0.558	-0.610	-0.468	-0.095	0.042	-0.033
Valle d'Aosta	-0.358	0.018	0.661	0.541	0.527	0.375
Västsverige	0.543	0.396	0.023	0.445	0.394	-0.217
Veneto	0.216	0.511	0.410	0.543	-0.100	0.001
Vest	-0.375	-0.638	-0.464	0.209	0.406	0.408
Vlaams-Brabant		-0.640	-0.315	-0.771	-0.900	-0.600
Vorarlberg	0.598	0.485	0.435	-0.655	-0.648	-0.733
Voreio Aigaio	0.508	0.086	-0.378	0.023	-0.527	0.258
Východné Slovensko	0.107	-0.875	-0.621	-0.218	-0.261	-0.142
Vzhodna Slovenija	-0.015	-0.195	0.279	0.714	0.261	0.383
Wales	-0.015	-0.477	-0.587	-0.143	-1.000	-1.000
Warmińsko-mazurskie	-0.231	-0.577	0.209	-0.286	-0.309	0.275
Weser-Ems	0.156	-0.611	-0.022	0.264	-0.164	-0.433
West Midlands	-0.016	-0.383	-0.426	-0.145	0.079	0.167
West-Vlaanderen	0.293	-0.081	-0.249	0.382	0.018	0.083
Wielkopolskie	-0.276	-0.718	-0.031	0.055	-0.164	0.792
Wien	0.778	0.679	0.713	-0.245	-0.212	-0.700

	Pearson's *r*			Spearman's ρ		
Yorkshire and The Humber	-0.010	-0.443	-0.541	0.527	0.418	0.067
Yugoiztochen	-0.522	-0.605	-0.138	0.100	0.491	-0.133
Yugozapaden	-0.214	-0.487	-0.425	-0.400	-0.152	-0.850
Yuzhen tsentralen	-0.563	-0.600	-0.209	0.543	-0.200	-0.400
Zachodniopomorskie	0.020	-0.467	-0.041	-0.257	-0.300	0.400
Zahodna Slovenija	-0.012	0.277	0.481	0.441	-0.030	-0.067
Západné Slovensko	0.326	-0.638	-0.464	0.657	0.300	-0.400
Zeeland	-0.500	-0.337	0.287	0.241	0.782	0.117
Zuid-Holland	0.222	0.426	0.078	0.300	0.152	0.400