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Regional Knowledge Scorecards

(Deliverable 2.3)

FP6 – 2004-KNOW-REG-2 REGIONS OF KNOWLEDGE 2

MIRIAD: Managing and Infusing Research Investment And Development

Project Participants

Partic. Role	Partic. no.	Participant name	Participant short name	Country	Date enter project	Date exit project
CO	1	University of Sheffield Management School	USFD	UK	1	24
CR	2	South East European Research Centre	SEERC	Greece	1	24
CR	3	Chamber of Commerce University Istanbul	ITICU	Turkey	1	24
CR	4	University of National and World Economy Sofia	UNWE	Bulgaria	1	24

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1. Introduction

This report represents Deliverable 2.3 of the MIRIAD project, which consists of the Regional Knowledge Scorecards for each of the four participating regions. The objective of this deliverable is to present the data collected in Deliverables 2.1 and 2.2 in a concise, digestible and informed format that can be made available to the relevant stakeholders in each region. Each scorecard is based on a common framework and template as follows:

- Regional Overview
- Competitiveness
- R&D Investment
- Knowledge Supply and Creation
- Knowledge Demand and Absorption
- Knowledge Transfer and Flow
- Regional Knowledge Model
- Summary of Indicators.

The remainder of this deliverable consists of the following:

- Chapter 2 – Yorkshire and the Humber (UK) Regional Knowledge Scorecard.
- Chapter 3 - Central Macedonia and East Macedonia-Thrace (Greece) Regional Knowledge Scorecard.
- Chapter 4 – Thrace (Turkey) Regional Knowledge Scorecard.
- Chapter 5 - South and East Bulgaria (Bulgaria) Regional Knowledge Scorecard.
- Chapter 6 – Comparison and Conclusions

YORKSHIRE
REGIONAL KNOWLEDGE
SCORECARD

2.1 Regional Overview

The Yorkshire and Humber region is located in the North of England covering 15,413 sq km, constituting 6.3% of the landmass of England. It stretches from Northallerton in the north to Sheffield in the south and from Settle in the west to Grimsby in the east and includes the four sub-regions of Humber, North, West and South Yorkshire. The region has a population of around 5 million people, many of whom live in the major cities: Bradford; Leeds; York; Sheffield; and, Hull. There is a working age population of 3 million with 2.3 million economically active adults earning an average gross weekly wage of £425.51 (compared with £475.08 for the UK average). There are approximately 167,000 businesses and the regional Gross Value Added (GVA) in 2004 was £71.3 billion or £14,222 per head compared with the UK average of £16,339.

The region has a developed infrastructure including: the largest port complex in the UK, which includes the Humber ports of Goole, Grimsby, Immingham and Hull, handling over 78 million tonnes of freight; three international airports (Leeds Bradford; Humberside; Robin Hood Doncaster Sheffield); key road links between the North and South (A1; M1) and the West and East (M62); and, fast rail links.

The industrial history of the region has a mining and farming legacy which can be traced back to before 500BC (iron-ore being mined by the Celts from 500BC and lead by the Romans after 71AD). Shortly before the industrial revolution in the 16th Century Yorkshire and Humber boomed, partly as consequence of the wool industry which was concentrated in West Yorkshire. Leeds flourished, Wakefield and Halifax became dominated by the cloth industry and Sheffield was already becoming known for its cutlery. A further major growth period occurred in the 18th Century led by the wool industry, Leeds and other wool towns grew rapidly as did Sheffield, Huddersfield and Hull. It was during this period that the coal mining industry also became a major contributor to regional prosperity and the transport infrastructure were improved via canals and turnpike roads.

Early tourism also grew in the spa towns of Harrogate and Scarborough where people drank mineral water and bathed. In the 19th Century during the industrial revolution the textile, steel and coal industries all grew rapidly making the region a major contributor to the UK's prosperity, although the quality of life deteriorated.

The industrial base being focused on heavy industry and textiles led to mass unemployment during the 1920s and 1930s, as these industries began to decline. Up until the present day the decline of traditional industries has continued and a restructuring of the economy has been ongoing. During the period 1994 to 1999 parts of Yorkshire were classed as an underdeveloped region of the European Union receiving Objective 2 status and considerable effort has been expended on reversing the effects of industrial decline. Some areas have begun to recover; Leeds in particular has grown to become the northern hub for the UK's financial and legal industries. At present South Yorkshire, however, continues to decline (and now receives EU Objective 1 status), having a Gross Domestic Product which is less than 75% of the European average.

2.2 Competitiveness

As shown by Table 2.1, the competitive of the economy of the Yorkshire and the Humber region lags behind that of the UK as a whole, as well as that of the EU. A key issue for the future competitiveness of the region is addressing the relatively low levels of labour productivity. Labour productivity is largely determined industrial structure, especially its knowledge intensity, and the effectiveness of human capital deployment.

Unpacking some of the constituent variables of competitiveness, we find that the Gross Domestic Product (GDP) per head of population in Yorkshire and the Humber is 3,112.70 Euros less than the UK average. Also, Gross Monthly Earnings statistics indicates that the pay gap between Yorkshire and the Humber and the UK as a whole is 106 Euros per month. Undoubtedly the key reason why these gaps have increased is that the relatively rich regions in the south-eastern regions of England have increased their wealth and prosperity at a faster rate than other regions of the UK.

Table 2.1: Key Competitiveness Indicators

Indicator	Yorkshire and the Humber	UK	EU-25 Regional Mean Average
European Competitiveness Index (2004, Index Score)	77.5	99.2	100.0 (EU-15)
Gross Domestic Product per Capita (2002, Euros)	21,832.4	24,945.1	20,6850
Labour Productivity (2002, Euros)	43,285.0	46,917.4	45,535.2
Unemployment Rate (2004, %)	4.6	4.7	9.0
Economic Activity Rates (2004, %)	61.0	61.9	57.5
Mean Gross Monthly Earnings (2002, Euros)	2,242	2,348	1,887

Sources: Office for National Statistics, Department of Trade and Industry, Huggins and Davies (2005)

Table 2.2 presents SWOT summary of the competitiveness of the Yorkshire and the Humber economy. It highlights the continuing threat of the emerging economies of eastern Europe and Asia, as well signalling a potential opportunity through improving interaction and connectivity with other regions in northern England. Improved inter-regional linkage across northern England is currently a key feature of the UK Government's regional policies.

Table 2.2: Competitiveness SWOT Summary

Strengths	Improving economic participation and falling unemployment rates, in line with general improvements across the UK.
Weaknesses	Low productivity as a continuing legacy of industrial restructuring. One of the UK's least competitive regions.
Opportunities	Potential to improve linkages and interaction within other regions in Northern England to form an alternative economic powerhouse to London and South East England.
Threats	The emerging economies of Asia and especially those in Eastern Europe are a real threat to the region's manufacturing sector, as well as some service sectors activities.

The key stakeholders in relation to improving the competitiveness of the Yorkshire and the Humber region are the UK National Government, Yorkshire Forward (the regional development agency), and the Government Office for Yorkshire and the Humber. In essence, much of the implementation of regional competitiveness policy is coordinated and implemented via Yorkshire Forward.

Table 2.3: Role of Key Competitiveness Stakeholders

Stakeholder	Role
UK National Government	Stimulate and improve the competitiveness of the UK economy as whole, with the lead role taken by the UK's Government Department of Trade and Industry
Yorkshire Forward	Regional development agency responsible for establishing and implementing the economic development strategy for the Yorkshire and Humber region.
Government Office for Yorkshire and the Humber	Government Office for Yorkshire and The Humber (GOYH) works with regional partners to improve the economic performance of the region. This includes sponsorship of Yorkshire Forward improving the skills of the regional workforce and facilitating work in enterprise.

Table 2.4 summarises the key competitiveness policies impacting on the Yorkshire and the Humber region. The National Government is attempting to strengthen regional policymaking mechanisms through devolved decision-making mechanisms, especially through the empowerment of institutions such as regional development agencies. The key competitiveness policy for Yorkshire and the Humber is undoubtedly its regional economic strategy, which is largely implemented via Yorkshire Forward.

Table 2.4: Summary of Key Competitiveness Policies

Policy	Objectives
Devolving decision making: - Meeting the regional economic challenge:	All cities and regions must lift their economic performance, building on the foundations of macroeconomic stability, through enhanced employment and productivity growth, tackling the drivers of productivity – skills, investment, innovation, enterprise and competition. As many economic challenges cut across administrative boundaries, greater collaboration between key stakeholders such as RDAs, local authorities, government offices and regional assemblies, will reap economic rewards.
Yorkshire and the Humber Regional Economic Strategy	This Strategy is a road map showing how Yorkshire and Humber aims to grow faster and better than its main competitors by 2015. It explains what the region needs to do to grow, how it will be done and who will be responsible for delivery. The region seeks high quality, sustainable growth that will maximise long-term benefits to businesses, people and to the environment.

2.3 R&D Investment

The key R&D investment indicators for Yorkshire and the Humber are summarised by Table 2.5. It is clear that the region possesses an R&D investment gap when compared with the UK and EU averages. In particular, the region has a major structural deficit in terms of the expenditure on R&D undertaken by the business sector. This highlights the R&D challenge the region is facing, and encapsulates the reasoning behind a requirement for policy intervention. More positively, there is significant R&D spending undertaken by the region's higher education sector, which is higher than the EU average and only slightly lower than the UK average.

Table 2.5: Key R&D Investment Indicators

Indicator	Yorkshire and the Humber	UK	EU-25 Regional Mean Average
R&D Expenditure by Business (2004, Euros per inhabitant)	105.2	317.2	230.5
R&D Expenditure by Government (2004, Euros per inhabitant)	36.9	46.6	48.0
R&D Expenditure by Higher Education (2004, Euros per inhabitant)	96.0	103.0	87.7

Source: Department of Trade and Industry

Table 2.6 presents a SWOT summary of Yorkshire and the Humber's R&D investment. It further highlights the potential to fully exploit the R&D capabilities and commercialisation potential of the region's higher education sector. The potential problem in relation to regional intervention is the dependency on national institutions and decision-making authorities as the main funders of higher education research.

Table 2.6: R&D Investment SWOT Summary

Strengths	Relative strong higher education sector, with a core of world-class research establishments.
Weaknesses	A clear lack of R&D investment by the business sector, which is largely dominated by SMEs.
Opportunities	The potential to build on the R&D undertaken by the region's higher education sector, so as to fully exploit its latent commercialisation capacity.
Threats	The dependency of UK government policies as the key funder of higher education research in the region.

As shown by Table 2.7, the key stakeholders involved in policies relating to R&D investment are the UK National Government, Yorkshire Forward and Yorkshire

Science. Yorkshire is a relatively new incarnation, but is increasingly set to become the key player responsible for science and innovation strategy development in the region. Yorkshire Forward, as the region's primary economic development institution, has recognised the region's R&D investment deficit and has set a broad target of doubling the level of current investment in the coming years.

Table 2.7: Role of Key R&D Investment Stakeholders

Stakeholder	Role
UK National Government	The Government's aim is that the UK should be a 'partner of choice' for global businesses looking to locate their research and development (R&D), and for foreign universities seeking collaboration with the science base or business.
Yorkshire Forward	Key Objective is to double R&D expenditure from 0.5% of GVA in 2002 to at least 1% of regional GVA.
Yorkshire Science	Yorkshire Science is the Science and Innovation Council established to deliver commercial value from science and innovation in the Yorkshire and Humber region.

R&D investment policies impacting on the Yorkshire and Humber region are double pronged. First, there is national policy intervention in the form of the UK Science & Innovation Investment Framework 2004 – 2014, which aims to increase the level of knowledge intensity in the UK (as measured by the ratio of R&D across the economy to national gross domestic product), from its current level of around 1.9 per cent to 2.5 per cent by around 2014. Second, there is the emerging Yorkshire Innovation and Science Strategy, which aims to provide more coordinated regional intervention, from both a demand and supply perspective, with regard to linking the science and industrial base of Yorkshire and the Humber.

Table 2.8: Summary of Key R&D Investment Policies

Policy	Objectives
UK Science & Innovation Investment Framework 2004 - 2014	The Government's long-term objective for the UK economy is to increase the level of knowledge intensity in the UK (as measured by the ratio of R&D across the economy to national gross domestic product), from its current level of around 1.9 per cent to 2.5 per cent by around 2014.
Yorkshire Innovation and Science Strategy	Demand side Provision– Targeted business support programmes; Supply side Provision– Access to the science base; Embedding a Culture of Innovation; and Investment for Business Growth.

2.4 Knowledge Supply and Creation

Table 2.9 presents some of the key measurable and available indicators of knowledge supply and creation. Although the level of patent applications is marginally lower than the UK and EU averages, there is a relative dearth of workers employed in an R&D function across the Yorkshire and the Humber economy. The marked exception here are R&D employment levels in the higher education sector, which is above the EU average and only slightly below that for the UK as a whole. In general, it is clear that within the region the higher education sector is the key driver of knowledge supply and creation, and it can be speculated (although not proven at this point) that much of the regional patent application activity emanates from this sector.

Table 2.9: Key Knowledge Supply and Creation Indicators

Indicator	Yorkshire and the Humber	UK	EU-25 Regional Mean Average
Patents (2003, Patent Applications per Million Inhabitants)	51.3	59.4	58.0
R&D Employment by Business (2003, Employees per 1,000 Inhabitants)	1.3	2.7	2.2
R&D Employment by Government (2003, Employees per 1,000 Inhabitants)	0.1	0.4	0.7
R&D Employment by Higher Education (2003, Employees per 1,000 Inhabitants)	1.6	1.7	1.4

Sources: Department of Trade and Industry

Table 2.10 presents a SWOT summary of knowledge supply and creation in the Yorkshire and the Humber region. The main finding of the SWOT is the current onus on the higher education sector in the region. However, it should be recognised that the apparent regional strength of this sector is somewhat relative rather than absolute, being largely the result of the lack of capacity visible in other parts of either the private or public sector within the region.

Table 2.10: Knowledge Supply and Creation SWOT Summary

Strengths	Knowledge creation and supply capacity of the higher education sector.
Weaknesses	Very low levels of R&D employment and activity in the business and government sectors.
Opportunities	To stimulate the transfer of knowledge from the higher education sectors to the business community.
Threats	The ability and willingness of the region's higher education sector to prioritise regional knowledge transfer activities.

Within the Yorkshire and the Humber regions, the key stakeholders responsible for knowledge supply and creation are within the region's higher education sectors. In particular, a group of regionally 'elite' universities – Leeds, Sheffield and York – appear to be the key drivers of knowledge creation, accounting for a large proportion of the sector's research spend within the region.

Table 2.11: Role of Key Knowledge Supply and Creation Stakeholders

Stakeholder	Role
Higher Education Institutions	The region is the home of 14 HEIs, eight of which are involved in high level research and already have strong links to industry.
White Rose University Consortium	A strategic partnership between Yorkshire's research-intensive universities of Leeds, Sheffield and York and accounts for 86% of the region's research spend.

As shown by Table 2.12, the key policies relating to knowledge supply and creation are unsurprisingly those involving the region's higher education sector. The overarching regional framework set by the sector is the strategic plan signed-up to by the region's universities. A key feature of this plan is to ensure that the region's higher education sectors is represented by and contributes to the regional and sub-regional agenda, as well as providing an intelligence gateway for and about higher education in the region. These policies are also recognised by the group of 'elite' universities, as part of the White Rose Research Triangle, and within the region's overall economic strategy.

Table 2.12: Summary of Key Knowledge Supply and Creation Policies

Policy	Objectives
Yorkshire Universities - Strategic Plan 2004-2007	Promoting collaboration which benefits higher education and the region. To promote the region's HEIs as providers of world-class knowledge and learning opportunities which contribute to sustainable regional growth and development. To ensure that HEIs are represented by and contribute to the regional and sub-regional agenda. To provide an intelligence gateway for and about HE in the region. To provide a forum for sharing, communicating and disseminating good practice in HE. To facilitate the development and delivery of collaborative policies and projects.
White Rose Research Triangle	To proactively develop strategic partnerships that have the capability of delivering flagship initiatives which raise the national and international profile of the Universities and other key stakeholders.
Priority from the Regional Economic Strategy	Continue to make significant investment in key areas of emerging technologies and exploitation and commercialisation of the science base.

2.5 Knowledge Demand and Absorption

Knowledge demand and absorption is necessarily a difficult area of analysis and measurement. At a regional level, the best available indicators relate to industrial structure and the human capital capacity of the existing workforce. Industrial structure analysed in terms of the knowledge intensity of the region's businesses is a useful indicator of the potential demand for knowledge, while human capital capacity indicators are able to monitor the likely ability to absorb appropriate knowledge. As shown by Table 2.13, the proportion of businesses within the Yorkshire and the Humber economy operating within knowledge-based sectors is significantly below the UK average. This strongly suggests that knowledge demand in the region is potentially weak, particularly in relation to the UK economy as a whole. Also, the higher order skills capacity of the region's workforce is below that of the UK as whole, indicating potential issues of the ability to absorb knowledge.

Table 2.13: Key Knowledge Demand and Absorption Indicators

Indicator	Yorkshire and the Humber	UK	EU-25 Regional Mean Average
Proportion of Knowledge-Based Businesses (2003, %)	15.6	21.2	N/A
Proportion of Workforce Educated to Degree Level in Science and Engineering (2004, % of workforce)	5.1	6.4	N/A
Proportion of Workforce Educated to Degree Level in Non-Science and Engineering Discipline (2004, % of workforce)	6.5	8.6	N/A
Proportion of Working Age Population with National Vocational Level 4 or Higher (2003, %)	22.3	25.1	N/A

Sources: Office for National Statistics, Department of Trade and Industry

Table 2.14 presents a SWOT summary of knowledge demand and absorption of the Yorkshire and the Humber region. Based on the apparent available evidence, it is suggested that the region faces a number of issues in this area that require addressing. At present, however, there is little substantive information of the complexities and specificities relating to these issues. It is the aim of the forthcoming workpackages of the Miriad initiative to provide and gather more detailed evidence in this area, so as to fully inform regional R&D investment strategy making.

Table 2.14: Knowledge Demand and Absorption SWOT Summary

Strengths	Although, knowledge absorption capacity – as measured by workforce skills base – is below the UK average, efforts are on-going to rectify this situation.
Weaknesses	The proportion of businesses likely to demand knowledge – as measured by the proportion of knowledge-based businesses within the region’s economy.
Opportunities	To build the quantity and quality of the knowledge demanded by the region’s large SME base.
Threats	A continuing inability of many firms to be aware of the need for knowledge to stimulate their innovation capability and overall competitiveness.

Knowledge demand and absorption is largely lies with the strategies pursued by the region’s business community. This community is represented at the regional (and national) level by a number of ‘umbrella’ institutions, the most important of which are the Chambers of Commerce, the Confederation of British Industry, and the Federation of Small Businesses.

Table 2.15: Role of Key Knowledge Demand and Absorption Stakeholders

Stakeholder	Role
Chambers of Commerce	Representative organisation for the region’s business community
Confederation of British Industry	Representative organisation for the region’s key businesses and organisations
Federation of Small Businesses	Representative organisation for the region’s small and medium sized businesses

Within both the UK and Yorkshire and the Humber, policies relating to knowledge demand and absorption tend to be an implicit feature of other policies targeted at the private sector, rather than explicit policies in themselves. At a national level, R&D policies in the form of tax credits and co-funded R&D initiatives are one implicit measure aimed at stimulating knowledge demand. Another is the Small Business Research Initiative, which is attempting to improve the knowledge and R&D interface between SMEs and the government. Within Yorkshire and the Humber, Yorkshire Forward’s cluster policy is an important potential means of improving the knowledge demand absorption capacity of targeted businesses within the region.

Table 2.16: Summary of Key Knowledge Demand and Absorption Policies

Policy	Objectives
National R&D Policies	The instruments the Government uses to narrow the difference between the benefits to the economy and to the company of R&D, and to spread risk, include R&D tax credits, the Patent System and a number of DTI programmes to co-fund applied R&D.
Small Business Research Initiative (SBRI)	Established in 2001 to increase the success of smaller businesses in obtaining contracts from government bodies to conduct research and development.
Yorkshire Forward's Cluster Policy	Cluster action plans for key regional industries taking into account previous cluster experience, and bring together interventions on business support, innovation, enterprise, trade and investment, productivity, employment, inclusion, corporate social responsibility, and environment, energy and resource efficiency.

2.6 Knowledge Transfer and Flow

Specific indicators and measures of knowledge transfer and flow within the Yorkshire and the Humber region and with other regions are relatively few, and this is again an area future Miriad workpackages will aim to address. At the present, the best – and possible only – consistent and comparative data is that collected as part of the Third Community Innovation Survey. Some of the key findings of the survey are presented by Table 2.17, which shows that in general knowledge transfer and flow is low across both Yorkshire and the Humber and the UK as a whole, with only 10% and 11% respectively involved in cooperation arrangements for innovations. Of those businesses involved in cooperation, relatively few in Yorkshire and the Humber are linked into global knowledge transfer and flow networks, with the majority having links within the UK.

Table 2.17: Key Knowledge Transfer and Flow Indicators

Indicator	Yorkshire and the Humber	UK	EU-25 Regional Mean Average
Cooperation arrangements for innovation (CIS3, % enterprises)	10	11	N/A
Cooperation arrangements for innovation – Local Collaboration (CIS3, % enterprises engaged in cooperative innovation)	39	41	N/A
Cooperation arrangements for innovation – National Collaboration (CIS3, % enterprises engaged in cooperative innovation)	76	76	N/A
Cooperation arrangements for innovation – European Collaboration (CIS3, % enterprises engaged in cooperative innovation)	31	40	N/A
Cooperation arrangements for	17	29	N/A

innovation –United States Collaboration (CIS3, % enterprises engaged in cooperative innovation)			
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Source: Michie et al (2004) – adapted from CIS 3

Table 2.18 presents a SWOT summary of knowledge transfer and flow within the Yorkshire and Humber region. Overall, there is currently an evidence gap of the type of transferring occurring, its density and frequency, as well the flow directions. It is this evidence gap that Miriad aims to go some way to narrowing.

Table 2.18: Knowledge Transfer and Flow SWOT Summary

Strengths	Engagement in innovation cooperation by businesses only marginally lower than the UK average.
Weaknesses	Low level of engagement in international knowledge transfer practices.
Opportunities	To take advantage of the increasing public sector investment in knowledge transfer policies.
Threats	The unknown appropriateness of the potential knowledge that can be supplied with that being demanded.

As shown by Table 2.19, there is a relative plethora of stakeholders with some form of responsibility for knowledge transfer and flow within the Yorkshire and the Humber region. A number of these stakeholders are relatively new institutions, and there is little evaluative evidence of their performance. An exception here is the Business Link programme, which is the Government’s mainstream business support provider, which has received significant criticism of effectiveness and performance.

Table 2.19: Role of Key Knowledge Transfer and Flow Stakeholders

Stakeholder	Role
Centres of Industrial Collaboration	The network of Centres of Industrial Collaboration (CIC) was established by Yorkshire Forward to help businesses harness the innovation and expertise from universities within Yorkshire and Humber.
Business Links	Main business support providers in England, operating through a network of sub-regional offices. Overseen by the Small Business Service, which is itself an office of the Department of Trade and Industry.
KnowledgeRICH	Under European Innovative Actions programme Yorkshire Forward established a Regional Innovation Clearing House (RICH) to facilitate the dissemination and diffusion of available knowledge on key innovation assets.
Connect Yorkshire	Set up to support early stage high technology, high growth companies and unlock the full potential of the wealth of technology businesses in Yorkshire and Humber.

West Yorkshire Knowledge Exchange	Established to represent a central hub for the digital expertise, skill and resources present within the four West Yorkshire Universities.
Association for University Research and Industry Links (AURIL)	Professional association representing all practitioners involved in knowledge creation, development and exchange in the UK.
Yorkshire and Humberside Regional Technology Network	Exists to assist Business Support organisations in the Yorkshire and the Humber region develop and deliver an effective and cohesive range of services to support innovation and technology transfer amongst the region's businesses
Regional Science and Technology Parks	The region is home to six Science and Technology Parks. These parks focus on the incubation of innovative, high-growth, knowledge-based start-ups. They aim to provide an environment in which companies, regardless of size, can develop operational links with universities, higher education and research institutes.
Advanced Manufacturing Park	Provide a base for research organisations and high-tech industries. Provide high quality accommodation. Provide 'scope for technology interchange minimising risks and costs'. Target sectors such as aerospace, medical implants and automotive components which have been identified as technologies and companies likely to benefit from the 'clustering effect.'

The criticisms made of Business Link are important as it is the flagship government business support provider, with a significant remit for implementing policies linked to knowledge transfer to and from the business sector. At a regional level, Yorkshire Forward are engaged in trying to improve the local implementation of these policies, while Connect Yorkshire specifically concentration on regional technology-based knowledge transfer policies.

Table 2.20: Summary of Key Knowledge Transfer and Flow Policies

Policy	Objectives
National Business Link initiative	The Business Link service is a crucial part of the government's campaign to promote enterprise and to make the UK the 'best place in the world to start and grow a business'.
Yorkshire Forward's Business Support Policy	The region will work with government on simplifying business support services. This will be a key tool in driving up the quality, effectiveness and penetration of business support as well as making sure that public sector business support gets to the heart of business needs.
Connect Yorkshire	Connect Yorkshire runs a range of programmes designed to meet the interests and needs of high-tech entrepreneurial companies and professionals working with technology companies.

2.7 Regional Knowledge Model

Figure 2.1 presents a broad conceptualisation of knowledge creation, demand, transfer and flow based on the evidence collected to date. In summary, it highlights the following:

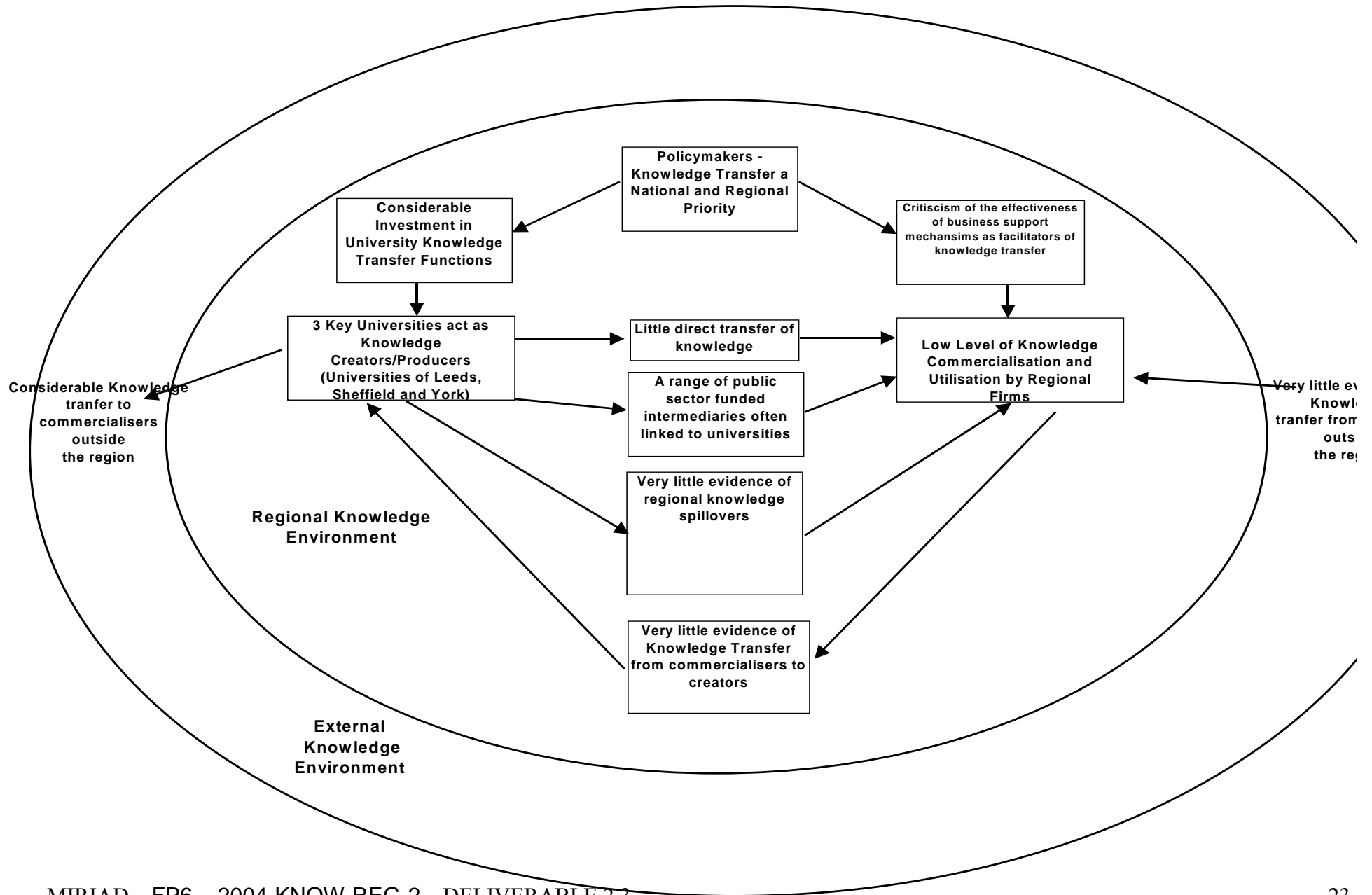
- Three key universities (Leeds, Sheffield and York) are the main visible knowledge creators within the region.
- These universities are engaged in considerable knowledge transfer with organisations external to the region.
- There is an apparent low level of knowledge commercialisation and utilisation by firms within the region.
- There is little evidence of direct knowledge transfer between the higher education and business communities.
- There is little evidence of business sector engagement with organisations external to the region.
- There is a range of public sector funded intermediaries, many of which are linked to the region's higher education sector.
- At both a national and regional level there is considerable investment in university knowledge transfer functions.
- There is criticism of the effectiveness of business support mechanisms as facilitators of knowledge transfer.
- There is little evidence of knowledge transfer from (potential) commercialisers to knowledge creators in the region.
- There is little evidence of regional knowledge spillovers.

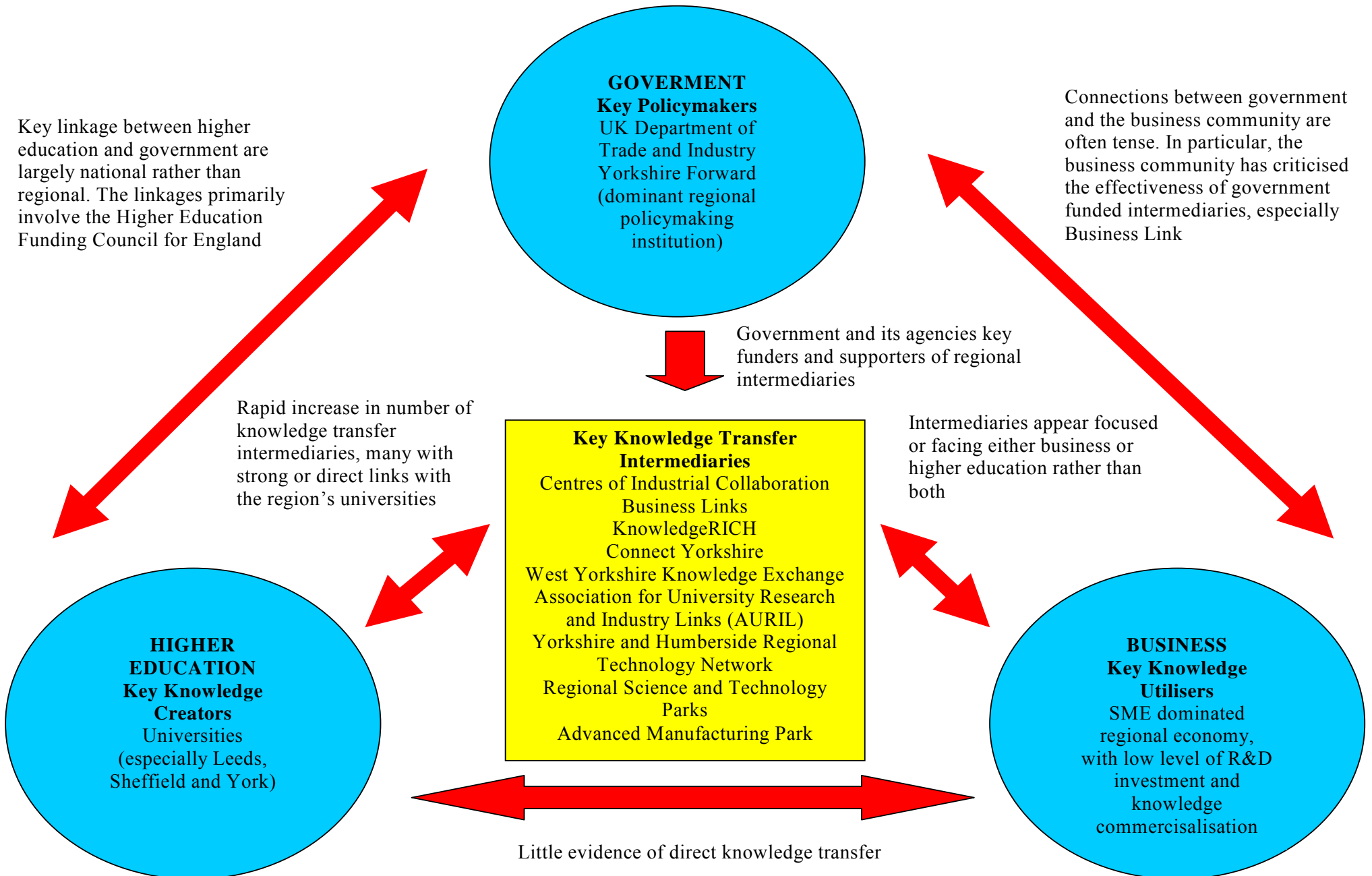
Figure 2.2 presents a further representation of knowledge flow within the region based on conceptualisation set within the framework of the Triple Helix model. From this conceptualisation the following is apparent within the Yorkshire and the Humber region:

- **Government** – key policymakers are the UK Department of Trade and Industry and Yorkshire Forward, which is the dominant policymaking institution in the region.
- **Business** – SME dominated regional economy with low levels of R&D investment and knowledge commercialisation.
- **Higher Education** – large-scale knowledge creation appears mainly restricted to a small number of higher education institutions.

- **Government-Higher Education Interface** - key linkages between higher education and government are largely national rather than regional. The linkages primarily involve the Higher Education Funding Council for England.
- **Higher Education-Business Interaction**– little evidence of direct knowledge transfer. Intermediaries act as key facilitators of this interaction, with government and its agencies being key funders and supporters of regional intermediaries. In general, there has been a rapid increase in number of knowledge transfer intermediaries, many with strong or direct links with the region's universities. Many intermediaries appear focused or facing either business or higher education rather than both.
- **Government-Business Interaction** - connections between government and the business community are often tense. In particular, the business community has criticised the effectiveness of government-funded intermediaries, especially Business Link.

Figure 2.1: Yorkshire's Knowledge Flow Model





2.8 Summary of Indicators

Table 2.11 presents a summary of the key benchmark indicators for the Yorkshire and Humber region.

Table 2.21: Summary of Key Benchmark Indicators for Yorkshire and the Humber

Indicator	Yorkshire and the Humber	UK	EU-25 Regional Mean Average
European Competitiveness Index (2004, Index Score)	77.5	99.2	100.0 (EU-15)
Gross Domestic Product per Capita (2002, Euros)	21,832.4	24,945.1	20,6850
Labour Productivity (2002, Euros)	43,285.0	46,917.4	45,535.2
Unemployment Rate (2004, %)	4.6	4.7	9.0
Economic Activity Rates (2004, %)	61.0	61.9	57.5
Mean Gross Monthly Earnings (2002, Euros)	2,242	2,348	1,887
R&D Expenditure by Business (2004, Euros per inhabitant)	105.2	317.2	230.5
R&D Expenditure by Government (2004, Euros per inhabitant)	36.9	46.6	48.0
R&D Expenditure by Higher Education (2004, Euros per inhabitant)	96.0	103.0	87.7
Patents (2003, Patent Applications per Million Inhabitants)	51.3	59.4	58.0
R&D Employment by Business (2003, Employees per 1,000 Inhabitants)	1.3	2.7	2.2
R&D Employment by Government	0.1	0.4	0.7

(2003, Employees per 1,000 Inhabitants)			
R&D Employment by Higher Education (2003, Employees per 1,000 Inhabitants)	1.6	1.7	1.4
Proportion of Knowledge-Based Businesses (2003, %)	15.6	21.2	N/A
Proportion of Workforce Educated to Degree Level in Science and Engineering (2004, % of workforce)	5.1	6.4	N/A
Proportion of Workforce Educated to Degree Level in Non-Science and Engineering Discipline (2004, % of workforce)	6.5	8.6	N/A
Proportion of Working Age Population with National Vocational Level 4 or Higher (2003, %)	22.3	25.1	N/A
Cooperation arrangements for innovation (CIS3, % enterprises)	10	11	N/A
Cooperation arrangements for innovation – Local Collaboration (CIS3, % enterprises engaged in cooperative innovation)	39	41	N/A
Cooperation arrangements for innovation – National	76	76	N/A

Collaboration (CIS3, % enterprises engaged in cooperative innovation)			
Cooperation arrangements for innovation – European Collaboration (CIS3, % enterprises engaged in cooperative innovation)	31	40	N/A
Cooperation arrangements for innovation –United States Collaboration (CIS3, % enterprises engaged in cooperative innovation)	17	29	N/A

Sources: Office for National Statistics, Department of Trade and Industry, Huggins and Davies (2005), Michie et al (2004) – adapted from CIS3

CENTRAL MACEDONIA AND EAST
MACEDONIA THRACE

REGIONAL KNOWLEDGE
SCORECARD

3.1 Regional Overview

The regions of Central Macedonia (CM) and East Macedonia-Thrace (EMTH) are NUTS 2 regions contained within the region of Northern Greece (Voreia Ellada) at NUTS 1 level. They engulf the following prefectures that are ranked according to GDP p.c. and contribution to GDP at national level:

Regions and their Prefectures (2004)	GDP p.c. (000s)	Rank	Contribution to GDP	Rank
Central Macedonia	13,9	6	17,6	2
Thessaloniki	15,2	5	11,7	2
Serres	8,9	47	1,2	16
Kilkis	11,6	23	0,7	34
Pella	9,6	42	1	24
Imathia	10,8	34	1,1	20
Pieria	9,1	45	0,8	30
Chalkidiki	13,9	11	1	25
East Macedonia & Thrace	10,5	12	4,2	10
Drama	8,2	49	0,6	38
Kavala	11,3	27	1,1	19
Xanthi	8,9	46	0,7	37
Rodopi	8,5	48	0,7	36
Evros	11,2	29	1,2	17
<i>The ranking for the regions refers to 13 regions, while ranking for prefectures to 52</i>				
Source: Nomoi, 2006				

Source: Eurostat

All prefectures in both regions with the exception of Thessaloniki that is the second to fifth most evolved in the country after Athens (Attiki) are lagging behind the national averages regarding most economic, infrastructure and social indicators. Apart from Thessaloniki whose economy is quite broad based the other prefectures have a sectoral specialisation that focuses on traditional sectors (textiles-clothing, food processing, furniture, plastics, timber) dominated mostly by small firms where the agricultural production has a higher relative economic weight and their services sectors are dominated by public administration and the broader public sector.

Although various versions of the Development Law have provided special subsidation incentives for these regions the revival of economic activity that was observed in the 1980s for most prefectures was not long lasting and unemployment rates currently surpass the national average by around 30%. Most funding for the regions is provided by the Regional and the National Operating Programs that both include very significant EU contributions via the CFS Programs.

Although the regions are geographically well placed to act as regional economic and infrastructure hubs so far they have mostly shed employment from the transfer of traditional enterprises to neighbouring low wage economies and have not been able to replace the gap with more modern economic activities. The growing restrictions placed by the Common Agricultural Policy (CAP) and the liberalisation of the textiles market are expected to continue to place economic pressure on the regions resources and competitiveness. The upgrading of the road and rail regional infrastructure has

been significant in recent years and more is expected to take place with the completion of Egnatia Roadworks and the upgrading of the regions ports as the Burgas-Alexandroupolis gas and oil pipelines are being completed.

3.2 Competitiveness

As shown by Table 3.1, the competitiveness of the economy of CM and EMTH lags behind the national average and more so with respect to the EU. The high unemployment rates are a key issue that at least for the region of EMTH are related to the low productivity and the same applies for most parts of CM if Thessaloniki was to be excluded. The weak economic structure, linked to traditional sectors with low knowledge intensity and less efficient human and physical capital deployment are the key factors.

Regarding the region of CM both Gross Domestic Product (GDP) per capita and Gross Monthly Earnings are close to the national average while EMTH and also most prefectures of CM lag by about 20-30%. An interesting point is that the economic activity rate at national is very much below the EU average due to the high unemployment and the low rate of participation in the workforce. The latter is related to lower participation rates for women and early retirement. Economic activity rates at regional level are probably lower (no recent data available), given that regional unemployment rates are higher than the national average and the region has a larger agrarian sector that usually implies a lower rate of womens' participation in the labour force

Table 3.1: Key Competitiveness Indicators

Indicator	Central Macedonia	East Macedonia & Thrace	GREECE	EU-25 Regional Mean Average
European Competitiveness Index (2004, Index Score)	N/A	N/A	43.5	100.0 (EU-15)
Gross Domestic Product per Capita (2002, Euros)	16,710	12,522	16,425	20,685
Labour Productivity (2002, Euros)	48	35,7	45.9	45.5
Unemployment Rate (2004, %)	10,1	11,9	10.3	9.0
Economic Activity Rates (2004, %)	N/A	N/A	51.9	57.5
Mean Gross Monthly Earnings (2002, Euros)	1,238	1,103	1,278	1,887

Source: Eurostat databanks on General and Regional Statistics, Huggins and Davies (2005)

Table 3.2 presents a SWOT summary of regional competitiveness for CM and EMTH. Improving regional infrastructure and positive trends in economic indicators over

recent years indicate potential for progress. Improvements in sectoral allocation coupled with gains in leaving standards and economic recovery in the broader region of SEE provide significant opportunities for regional synergies and amelioration of risks arising from regional antagonism and the pressures from a restrictive CAP. The role of Thessaloniki as a growth hub for the region as a whole could be vital.

Table 3.2: Competitiveness SWOT Summary

Strengths	Improving regional infrastructure and prospects for further gains in this area. Positive trends in various socio-economic indicators over the last decade indicate the presence of catch-up potential. Thessaloniki could act to boost growth for the region as a whole.
Weaknesses	Low productivity at prefecture level especially in EMTH and a weak economic structure reflected in stagnant employment rates.
Opportunities	Should the region improve its sectoral allocation combined with improving infrastructure and as the neighbouring countries are raising their leaving standards then there is significant upside potential. This could be more so if synergies are cemented between EMTH and CM as well as the broader SEE region
Threats	The neighbouring Balkan economies have placed pressure on traditional manufacturing sectors employment. Growing economic pressure is expected through CAP for the primary sector.

The key stakeholders in relation to improving the competitiveness of the regions of CM and EMTH are the National Government and the Regional Authorities of EMTH and CM. The regional competitiveness policy is primarily decided at national level and is implemented by the Regional Authorities through the Regional Operational Programs (ROP) and by the National Government through the National Operating Programs (NOP) as they are specified at regional context. The role of EU funding in both regional and national programs is very significant reaching in some cases 80% of the total.

Table 3.3: Role of Key Competitiveness Stakeholders

Stakeholder	Role
National Government	The key ministries are the Ministry for the Economy and the Ministry for Development with smaller contribution from the Ministry for Macedonia and Thrace (based in Thessaloniki).
Regional Authority of CM	The Regional Authority for CM is responsible for establishing in cooperation with national government and implementing the economic development strategy primarily through the ROP for the region of CM. Over the period 2007-13, CM has been upgraded to a Phasing-out region and will receive Eur1,562mn.
Regional Authority of EMTH	The Regional Authority for EMTH is responsible for establishing in cooperation with national government and implementing the economic development strategy primarily through the ROP for the region of EMTH. Over the period 2007-13, EMTH will remain an objective 1 region and will receive Eur420 2mn. The national total is Eur18167mn

Table 3.4 summarises the key competitiveness policies impacting on the regions of CM and EMTH. The National Government has over the past decade promoted the decentralisation process in line with EU objectives. A growing share of national funding has been shifting to regional level and there are efforts to strengthen regional policymaking mechanisms through devolved decision-making to Authorities at both Regional and Prefectures levels. The key competitiveness policy tools for CM and EMTH are the ROPs, implemented via the respective regional authorities.

Table 3.4: Summary of Key Competitiveness Policies

Policy	Objectives
Devolving decision making: - Meeting the regional economic challenge:	The gradual decentralisation of decision-making and particularly implementation of public investment strategies and projects have been a key development over the past decade. More and more policies that were only understood at national level are currently requiring implementation at both prefecture and regional level. This has led to the creation of new institutions like Regional Development Companies and other intermediaries and increasing collaboration with existing stakeholders like Regional Authorities, Chambers of Commerce and Industry etc.
CM and EMTH Regional Operating Programs(ROP)	The ROPs are the tools for regional economic planning that lay out the strategies and for each region over a six- year period. Currently the ROPs for 2007-2013 are under preparation but the 2 regions together are reported to receive about 12% of the national funding.

3.3 R&D Investment

The key R&D investment indicators for CM and EMTH are summarised in Table 3.5. The regions lag behind the national average on most indicators with EMTH being very much behind. The gap with respect to the EU average is quite overwhelming. The gap is most evident when looking at corporate R&D expenditure, which reflects the relatively unfavourable economic structure of the region and also the fact that many of the major regional companies are based in Southern Greece. The situation is more positive with respect to higher education expenditure, thanks to the presence of regional universities, particularly in Thessaloniki. The small government expenditure for EMTH is quite notable. Hence the challenge for the region regarding R&D is very significant and explicit policy intervention is required.

Table 3.5: Key R&D Investment Indicators

Indicator	Central Macedonia	East Macedonia & Thrace	GR	EU-25 Regional Mean Average
R&D Expenditure by Business (2003, Euros per inhabitant)	24	14	32	230.5
R&D Expenditure by Government (2003, Euros per inhabitant)	18	6	22	48.0
R&D Expenditure by Higher Education (2003, Euros per inhabitant)	56	38	52	87.7

Source: Eurostat databanks on General and regional statistics

Table 3.6 presents a SWOT summary of CM and EMTH R&D investment. It further highlights the potential to fully exploit the R&D capabilities and commercialisation potential of the region's higher education sector and to build synergies at various levels and across all stakeholders in order to ensure the presence of a critical-mass for R&D that will allow to reap economies of scale and create stronger multiplier effects. A greater degree of decentralisation in decision making and resource allocation and the reform of the higher education system will prove vital both in setting and implementing the right strategies.

Table 3.6: R&D Investment SWOT Summary

Strengths	A relatively strong higher education sector, that is in addition spread across various regional prefectures.
Weaknesses	A lack of R&D investment by the business sector, which is

	largely dominated by SMEs in traditional economic sectors. Limited synergies between the corporate sector and the public sector dominated R&D institutions.
Opportunities	The latent potential of the higher education sector to promote more focused R&D activity and evolve its capacity for commercialisation. Synergies between key stakeholders that are currently quite limited. Breaking the self-contained nature of public and corporate R&D activity to reap agglomeration gains.
Threats	Limited regional expertise and experience and lack of R&D specific policies. Limited synergies across regions to address the issue of the lacking critical-mass for further R&D development. Centralisation of decision-making at national level and limited synergies between key stakeholders at institutional level. The lagging culture and institutional arrangements at HEIs to promote commercialisation and synergies linking R&D to the real economy. HEIs are not explicitly provided with research budgets and have no established commercialisation plan at national level.

As shown by Table 3.7, the key stakeholders involved in policies relating to R&D investment are the National Government, the Regional Authorities of CM and EMTH as well as the Ministry of Macedonia-Thrace. The Regional Authorities have been gaining in significance regarding their policy impact on regional economic development. R&D investment at regional level is impacted via broader policy channels, particularly via the ROPs for CM and EMTH amounting to Eur1290mn and Eur1116mn respectively as well as the various national Operational Programs:

- OP Competitiveness (RTD support, incentives for investment)
- OP Information Society (ICT public and private infrastructure)
- OP Railways, Airports and Urban Transport (large scale public infrastructure)
- OP Road Axes, Ports and Urban Development (large public infrastructure)
- OP Human Resources relating to the upgrading of human capital

The national OPs for Competitiveness and Information society is the major national program with an important impact on regional R&D since it engulfs regional projects and is in coordination with the ROPs. In total, the OPC (2000-06) spending for RTD at national level is budgeted for Eur415,2mn and is further complemented by the OP Information Society with EUR60mn and another Eur65mn from the various ROPs.

The most important are the policies for R&D arising primarily from the OP Competitiveness (OPC), implemented at national level (via the Ministry of Development-GSRT) and divided into 6 main chapters as follows:

- Increasing Demand for R&D
- Restructuring the system for R&D Supply
- Opening Greece to international R&D
- Developing R&D Infrastructure
- Setting sector/thematic priorities
- Quantification of goals

Table 3.7: Role of Key R&D Investment Stakeholders

Stakeholder	Role
National Government	The national government primarily addresses R&D issues through the Ministry of the Economy and the Ministry of Development within which the General Secretariat for Research and Technology (GSRT) is playing the key role. Other ministries like Education, Agriculture etc also indirectly address R&D issues. Co-ordination problems between ministries at national level.
Regional Authorities for CM and EMTH	The regional Authorities in collaboration with the GSRT propose and implement regional strategies and projects. The Regional Authorities in addition to the ROP also play an important role in implementing the major national Operational Programs at regional level.
Ministry of Macedonia-Thrace	The ministry was recently empowered to act in spearheading the effort for the creation of the Innovation Zone. A major R&D future infrastructure project for Thessaloniki (see D 2.1).

In general, policy makers, in addition to specific policy targets regarding R&D spending, are aiming to stimulate demand for RTD from the corporate sector of the economy by improving its sectoral allocation, stimulating supply of RTD through the reorganization of the tertiary education and research system, opening up to global research networks and building domestic R&D capacity infrastructure. Finally the sectoral focus is on renewable energies, tourism-sports-culture, transport, food and agriculture, environment, health, modes of work organisation, e-learning and e-business. These priorities coexist with the second pillar of the policy relating to private investment incentives for innovation propagated either directly through the Ministries of Development and Finance or through regional development incentives.

A key criticism of the policy framework has been the perceived lack of co-ordination on the one hand between the aforementioned ministries and on the other amongst public policies at sector level to maximize the efficiency of policy measures.

Table 3.8: Summary of Key R&D Investment Policies

Policy	Objectives
National Government Policy	Innovation is primarily addressed via the Operational Program for Competitiveness (OPC) 2001-06. The national strategy targets R&D expenditure to reach 1,5% of GDP by 2010 with 40% financed by the corporate sector. The current figures are 0,65% and 30% respectively. The other important OPs affecting R&D are those on Information Society and Human Resources.
Regional Policies Relating to CM and EMTH	Apart from the national, there are no explicitly stated R&D targets at regional level. In addition to the OPC, innovation is addressed via the ROP that includes sub-programs for regional development, education/vocational training, information society as well as sectoral projects that are supposed to match national targets.

2.4 Knowledge Supply and Creation

Table 3.9 presents some of the key measurable and available indicators of knowledge supply and creation. The main weakness of the region lies in the very low level of R&D employment by the corporate sector, which is very small both in relation to the national average and the EU average. The same applies for patents, which are minimal at both regional and national level compared to the EU average. The marked exception is R&D employment in the higher education sector, which for the case of CM is even above the EU average. When these indicators are combined with those regarding R&D spending, the conclusion that the higher education sector and its reform are the key to the evolution of R&D activity at both national and regional levels is inescapable. This is more so given that policy action regarding the R&D outlook of the corporate sector can not be as effective since the latter is primarily market determined. However, the potential impact of synergies between higher education and the corporate sector is also a policy variable that can be influenced to a significant degree and allow for strong gains.

Table 3.9: Key Knowledge Supply and Creation Indicators

Indicator	Central Macedonia	East Macedonia & Thrace	GR	EU-25 Regional Mean Average
Patents (2003, Patent Applications per Million Inhabitants)	3	N/A	6	58.0
R&D Employment by Business (2003, Employees per 1,000 Inhabitants)	0,3	0,2	1,1	2.2
R&D Employment by Government (2003, Employees per 1,000 Inhabitants)	0,3	0,2	0,5	0.7
R&D Employment by Higher Education (2003, Employees per 1,000 Inhabitants)	1,6	0,9	1,4	1.4

Source: Eurostat databanks on General and regional statistics

Table 3.10 presents a SWOT summary of knowledge supply and creation in the CM and EMTH region. The ability and willingness of the higher education sector to focus on its ability to evolve its R&D capacity to a higher level is the key issue. Commercialisation and spin-offs will play an important role. The creation of synergies with the corporate sector and the latter's ability to add a greater degree of sophistication to its entrepreneurship and R&D outlook will prove vital to allow for this process to culminate into an overall improved outcome.

Table 3.10: Knowledge Supply and Creation SWOT Summary

Strengths	A strong potential for knowledge creation and enhanced supply capacity by the higher education sector.
Weaknesses	Markedly low levels of R&D employment and activity by the corporate sector.
Opportunities	Promoting synergies for the transfer of knowledge from higher education to the business community.
Threats	Difficulties to effectively and swiftly reform the higher education sector. The possibility that the national government will not be able to implement decisive policies to impact the R&D system as a whole.

Within the CM and EMTH regions, the key stakeholders responsible for knowledge supply and creation are within the region's higher education sectors. In particular, a group of regional universities – Aristotle, Democritus and Macedonia and a number of Technological Education Institutes across the region – appear to be the key drivers of knowledge creation, accounting for the bulk of the sector's research. A promising development has been the presence of the Technological Park of Thessaloniki, which acts as an intermediary, and the National Centre for Research and Technological Development (CERTH) within it.

Table 3.11: Role of Key Knowledge Supply and Creation Stakeholders

Stakeholder	Role
Higher Education Institutions	The region is the home to 3 Universities and 4 Higher Technological Institutes. The 2 major universities, are conducting significant research with around 20% of the research budget relating to corporate projects. The future potential is great if HEIs engage in cooperation between them and other stakeholders (especially the corporate sector) and engage in commercialisation.
Research Centres and Intermediaries	The most important is the Technology Park (and CERTH), although only a minimal share of its research relates to corporate applications. Intermediaries are generally a recent creation and resources/experience have not yet accumulated to an efficient level.

As shown by Table 3.12, the key policies relating to knowledge supply are primarily relating to the region's higher education sector. Hence the strategic plans adopted by regional universities (Research Committees and Liaison Offices) and the ability to implement them will be vital in shaping the future R&D outlook for the region. Further, the role of intermediaries and regionally based research centres will need to

forge synergies with the higher education sector and other stakeholders including the Regional Authorities which could play a key role in promoting this process. Cooperation between institutions within the higher education sector could lead to agglomeration effects and fill knowledge gaps across regions. This process needs to be set-up via institutional links with the cooperation of regional policy makers and communication at the national level.

Table 3.12: Summary of Key Knowledge Supply and Creation Policies

Policy	Objectives
National Government level- GSRT	Restructure R&D supply system: GSRT supervised research performers to engage with corporations (private and public), promote academic research to support academic training and produce new R&D personnel, differentiate role of HEIs from GSRT research performers, promote critical-mass though concentration of R&D spending and improve operational efficiency of research institutions.
CM and EMTH Research Performers and intermediaries	To facilitate the development and delivery of collaborative policies and projects. To develop strategic partnerships with the capability to raise the profile of the research community as a whole and other key stakeholders.
Priorities from the Regional Operational Programs (ROP)	Promotion of cooperation between the regional authorities-corporate representative organisations-higher education institutes-intermediaries mostly through specific project focus. The planned Innovation Zone as a key R&D infrastructure facility is of special importance for the region of CM and hopefully also for EMTH.

3.5 Knowledge Demand and Absorption

Knowledge demand and absorption is necessarily a difficult area of analysis and measurement. At a regional level, the best available indicators relate to industrial structure and the human capital capacity of the existing workforce. Industrial structure analysed in terms of the knowledge intensity of the region's businesses is a useful indicator of the potential demand for knowledge, while human capital capacity indicators are able to monitor the likely ability to absorb appropriate knowledge.

As shown by Table 3.13, the proportion of innovative businesses in CM and EMTH is overall below the national average, particularly in the case of EMTH, which lags by 30-50% with respect to the national average. Hence the weak knowledge demand that applies for the country as a whole is more pronounced at the regional level. Finally, the lower workforce skills on offer observed for EMTH and most likely for some prefectures of CM also highlight problems of skill shortages at this level. The problem of vocational, on-the-job training as well as life-long learning are issues of special importance that need to be addressed by both the national and regional policy makers.

Table 3.13: Key Knowledge Demand and Absorption Indicators

Indicator	Central Macedonia	East Macedonia & Thrace	GR	EU-25 Regional Mean Average
Proportion of Knowledge-Based Businesses (2000, %)	23	15,1	27.3	N/A
Proportion of Knowledge-Based Businesses in Manufacturing (2000, %)	22,1	14,7	26,4	N/A
Proportion of Knowledge-Based Businesses in Services (2000, %)	30,8	23,2	31,9	N/A
Proportion of Workforce Educated to Degree Level (2003, % of population)	23,7	17,1	23.9	N/A

Sources: Eurostat databanks on General and regional statistics, National innovation surveys (1994-2000)

Table 3.14 presents a SWOT summary of knowledge demand and absorption of the CM and EMTH region. The lack of sophisticated demand for knowledge due to the weak economic structure is a major weak link on the R&D demand side which poses a constraint for the evolution of the system as a whole. However, the weak links between the higher education and the corporate sectors are intensifying problems. The degree of relevance of the skills produced by the higher education system is an issue for consideration. Overall, the degree in which R&D demand and supply meet is not entirely clear. Generally, there is little substantive information of the complexities and specificities relating to these issues. It is the aim of the forthcoming workpackages of the Miriad initiative to provide and gather more detailed evidence in this area, so as to fully inform regional R&D investment strategy making.

Table 3.14: Knowledge Demand and Absorption SWOT Summary

Strengths	Workforce-skills are the least lagging factor although this is less so at individual prefecture level. The relevance of skills produced by the education system might be an issue.
Weaknesses	The share of innovative firms in both the manufacturing and services sectors is relatively small, reflecting the weak economic structure of the region. This implies a knowledge demand of limited sophistication that constrains the development of supply. Limited vocational training at national and regional levels.
Opportunities	Building information networks and enhancing the knowledge base of SMEs in the region would raise demand for more sophisticated know-how. Creating/enhancing communication links between corporations and HEIs.
Threats	A continuing inability of many firms to be aware of the need for knowledge to stimulate their innovation capability and overall competitiveness. A limited response by HEIs to open themselves to the needs of the real economy.

Knowledge demand and absorption largely lies with the strategies pursued by the region's business community. This community is represented at the regional level by a number of 'umbrella' institutions, the most important of which are the Chambers of Commerce, the Federation of industrialists, and various business Associations at sector level.

Table 3.15: Role of Key Knowledge Demand and Absorption Stakeholders

Stakeholder	Role
Chambers of Commerce	Representative organisation for the region's business community at prefecture level
Federation of Industrialists of Northern Greece	Representative organisation for the region's key businesses and organisations in the broader region
Business Associations	Representative organisation for the region's businesses at sectoral level.

In most regions of Greece including CM and EMTH, policies relating to knowledge demand and absorption tend to be an implicit feature of other policies targeted at the

private sector, rather than explicit policies in themselves. At a national level, R&D policies primarily in the form of subsidisation of innovative companies and investment projects is the major policy measure that is implicitly aimed at stimulating knowledge demand. Indirectly, the Development Law that places special incentives, mostly subsidisation of initial investment, for disadvantaged regions is the major policy tool in place, which however applies for all business. In addition there are regional projects that aid the creation of clusters, intermediaries and co-operative schemes between knowledge performers and business at regional level supported through EU policies.

Table 3.16: Summary of Key Knowledge Demand and Absorption Policies

Policy	Objectives
National R&D Policies	<u>Increase R&D demand</u> : invest in knowledge intensive sectors and attract R&D personnel in these areas, increase corporate R&D employment, attract R&D intensive FDI, incentives for new R&D intensive entrepreneurship, cooperation between research and corporations. Promote <u>sector/thematic priorities</u> with cross-sector synergies (see section 3.3). Main <u>policy tools</u> are primarily subsidisation schemes for innovative business investments while the Development Law provides subsidies for disadvantaged regions (all business eligible).
Regional Authorities CM: Regional Projects	In the 1990s the RTP, RIS+ and Technology Foresight for CM were the main projects. “Excellence for CM” aims to develop high tech clusters, technology foresight and technology clinics applied to key industries of the region. The Innovation Pole for ICT clustering is the other key project.
Regional Authorities EMTH: Regional Projects	In the 1990s the RISS for EMTH was the major project. Currently, “Technogenesis for EMTH” focuses on developing a regional network of all major players in the area of RTD and the various segments of the regional production system through forums (including venture capital), technology clinics and new product ideas.

3.6 Knowledge Transfer and Flow

Specific indicators and measures of knowledge transfer and flow within the regions of CM and EMTH as well as amongst them and other regions are non-existent. However, the opinions of organisations engaged as well as some national data, presented by Table 3.17, point towards the conclusion that in general knowledge transfer and flow must be quite low as this is the case also at national level. Hence only 20,4% of innovative companies in manufacturing and 39,7% in services have been in some form of cooperation. Although no exact figures are available, there is a general belief that there is very significant transfer of know-how from abroad primarily by suppliers in the form of imported machinery and licences. The figures for cooperation arrangements between innovative corporations and HEIs are much lower.

Table 3.17: Key Knowledge Transfer and Flow Indicators

Indicator	CM & EMTH	GR	EU-25 Regional Mean Average
Cooperation arrangements for innovation in Manufacturing (% of innovative manufacturing enterprises, 2000)	N/A-- Expected at less than national average	20,4	N/A
Cooperation arrangements for innovation in Services (% of innovative services enterprises,2000)	N/A-- Expected at less than national average	39,7	N/A
Cooperation with HEIs in manufacturing (% of innovative manufacturing enterprises, 2000)	N/A-- Expected at less than national average	9,1	N/A
Cooperation with HEIs in Services (% of innovative services enterprises, 2000)	N/A-- Expected at less than national average	17,5	N/A

Source: National Innovation Surveys (1994-2000)

Table 3.18 presents a SWOT summary of knowledge transfer and flow for the regions of CM and EMTH. Overall, there is currently an evidence gap of the type of transferring occurring, its density and frequency, as well the flow directions

Table 3.18: Knowledge Transfer and Flow SWOT Summary

Strengths	Growing cooperation amongst innovative businesses.
Weaknesses	Overwhelming knowledge transfer from abroad with limited value

	added at domestic level.
Opportunities	Growing public sector investment in knowledge transfer policies including the recent growth of intermediaries.
Threats	A weak response by stakeholders to promote triple-helix interaction. Matching knowledge supplied with that being demanded.

As shown by Table 3.19, there is a relative plethora of stakeholders with some form of responsibility for knowledge transfer and flow within the regions of CM and EMTH. We have mentioned that most of these organisations are relatively new and as a result it is relatively early to evaluate their overall performance, other than stating that the regions are still at the stage of developing the critical-mass for R&D.

Table 3.19: Role of Key Knowledge Transfer and Flow Stakeholders

Stakeholder	Role
The national innovation network of Greece (RINO) and the Hellenic RITTS/RIS network	The RINO (Regional Innovation Network) was set up to support the exchange of experience and diffusion of best practices across all regions within the country but also other regions within the EU. The RISS/RIS network was set-up in 1998 to share cross regional information from these projects.
Centers of Business and Technological Development. Central Support Agency (KEDY)	These organizations were established by the Operational Program Competitiveness (OPC) and form a network of 13 organizations (one for each region). The network is based and coordinated from Athens. The regional counterparts are the Centre of Business and Technological Development in CM and EMTH
Innovation Pole for CM & Thessaloniki Technopolis	The Innovation Pole is at an early stage aiming to achieve ICT agglomeration in research and business with the participation of all R&D players in the region. The Technopolis is an initiative of the Association of Information Technology Companies of Northern Greece to establish a high tech industrial area that would “cluster” ICT companies.
Technology Park of Thessaloniki (TPTh)	Established by CERTH in co-operation with FING and a number of industrial and consulting companies of Thessaloniki, TPTh operates an Incubator and acts as an intermediary between supply (mainly CERTH) and demand for R&D (GSRT supervised)
SME Development Intermediary Bodies	Established by business representing organizations. For CM the Business Development Center (KEPA) and for EMTH: SME Development Intermediary Body – DESMOS. They have been important in facilitating access of SMEs to programs funded by the Structural Funds by the Community Support Frameworks
The URENIO laboratory in Thessaloniki	This is a laboratory established by the Engineering School of Aristotle University. It is being addressed separately, because of the important role it plays in the development of policies for innovation in the region
Regional Development	These agencies are being established by public bodies (most often Municipalities and Prefectures but also by Chambers or Regional

Agencies (RDAs)	Authorities) and their role is to promote entrepreneurial and social development in the region with focus on the primary sector.
Clusters- an initiative by the Ministry of Development	These are: Organic Products Cluster – an initiative of FING and Wine cluster (Wine roads of N. Greece)
Incubators- (Technology Park incubator, i4G, Thermi)	The 3 high-tech/knowledge based incubators operating in the area Thessaloniki. Another 3 incubators are in the planning stage, again to be situated in the area of Thessaloniki.

It can be seen that most of the infrastructure and organisations relating to knowledge flow and transfer are based in Thessaloniki (CM) while the region of EMTH is endowed with relatively limited resources. The issue of cooperation between the two regions regarding the use of such infrastructure might provide mutual benefits.

Table 3.20: Summary of Key Knowledge Transfer and Flow Policies

Policy	Objectives
National initiatives from the GSRT	<u>Developing infrastructure</u> : incubators-technology parks-research centres with corporate sector participation, dissemination of practices, infrastructure for R&D commercialisation, spin-offs, standardisation etc. <u>International exposure</u> : Promoting the participation of Greece in the EU's framework program, opening the R&D system to global networks: cooperation with international actors, Greek presence in global forums.
Regional initiatives for CM	In addition to Excellence for CM, there are 2 major projects in the planning stage: the Innovation Zone (R&D infrastructure) and the Thessaloniki Technopolis (high tech industrial cluster for ICT companies). The latter will achieve synergies with the Innovation Pole for CM (initiation stage) regarding ICT clustering.
Regional initiatives for EMTH	In addition to Technogenesis, the Regional Authority is currently discussing with the Ministry of Technology specific actions at sector level with focus on the primary sector and related industries.

2.7 Regional Knowledge Model

Figure 3.1 presents a broad conceptualisation of knowledge creation, demand, transfer and flow based on the evidence collected to date. In summary, it highlights the following:

- The higher education institutes, particularly Aristotle and Democritus are the main knowledge creators within the region. The Thessaloniki Technology Park is also playing an important role.
- These universities are not engaged in considerable knowledge transfer with organisations external to the region. Although Aristotle university has been active in providing a significant share of its research services outside the region of CM.
- There is an apparent low level of knowledge commercialisation and utilisation by firms as well as higher education institutes within the region.
- There is little evidence of significant direct knowledge transfer between the higher education and business communities.
- There is little evidence of business sector engagement with organisations external to the region outside their head-offices or imported know-how in the form of equipment and licences to sell products.
- There is a range of public sector funded intermediaries, few of which are linked to the region's higher education sector.
- At both the national and regional level there is limited investment in university knowledge transfer functions.
- There are limited business support mechanisms with effective facilitation of knowledge transfer.
- There is little evidence of knowledge transfer from (potential) commercialisers to knowledge creators in the region.
- There is little evidence of regional knowledge spillovers.

Figure 3.2 presents a further representation of knowledge flow within the region based on conceptualisation set within the framework of the Triple Helix model. A key finding is that the triple-helix interaction is reliant on a group of intermediaries that are not very well connected or interfaced. From the whole conceptualisation the following is apparent for the regions of CM and EMTH taken together:

- **Government** – key policymakers are the Ministry of Development-GSRT at national level and the Regional Authorities of CM and EMTH at regional.

- **Business** – SME dominated regional economy with low levels of R&D investment and knowledge commercialisation.
- **Higher Education** – large-scale knowledge creation appears mainly restricted to a small number of higher education institutions. The cases of the Thessaloniki Technology Park/CERTH and URENIO show that there is significant potential for intermediation in synergy with Higher Education, should the proper institutional arrangements were in place.
- **Government-Higher Education Interface** - key linkages between higher education and government either lack coordination and decisive initiative or are limited at both national and regional level.
- **Higher Education-Business Interaction**– little evidence of direct knowledge transfer and even less of reverse transfer. Intermediaries act as key facilitators, with the government being the key funder. Although, there has been a rapid increase in number of knowledge transfer intermediaries the process is at a relatively early stage. There is a lack of intermediaries facing higher education institutes with the main focus being instead on the corporate sector.
- **Government-Business Interaction** - connections between government and the business community with regards to R&D are limited at both national and regional levels or lack decisive initiative.

Figure 3.1: CM and EMTH Knowledge Flow Model

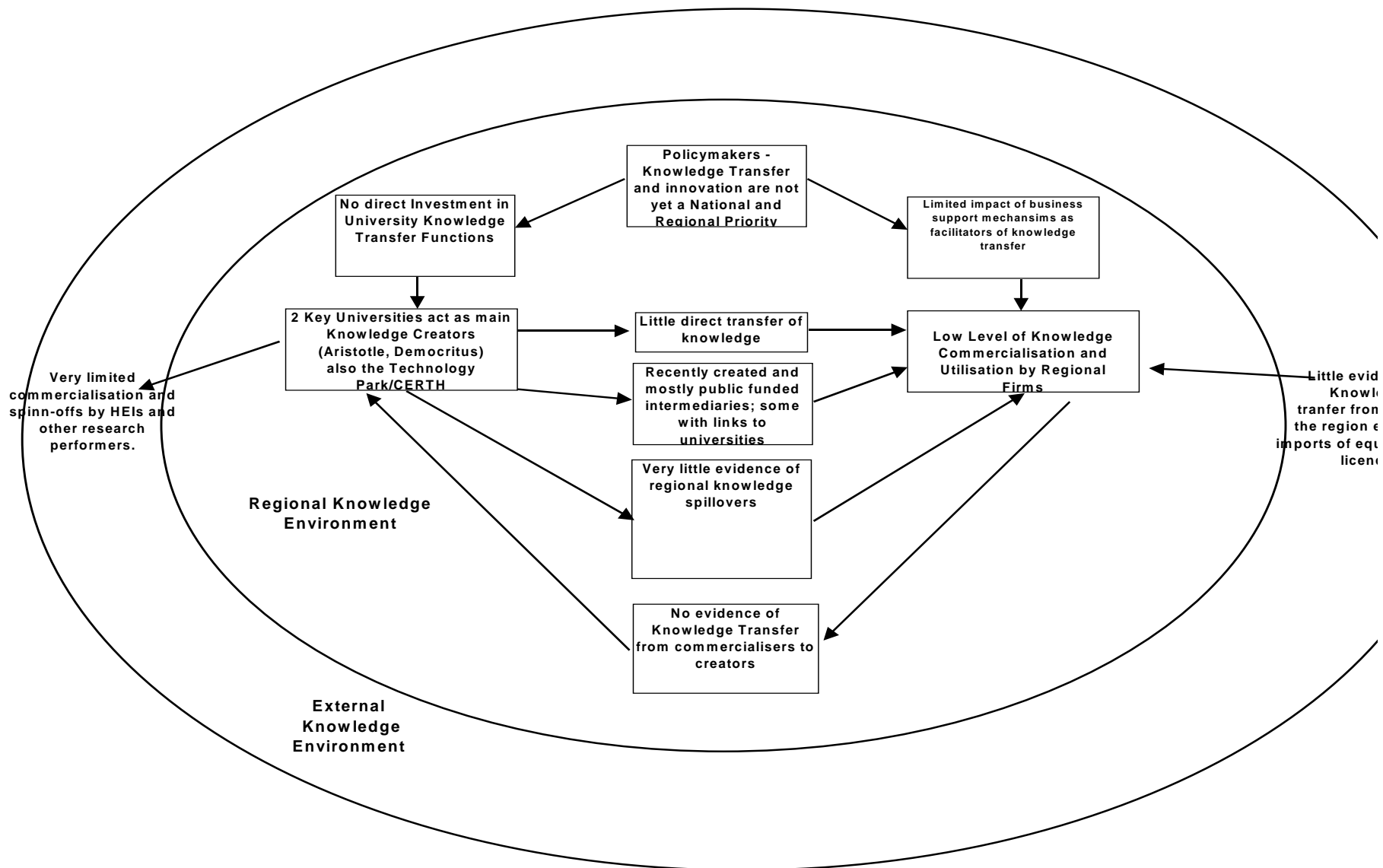
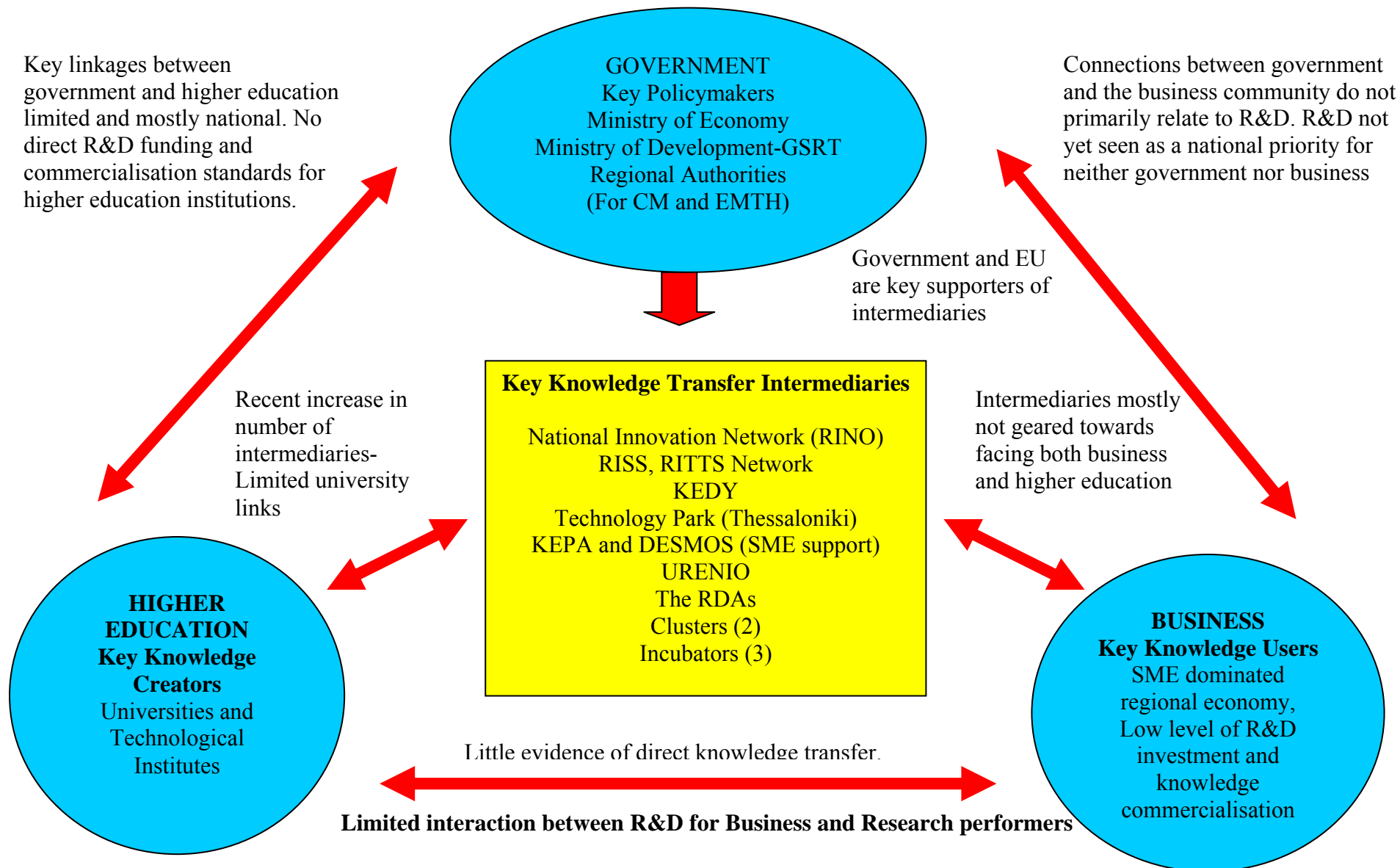


Figure 3.2: Triple Helix Representation of CM and EMTH Knowledge Flow Model



3.8 Summary of Indicators

Table 3.11 presents a summary of the key benchmark indicators for the CM and EMTH regions.

Table32.21: Summary of Key Benchmark Indicators for CM and EMTH

Indicator	Central Macedonia	East Macedonia & Thrace	GREECE	EU-25 Regional Mean Average
European Competitiveness Index (2004, Index Score)	N/A	N/A	46,5	100.0 (EU-15)
Gross Domestic Product per Capita (2002, Euros)	16,710	12,522	16,425	20,685
Labour Productivity (2002, Euros)	48	35,7	45,9	45,535
Unemployment Rate (2004, %)	10,1	11,9	10,3	9.0
Economic Activity Rates (2004, %)	NA	NA	51.9	57.5
Mean Gross Monthly Earnings (2002, Euros)	1,238	1103	1,278	1,887
R&D Expenditure by Business (2003, Euros per inhabitant)	24	14	32	230.5
R&D Expenditure by Government (2004, Euros per inhabitant)	18	6	22	48.0
R&D Expenditure by Higher Education (2003, Euros per inhabitant)	56	38	52	87.7 ¹
Patents (2003, Patent Applications per Million Inhabitants)	3	NA	6	58.0 ¹

¹ EU-25 data is from 2004, regional data is the latest available

R&D Employment by Business (2003, Employees per 1,000 Inhabitants)	0,3	0,2	1,1	2.2 ¹
R&D Employment by Government (2003, Employees per 1,000 Inhabitants)	0,3	0,2	0,5	0.7 ¹
R&D Employment by Higher Education (2003, Employees per 1,000 Inhabitants)	1,6	0,9	1,4	1.4 ¹
Proportion of Knowledge-Based Businesses (2000, %)	23	15,1	27.3	N/A
Proportion of Knowledge-Based Businesses in Manufacturing (2000, %)	22,1	14,7	26,4	N/A
Proportion of Knowledge-Based Businesses in Services (2000, %)	30,8	23,2	31,9	N/A
Proportion of Workforce Educated to Degree Level (2003, % of population)	23,7	17,1	23.9	N/A
Cooperation arrangements for innovation in Manufacturing (% of innovative enterprises, 2000)	N/A	N/A	20,4	N/A
Cooperation arrangements for innovation in Services (% of innovative enterprises,2000)	N/A	N/A	39,7	N/A

Cooperation with HEIs in manufacturing (% of innovative enterprises, 2000)	N/A	N/A	9,1	N/A
Cooperation with HEIs in Services (% of innovative enterprises, 2000)	N/A	N/A	17,5	N/A

Sources: Eurostat databanks on General and regional statistics, National Innovation Surveys 1994-2000

THRACE-TURKEY

REGIONAL KNOWLEDGE
SCORECARD

4.1 Regional Overview

The Thrace region is located in the North-West of Turkey covering 24,098 sq km, constituting 2.96 % of the landmass of Turkey. It stretches from Greek and Bulgarian borders on the North West end of Turkey, northern part of Çanakkale and the Marmara Sea on the south west, Black Sea on the east and Kocaeli on the south. The region has a population of almost 12 million people, 16.77 % of the country population in Edirne, Kırklareli, Tekirdağ and Istanbul. 91% of the population lives in Istanbul, the commercial metropolis in Turkey. 30 % of the active business enterprises and 34.5 % of the working population are located in Thrace. There are 12,750 Small and Medium Enterprises active in the region and average GDP per capita is \$3,024, very close to the average in Turkey which is \$3,044.

Thrace is on the transit route between Europe and Asia minor and served as a portal since 500 BC. This is why the transportation facilities in the region constitute a high advantage in trading with Europe. The Trans-European highway and the railway pass through all four cities; there are three airports, Atatürk and Sabiha Gökçen in Istanbul and Çorlu in Tekirdağ and there are three harbours, Ambarlı and Haydarpaşa in Istanbul and Tekirdağ.

Thrace is a region of tourist attraction due to its rich history and geographic beauty of beaches and rivers. After the Balkan wars and establishment of the Republic of Turkey in 1923, industrial investments have started with textile in the region. Istanbul has become the main centre of industry residing 35% of all the industrial investments in the country. Recent development of textile enterprises in Çorlu has contributed in the average growth of 5% in the region, since 1981. Although the Kocaeli earthquake in 1999 has caused economic damages resulting a fall in growth down to 2 %, it was recovered fast. Food processing, oil products, rubber, metal ware, leather, chemicals, electronics, glass, machinery, alcoholic products, paper and paper products are among the major industrial products in the region. Istanbul also has plants that assemble automobiles and trucks as well as white and brown household manufacturing factories.

Thrace has become the exportation centre of Turkey and currently contributes 41% of all taxes collected in Turkey and produces 28% of Turkey's national product. In the last ten years, establishment of twenty two foundation Universities and three technocities in the region shows the regional enthusiasm in increasing the competitive index.

4.2 Competitiveness

As shown by Table 4.1, the competitive index of the Thrace economy reflects almost the averages of Turkey but lags far behind that of the EU. A key issue for the future competitiveness of the region is addressing the unemployment, which is well above the national average. Labour productivity is in general low in Turkey, due to low industrialisation and weak knowledge intensity. Although labour activity studies have been initiated by an ILO pilot project for the Kocaeli region, figures for Thrace are not available yet. However, the growing number of university graduates employed and the increase in university quotas of technology-based education in the region are hopeful signs.

Gross Domestic Product (GDP) per head of population in Thrace is slightly under the national average. This is mainly attributable to the degradation of agriculture, which is the main occupation in the western part of the region. Istanbul alone absorbs the highest share in budgetary revenue in Turkey. As expected, Regional gross monthly earnings are higher than the Turkish average.

Table 4.1: Key Competitiveness Indicators

Indicator	THRACE	TURKEY	EU-25 Regional Mean Average
European Competitiveness Index (2004, Index Score)	N/A	14	100
Gross Domestic Product per Capita (2004, Euros)	2,522.31	2,539.00	21,247.14
Labour Productivity (2004, per person employed)	N/A	43.9	100.0
Unemployment Rate (2004, %)	11.45	10.30	9.0
Economic Activity Rates (2004, %)	N/A	51.5	57.5
Mean Gross Monthly Earnings (2004, Euros)	580	309	1,887

Source: TUIK, Eurostat

Table 4.2 presents a SWOT summary of the competitiveness of the Thrace economy. It highlights the continuing threat of high unemployment rate linked, amongst others, to growing Chinese textile industry exports. On a positive note, there are signs of potentially arising opportunities through improving interaction and connectivity within the region and around the borders. The regional policy is to restructure the economy around tourism in addition to the industrial manufacturing, which will improve opportunities for international collaboration.

Table 4.2: Competitiveness SWOT Summary

Strengths	Growth in GDP is faster than the country average. A lower net increase in population and a faster increase in education levels compared to respective national averages.
Weaknesses	Slow restructuring of the production base from agriculture to tourism and manufacturing.
Opportunities	Potential to improve interaction within the region and linkages with the Greek and Bulgarian parts of Thrace.
Threats	Growing population in Istanbul adds on to the unemployment. The emerging economy of China is the biggest threat to the textile industry.

The key stakeholders in relation to improving the competitiveness of the Thrace region at national Government level are the Ministry of Development and KOSGEB (Department of SME Development). At regional level is the KOSGEB-Trakya office and the Municipalities of Edirne, Kırklareli, Tekirdağ and Istanbul. In essence, much of the implementation of regional competitiveness policy is coordinated and implemented via KOSGEB.

Table 4.3: Role of Key Competitiveness Stakeholders

Stakeholder	Role
Turkish Government	Stimulate and improve the competitiveness of the Turkish economy as whole, the lead role is taken by the Ministry of Industry and Development.
KOSGEB-Thrace	Regional office of SME development agency responsible for analysing the regional conditions and suggest strategies for implementing the economic development strategies for the Thrace region.
Municipalities	Municipalities are mainly responsible for the maintenance of the regional infrastructure.

Table 4.4 summarises the key competitiveness policies impacting on the Thrace region. The National Government is focused on establishing a sustainable economic stability via macroeconomic policies. The investment policies of the Government will influence the unemployment in the region. KOSGEB is developing collaboration policies to enable the SMEs to share industrial facilities.

Table 4.4: Summary of Key Competitiveness Policies

Policy	Objectives
Economic Stability	Sustainable economic policy will facilitate the industrial growth and reduction of unemployment nationwide.
SME co-operation	KOSGEB Strategies concerning collaboration in the Organised Industrial Districts, Internet Portal, and Technology Development Centres. Further, cooperative utilisation by SMEs of machinery, equipment and laboratories are creating a growing interest.

4.3 R&D Investment

The key R&D investment indicators for Turkey are summarised by Table 4.5, which shows an important gap when compared with the EU averages. The fact that the Thrace region has received 37.2 % of 56 million Euro of KOSGEB subvention in 2004 and 25% of 96 million Euro of TUBITAK research grants is evidence that a major part of the national R&D investment takes place in Thrace, both in terms of business and Higher Education.

Table 4.5: Key R&D Investment Indicators

Indicator	THRACE	TURKEY	EU-25 Regional Mean Average
R&D Expenditure by Business (2002, Euros per inhabitant)	N/A	5.09	268.57
R&D Expenditure by Government (2002, Euros per inhabitant)	N/A	1.25	54.15
R&D Expenditure by Higher Education (2002, Euros per inhabitant)	N/A	11.41	90.97

Source: BDYK

Table 4.6 presents a SWOT summary of Thrace R&D investment. It further highlights the potential to fully exploit the R&D capabilities and commercialisation potential of the region's higher education sector. The main obstacles are the bureaucratic operations and the full dependence of both municipalities and public universities on the national policies.

Table 4.6: R&D Investment SWOT Summary

Strengths	Strong higher education sector, with a core of world-class research establishments. The number and strength of Foundation Universities in the region triggers significant R&D involvement by business.
Weaknesses	A clear lack of R&D investment by the business sector, which is a late starter in the process.
Opportunities	The potential to build on the R&D undertaken by the region's public higher education and latent commercialisation capacity.
Threats	The dependency on government policies as the key resource of funds for higher education research in the region.

As shown by Table 4.7, the key stakeholders involved in policies relating to R&D investment are SPO (State Planning Organisation), TUBITAK and KOSGEB. TUSIAD (Turkish Industrialists' and Businessmen's Association) has started projects

for R&D investment. The Chambers of Commerce and Industry need to be involved in regional policies in order to eradicate the R&D investment deficits of business.

Table 4.7: Role of Key R&D Investment Stakeholders

Stakeholder	Role
SPO	It is stated in the IX th Development Plan that R&D and technology investments should have priority. SPO provides funds for the public universities and research organisations.
TUBITAK	In accordance with the strategies of Supreme Council of Science and Technology, TUBITAK gives grants to any researcher either from the high education or SME.
TUSIAD	Research Projects are run for improving competitiveness with Sabancı and Koc Universities. Investment policies are prepared to support business projects.

The Vision 2023 (science and technology policies for the hundredth year of the Turkish Republic) states an aggressive target of increasing the R&D investment from 0.6 % of GDP to 2 % in 2010. This allows TUBITAK to collaborate closely with the European research organisations and increase contributions for the FW7 projects. Regional development policies are redefined to be based on innovation in the IXth Development Plan, while most of the regional activities are assigned to KOSGEB, which has become the information and access centre for all the European research programs concerning SMEs. The KOSGEB Thrace office is being established to train and encourage SMEs to invest in R&D in collaboration with the regional, national and or international partners.

Table 4.8: Summary of Key R&D Investment Policies

Policy	Objectives
Vision 2023	To increase R&D investment per capita to 2 % of GDP and increase the business participation in research to 50% in 2010.
the IX th Development Plan	To increase the funds for regional development with a focus on innovation.
KOSGEB-Thrace	Demand side Provision– Targeted business support programmes embedding a Culture of Innovation and Investment for Regional development.

4.4 Knowledge Supply and Creation

Table 4.9 presents some of the key measurable and available indicators of knowledge supply. The patent numbers represent only the ones given by the National Patent office. Koç University and large white houseware manufacturers like Arçelik and Vestel are known to have taken the patents either from the European patent office or US. It is observed that the region resides more researchers than the national average and is very close to the EU25 average. However, the business and government researchers are still far behind the EU25 averages even though; they are still higher than the national average. It is clear that within the region, the higher education sector is the key driver to R&D. However, the majority of researchers employed by the public universities are not prone to promoting R&D commercialisation due to cultural and institutional barriers.

Table 2.9: Key Knowledge Supply and Creation Indicators

Indicator	THRACE	TURKEY	EU-25 Regional Mean Average
Patents (2003, Patent granted per Million Inhabitants)	0.01	0.01	58.0
R&D Employment by Business (2002, Employees per 1,000 Inhabitants)	0.15	0.13	2.2
R&D Employment by Government (2002, Employees per 1,000 Inhabitants)	0.14	0.12	0.7
R&D Employment by Higher Education (2005, Employees per 1,000 Inhabitants)	1.36	1.15	1.4

Source: Eurostat

Table 4.10 presents a SWOT summary of knowledge supply and creation in the Thrace region, where the major strength lies in the strong presence of the higher education sector. However, the apparent capacity of this sector is not effectively utilised and it can be a threat if the collaboration with business is not facilitated. Specifically, the high level competence of four medical schools of the region (Istanbul, Cerrahpaşa, Marmara and Trakya) focuses on their clinical operations rather than research due to lack of finance and personnel.

Table 4.10: Knowledge Supply and Creation SWOT Summary

Strengths	Knowledge creation and supply capacity of the higher education sector.
Weaknesses	Lack of strategies for collaboration among the universities. Very low levels of R&D employment and activity in the business and government sectors.
Opportunities	To stimulate the transfer of knowledge from the higher education sectors to the business community.
Threats	Disability of the cooperation of public universities with the business. The medical schools not using the capacity.

Within the Thrace region, the stake holders are the high education, TUBITAK, KOSGEB and TUSIAD. TUBITAK and KOSGEB both support the researchers as well as executing research projects themselves. Istanbul Technical, Yildiz Technical and Bosphorus Universities have the highest engineering technology capacities, which complement the TUBITAK and KOSGEB resources. TUSIAD has already started technological and scientific research projects with the high level foundation universities: Sabanci and Koç.

Table 4.11: Role of Key Knowledge Supply and Creation Stakeholders

Stakeholder	Role
Higher Education Institutions	The region is the home of one third of the HEI in Turkey, half of which run research in parallel with their education activities.
TUBITAK	Research on the national basis besides supporting the HEI and SME.
KOSGEB	Research on SME business besides supporting the HEI and SME.
TUSIAD	Research in cooperation with the large industry and big foundation universities

As shown by Table 4.12, the key policies relating to knowledge supply and creation are involving the higher education and the business. There is no regional framework set yet, but the national strategies are initiated in the region. The key features of Vision 2023 operated by TUBITAK and National Initiative for Innovation operated by Sabanci University and TUSIAD are focused on collaborative research among the business and the HEI.

Table 4.12: Summary of Key Knowledge Supply and Creation Policies

Policy	Objectives
HEC (High Education Council) Strategic Plan	Promoting high education quality measures depending on the research projects realised and scientific articles. To ensure defining common goals for the benefits of the universities. Reforming the HE system to allow easier access and courses of world standard.
TUBITAK	Preparation researcher and research inventory so as to encourage collaboration among the individual researchers.
TUSIAD	Promotion of innovation focused development and preparing National Initiation for Innovation together with Sabanci University.

4.5 Knowledge Demand and Absorption

Knowledge demand and absorption is analysed through the regional survey run by KOSGEB. Considering the key technology producers, KOSGEB calculates the percentage of innovative SMEs in Turkey as 30.24 %, which is higher than EU-25 average, since Turkish economy is mainly based on SMEs. The Thrace region seems to have the percentage below the national average for two reasons: (i) large innovative companies are mainly located around Istanbul; (ii) transformation from farming to the industry is not yet completed in the Edirne-Kırklareli region. The high level of education in the region is demonstrated in Table 4.13 with figures relating to the education level all being above the national average.

Table 4.13: Key Knowledge Demand and Absorption Indicators

Indicator	THRACE	TURKEY	EU-25 Average
Proportion of Innovative SME (2004, %)	11.4	30.24	25.0
Proportion of Workforce Educated to Degree Level in Science and Engineering (2005, % of workforce)	6.07	4.69	N/A
Proportion of Workforce Educated to Degree Level in Non-Science and Engineering Discipline (2005 % of workforce)	11.46	8.84	N/A
Proportion of Working Age Population with National Vocational Level 4 or Higher (2005, %)	21.60	19.62	N/A

Source: Eurostat

Table 4.14 presents a SWOT summary of knowledge demand and absorption of the Thrace region. In accordance with the KOSGEB survey, the SMEs are capable of stating their R&D needs but are not capable of expressing their demand for R&D because of bureaucratic difficulties and lack of confidence. The weakness lies mainly on the knowledge transfer gap. Further survey in the forthcoming workpackages of MIRIAD will allow for more in-depth investigations of these issues.

Table 4.14: Knowledge Demand and Absorption SWOT Summary

Strengths	Knowledge absorption capacity is higher than the national average. There are a high number of innovation centres and the R&D sites that could be used in collaboration located in the region.
Weaknesses	The culture of expecting the Government to initiate the models before declaring the needs. Lack of confidence in the knowledge suppliers; the intermediary organisations are not as effective as expected.
Opportunities	Facilitating easier access to the resources could allow creation of synergy among the regional SMEs.
Threats	Economical and political instability that blocks the investment.

KOSGEB-Thrace will soon be active to implement the national strategies for SME in the Thrace region. Chambers of commerce and Industry have an important responsibility in the region, although they have not yet defined specific R&D strategies.

Table 4.15: Role of Key Knowledge Demand and Absorption Stakeholders

Stakeholder	Role
Chambers of Commerce and Industry	Representative organisations for the region's business community
TUSIAD	Representative organisation for the region's large businesses and organisations
KOSGEB-Thrace	Representative organisation for the region's small and medium sized businesses

Techno-cities and technology development centres are foreseen in the Vision 2023 strategies to develop effective interaction among the universities and innovative SME where, nationwide 300 SME enterprises are currently active. The KOSGEB strategy for establishing Technology Development Centres is a contribution in terms of innovative collaboration among the SMEs. Internationalisation of SMEs is one of the main objectives of KOSGEB strategy. Hence, the Foreign Economic Relations Board is working on clusters for the pilot study of which started in textile sector; one of the principal industries in the Thrace region.

Table 4.16: Summary of Key Knowledge Demand and Absorption Policies

Policy	Objectives
Vision 2023	Supreme Council of science and Technology has aimed at reducing the disparity among the regions in Turkey through investment in innovation. Strategies are based on responding to the know-how and innovation requirements of SME by research and innovation centres. Techno-cities are the initial outcome.
KOSGEB-Technology Development Centres	Centres for collaboration among the SME enterprises in the Universities. There are five of them established in the Thrace region.
Textile Exportation Department	Clustering training and surveys have been initiated in the textile industry having chosen the pilot in the Thrace region.

KOSGEB strategies are restructured according to the requirements defined by SME as summarised in Table 4.17.

Table 4.17: Summary of Key Needs for Innovation Development

	Thrace	Turkey	EU25
No of Enterprises (Total)	12,750	43,642	N/A
Investment Financing (% of Total-T)	61.18	36.92	N/A
Quality Improvement (% of T)	43.53	62.16	N/A
Exportation (% of T)	54.77	55.96	N/A
New Business Field (% of T)	20.46	81.05	N/A
Reengineering (% of T)	29.84	73.2	N/A
Qualified Manager (% of T)	28.58	76.75	N/A
Qualified Experts (% of T)	47.32	57.59	N/A
New Product Development (% of T)	38.14	68.56	N/A
Technology Improvement (% of T)	51.38	47.05	N/A
New Sales Channel (% of T)	24.94	78.54	N/A
E-Commerce (% of T)	22.97	76.23	N/A
New IT Investment (% of T)	33.94	73.32	N/A
Automation (% of T)	25.08	75.07	N/A

Source: KOSGEB

4.6 Knowledge Transfer and Flow

CIS 3 data on Knowledge Transfer and Flow are neither available for Thrace nor for Turkey. The knowledge transfer and flow is mainly realised by KOSGEB for the SME enterprises and TUBITAK for the researchers. The Chambers of Industry and Commerce prepare training seminars and survey reports for the business but they are not active in knowledge transfer. The business associations work on the national basis rather than regional activities. The cooperation of municipalities of four cities are being started in TRAKAB project. It will be an opportunity to benefit popularity of the municipalities if the prefectures are convinced in the value added by knowledge transfer. Table 4.18 presents a SWOT summary of knowledge transfer and flow within the Thrace region.

Table 4.18: Knowledge Transfer and Flow SWOT Summary

Strengths	Local business networks in the smaller cities allow more cooperation with KOSGEB.
Weaknesses	Low level of engagement in international knowledge transfer practices.
Opportunities	Popularity of municipalities can play a strong role in taking the advantage of increasing international support for the knowledge transfer policies.
Threats	Inability to activate the knowledge suppliers to respond to the needs.

Table 4.19 shows the lack of awareness in chambers of industry and commerce as well as business organisations and associations, who are motivated by the recent EU reports on innovation. National Initiative for Innovation is expected to fill in this gap soon. TUBITAK and KOSGEB efforts to transfer knowledge are improving as Vision 2023 sub projects are implemented.

Table 4.19: Role of Key Knowledge Transfer and Flow Stakeholders

Stakeholder	Role
ARBIS	The network for researchers established by TUBITAK to encourage co-operative research.
TARABIS	Research infrastructure network established by TUBITAK allowing access for international information and knowledge.
KOBI-NET	Network for enabling the collaboration of SMEs and the e-commerce initiated by KOSGEB.
Professional Association	Chamber of Engineering and Architecture is in preparation of activating a network for the collaboration of the members.
ARI-Technocity Network	Technocity in Istanbul Technical University has an internal network for the companies residing in the city.
YTU-Technocity	Technocity in Yildiz Technical University has an internal network for the companies residing in the city.
KOSGEB-Tekmer	Technology development centres established by KOSGEB in Istanbul Technical, Yildiz Technical, Bosphorus and Trakya Universities.

TRAKAB will lead the joint effort of four municipalities in the region which can initiate the regional strategies of Knowledge Transfer and Flow Policies.

Table 4.20: Summary of Key Knowledge Transfer and Flow Policies

Policy	Objectives
Vision 2023	National policies for knowledge transfer in the business world are foreseen in sub-projects.
National Initiative for Innovation	National strategies for innovation are being designed by industry leaders
TRAKAB	Will match municipal needs and solutions in the Thrace region.

4.7 Regional Knowledge Model

Figure 4.1 presents a broad conceptualisation of knowledge creation, demand, transfer and flow based on the evidence collected to date. In summary, it highlights the following:

- Four medical schools (Cerrahpaşa, Istanbul, Marmara and Trakya), three public (Bosphorus, Istanbul Technical, Yildiz Technical) and two foundation (Koc and Sabanci) universities are the main visible knowledge creators within the region.
- These universities are engaged in considerable knowledge transfer with regional organisations only on an individual basis.
- There is an apparent low level of knowledge commercialisation and utilisation by firms within the region.
- There is little evidence of direct knowledge transfer between the higher education and business communities.
- There is no evidence of business sector engagement with organisations external to the region.
- Two state funded autonomous organisations, TUBITAK and KOSGEB are the most prominent knowledge transfer facilitators.
- There is considerable international investment for the transfer of knowledge between universities and the SMEs.
- The effectiveness of knowledge transfer from the universities is criticised mainly because of the gaps in HE system.
- The large enterprises are inclined to collaborate with the foundation universities.
- Business organisations have not yet constructed the support mechanisms as facilitators of knowledge transfer.
- KOSGEB seems to be the only facilitator for knowledge transfer from potential beneficiaries to knowledge creators in the region.
- There is little evidence of regional knowledge spillovers.

Figure 4.2 presents a further representation of knowledge flow within the region based on the conceptualisation set within the framework of the Triple Helix model. From this conceptualisation the following is apparent within the Thrace region:

- **Government** – key national policymakers are the Supreme Council of Science and Technology (BTYK) and the Department of SME Development (KOSGEB), which are also dominant policymaking institution in the region.
- **Business** – SME dominated regional economy with low levels of R&D investment and knowledge commercialisation.
- **Higher Education** – The largest-scale knowledge creation in Turkey is actually realised by a number of regional universities.
- **Government-Higher Education Interface** – The key liaison between higher education and government are through HEC and TUBITAK. There exists no regional authority.
- **Higher Education-Business Interaction** – The direct knowledge transfer is on an individual basis. Intermediaries are state funded organisations which act mainly as facilitator of funds but they are focused both on business and higher education. The business organisations are motivated to initiate knowledge transfer intermediaries.
- **Government-Business Interaction** – The business community had good connections with the Government, influencing the economic policies until recently. The SMEs have always had good relations with KOSGEB.

Figure 4.1: Thrace Knowledge Flow Model

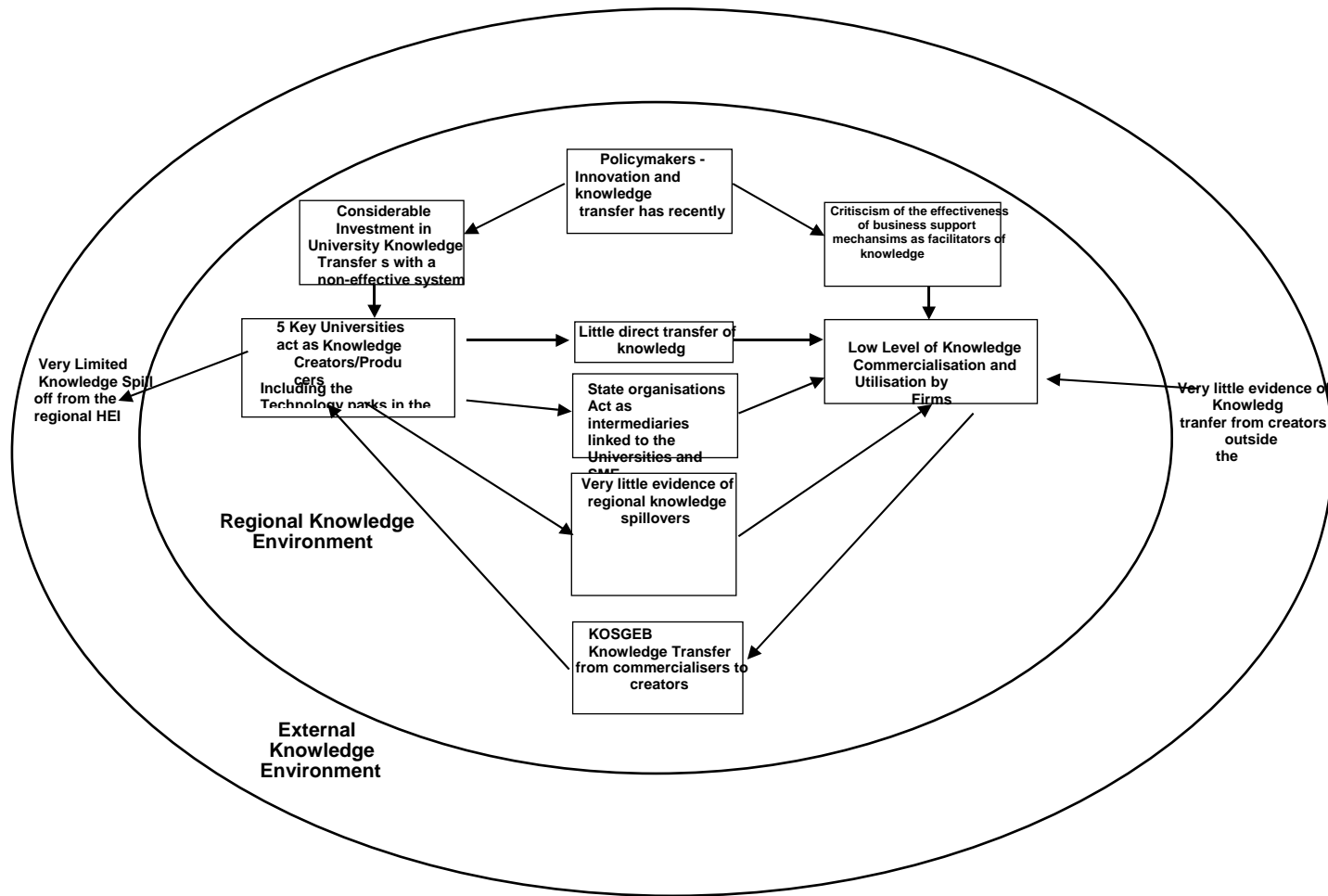
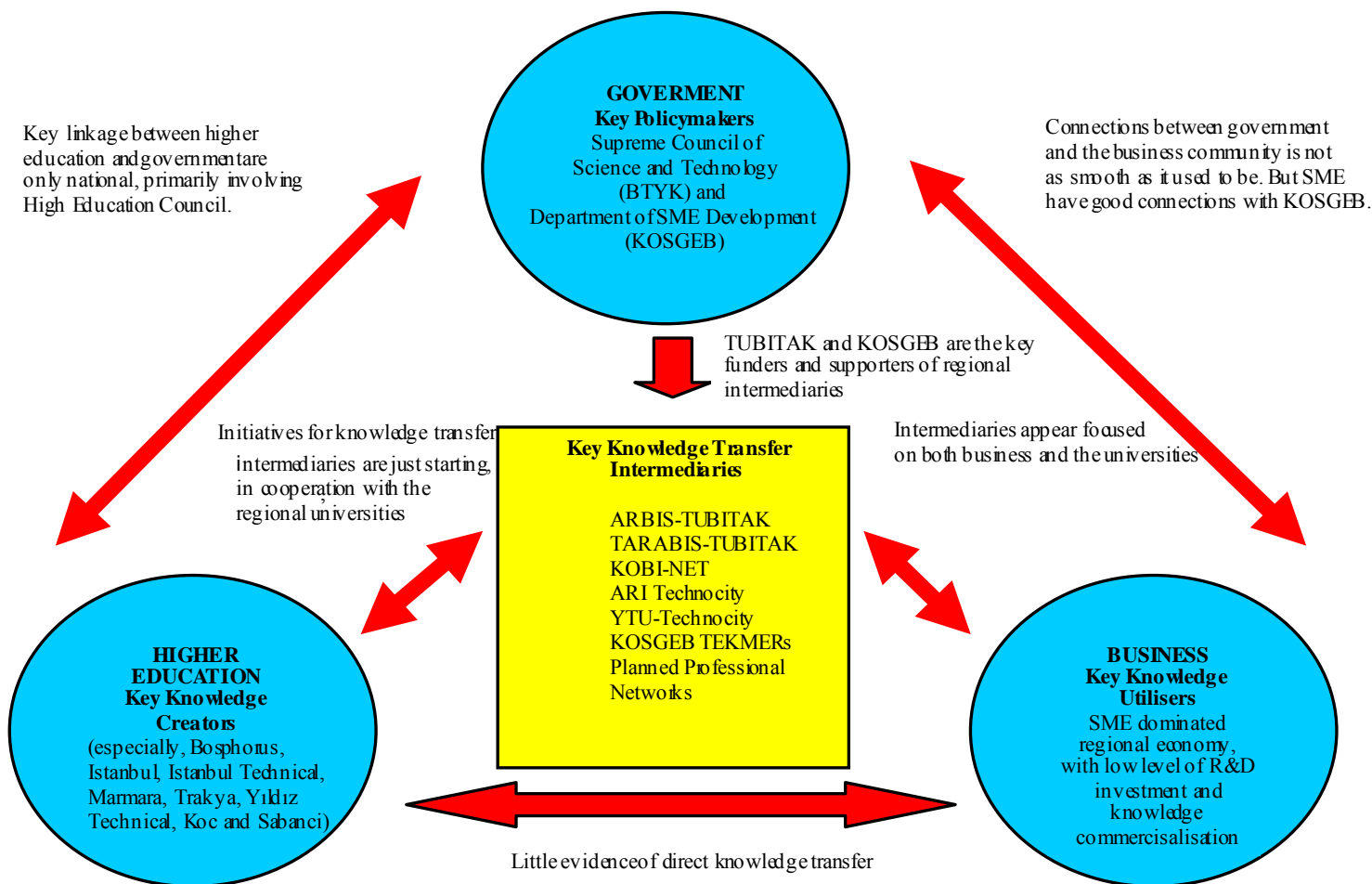


Figure 4.2: Triple Helix Representation of Thrace Knowledge Flow Model



4.8 Summary of Indicators

Table 4.21 presents a summary of the key benchmark indicators for the Thrace region.

Table 4.21: Summary of Key Benchmark Indicators for Thrace-Turkey

Indicator	THRACE	TURKEY	EU-25 Regional Mean Average
European Competitiveness Index (2004, Index Score)	N/A	14	100
Gross Domestic Product per Capita (2004, Euros)	2,522.31	2,539.00	21247.14
Labour Productivity (2004, per person employed)	N/A	43.9	100.0
Unemployment Rate (2004, %)	11.45	10.30	9.0
Economic Activity Rates (2004, %)	N/A	51.5	57.5
Mean Gross Monthly Earnings (2004, Euros)	580	309	1,887
R&D Expenditure by Business (2002, Euros per inhabitant)	N/A	5.09	268.57
R&D Expenditure by Government (2002, Euros per inhabitant)	N/A	1.25	54.15
R&D Expenditure by Higher Education (2002, Euros per inhabitant)	N/A	11.41	90.97
Patents (2003, Patent Applications per Million Inhabitants)	0.01	0.01	58.0
R&D Employment by Business (2002, Employees per 1,000 Inhabitants)	0.15	0.13	2.2 ²
R&D Employment by Government (2002, Employees per 1,000 Inhabitants)	0.14	0.12	0.7 ²
R&D Employment by Higher Education (2005, Employees per 1,000 Inhabitants)	1.36	1.15	1.4 ²
Proportion of Innovative	11.4	30.24	25.0

² EU-25 data is from 2004, regional data is the latest available

SME (2004, %)			
Proportion of Workforce Educated to Degree Level in Science and Engineering (2005, % of workforce)	6.07	4.69	N/A
Proportion of Workforce Educated to Degree Level in Non-Science and Engineering Discipline (2005 % of workforce)	11.46	8.84	N/A
Proportion of Working Age Population with National Vocational Level 4 or Higher (2005, %)	21.60	19.62	N/A

Sources: Eurostat, KOSGEB, BDYK

REGIONAL KNOWLEDGE SCORECARD

SOUTH and EAST
BULGARIA

2.1 Regional Overview

It is useful at the outset to provide information about the administrative and territorial structure of Bulgaria and about the region under discussion (South and East Bulgaria). According to active legislation, the country's territory is divided into 28 districts, each comprising one or several municipalities. As of December 31, 2003, the total number of municipalities in Bulgaria was 264³. Districts and municipalities are the basic administrative-territorial units in the country. Municipalities as self-governing communities have the required administrative capacity to initiate policies at the local level. They are the main units, which have the relevant structures and administrative capacity to absorb EU Pre-accession and Structural Funds.

In order to implement strategies and measures in the field of regional development the Council of Ministers differentiated six planning regions on the Bulgarian territory in 2000. Regional innovation strategies are planned to be developed in each of the 6 planning regions. The first one was prepared in 2004 for the South-Central Region and the rest are in process of elaboration. *The Bulgarian region, as it is defined in the MIRIAD project, includes four of the six planning regions in Bulgaria – South-west, South-central, South-east and North-east region.* This area covers approximately 74% of Bulgarian territory and is home to 88% of the population.

Currently, most of the statistical information in Bulgaria is provided at the level of six planning regions. Therefore, analysis in the present report draws on regional data at level of six planning regions. A special attention is given to the area that is under the interest in the MIRIAD project. Further, on in the report for convenience we call the four planning regions considered by the MIRIAD project either MIRIAD region or the South and East Bulgaria region.

Table 5.1: General information about the MIRIAD region (2003)

Planning regions	Area 2003 (km ²)	% of the total area of the country	Population 2003 (persons)	% of the national total	Population density (persons / km ²)	Arable land 2003 (dca / capita)	Number of districts	Number of municipalities
Observed region	82 393,7	74.2	6122874	78,4	70.3	6.4	28	264
Northeastern	19923.4	17.9	1285803	16.5	64.5	9.3	6	49
Southeastern	14647.6	13.2	782653	10.0	53.4	8.6	3	22
South Central	27516.2	24.8	1944382	24.9	70.7	5.0	6	68
Southwestern	20306.5	18.3	2110036	27.0	103.9	2.5	5	52

Source: National Statistical Institute and authors calculations.

³ The current administrative division of the country has been in force since 1999, when the President of the Republic of Bulgaria issued Decree No.1 of January 5, 1999, endorsing the borders and district capitals of the 28 districts, into which the country is divided under the Act to Amend and Supplement the Law on the Administrative and Territorial Structure of the Republic of Bulgaria (promulgated in State Gazette, No. 154 of December 28, 1998).

Among the four planning Bulgarian regions, enclosed within the South and East Bulgaria region, the **South West Region** is considered to be the most economically advanced. It encompasses five districts, and is home to the national capital, Sofia. The region concentrates also the largest human resource pool with the highest education level in Bulgaria. Sofia is the hub of RTD organisations, human resources development centres, and the Bulgarian R&D and innovation infrastructure. South West Bulgaria (including Sofia) has a considerable potential for development of a sound research and innovation infrastructure. The South West region produces 38% of Bulgaria's GDP. The main industrial sectors are metal production, electrical and optical devices, textile and clothing, paper and printing industries, chemicals and pharmaceuticals, and food and tobacco processing. Industry employs in total 44% of the working population, and the service sector 53%.

The South Central region has borders with Greece and Turkey. Plovdiv, Pazardjik, Haskovo, Stara Zagora, Kurdjali, and Smolyan are the most important industrial and research centres in the region. The industrial sector accounts for 26% of regional GDP, while services represent 58% and agriculture 16%. Food, beverages and tobacco are the most prominent industries. Other important industries are those of metal processing, machine production, wood processing, textiles and footwear. Due to its beautiful scenery and natural forests, the region, and especially the Rodopi Mountains, is a popular tourist destination.

The South East Region of Bulgaria that borders Turkey to the South and the Black Sea to the East is a relatively small one covering 13% of the area of the country, hosting 10% of the population in the country and producing 8.8% of the Bulgarian GDP. Tourism is the most rapidly developing sector of the regional economy, with activities mainly on the Black sea coast. During the last few years, new tourism products have been developed in the region, such as ecotourism in the natural parks Strandzha and the Blue Rocks, cultural tourism and hunting. Agriculture accounts for 18.8% of the regional GDP and 6% of the employment. Grapes, fruit and corn are the most commonly grown crops. Cattle breeding is located mainly in the mountainous areas. Fishery and aquaculture is developed along the coastline. Industry in South East Bulgaria provides around one fourth of the total employment and is dominated by SMEs. The main industrial sectors are food and drinks production, textiles, petrochemical products, and wood processing. The main industrial companies are located in Bourgas and the big towns of Sliven and Yambol.

North East Bulgaria, covering 20,000 km², is the third largest region in Bulgaria. It borders the Black Sea to the east, the Danube river to the north and the Balkan range to the south, and includes six districts: Varna, Dobrich, Razgrad, Silistra, Targovishte and Shumen. The region is inhabited by 1.3 million people, which corresponds to 16% of the national population, and produces 14.4% of the Bulgarian GDP. North East Bulgaria is crossed by three pan-European transport corridors and three international roads. An international airport (Varna), a sea port (Varna) and a river port (Silistra) are located in the region. The economic development of the region is strongly dependent on the performance of SMEs which account for most of the regional gross added value. North East Bulgaria has the most developed and dynamic tourism industry among all regions in the country and tourism is perceived as a tool for boosting the development of the region as a whole. Other important industries are maritime industry, construction, agriculture including food-processing industry,

textile and tailoring industry, wood-processing industry, machine-building industry and transport. Industry employs in total a third of the workforce, while over 60% work in the service sector.

5.2 Competitiveness

In 2003 the South and East Bulgaria region as a whole provides the 81.5% of the country's *GDP level* (see Table 5.2a.) A leading place among the consisting planning regions occupies again South-western planning region, producing 46.7% of the region's GDP and 38.1% of the country's GDP (see Table 5.2b). Thus, the Southwestern planning region ranks on the first place in the country in terms of GDP per capita – 141.3% of average of the country. On the opposite site within the region is the Southeastern planning region, giving only 11.2% and 9.1% of the region's and the country's GDP respectively.

Table 5.2.a. Regional GDP (1999-2003)

(current prices, BGN)

<i>Regions</i>	1999	2000	2001	2002	2003
Total for country	23790440	26752833	29709210	32335083	34410244
Total for observed region	19358805	21458806	23998273	26196662	28033923
Northeastern	3369417	3937907	4285027	4497815	4836051
Southeastern	2495534	2704380	2538995	2674218	3128720
South Central	5001213	5584672	6185725	6507938	6975941
Southwestern	8492641	9231847	10988526	12516691	13093211

Source: “Convergence and European Funds”, Economic Report for the President of the Republic of Bulgaria, 2006 and authors calculations.

Table 5.2.b. Regional GDP per capita (1999-2003)

(current prices, BGN)

	1999	2000	2001	2002	2003
Total for country	100.0%	100.0%	100.0%	100.0%	100.0%
Northeastern	86.3%	89.9%	87.2%	84.3%	85.2%
Southeastern	104.1%	100.4%	84.9%	82.3%	90.6%
South Central	83.3%	82.6%	83.4%	80.7%	81.3%
Southwestern	136.8%	131.6%	139.6%	144.9%	141.3%

Source: “Convergence and European Funds”, Economic Report for the President of the Republic of Bulgaria, 2006

As can be seen from Table 5.2.a. and Table 5.2.b. the *inter-regional disparities* in economic development are strongly manifested. There is a clear trend for speeding tempo of development in the South-West region, which leads to a significant increase of disparities in respect of the GDP per capita between this region and the other planning regions. The structure of gross value added by planning region for the period 1997-2003 is characterised by controversial trends with respect to the participation of different economic sectors. This leads to the conclusion that economic restructuring in the regions is still continuing. The service sector has a dominant share in the gross value added of all planning regions, included in the reviewed region. Regarding to the industrial sector, a considerable lagging behind is observed in the North-East planning region.

The *intra-regional* disparities in economic development are also rather high. Differences in the levels of net incomes from economic activity at municipal level are tenfold. A considerable clustering of municipalities with low economic development is been observed in all planning regions. Such strong intra-regional disparities are typical with respect to almost all other economic indicators.

A key issue for the future competitiveness of the region is addressing the relatively low levels of labour productivity. Labour productivity is largely determined by industrial structure, especially its knowledge intensity, and the effectiveness of human capital deployment.

As shown by Table 5.3, the competitiveness of all of four regions lags far behind that of the EU. At the same time, there are rather high inter-regional disparities. Bulgarian GDP per capita in PPP is almost 3.4 times lower than for the EU as a whole. The leading position is for South West Region, where the GDP per capita in BGL is 1.4 times higher than the Bulgarian average. On the opposite site is South Central Region where the GDP per capita is 3576 BGL, compared with 4398 BGL for the whole of Bulgaria.

Bulgarian labour productivity per person employed is also relatively low. In 2004, it reaches 31.9% of the EU-25 level. Labour productivity does not vary considerably by planning regions. Still South East Region and South West Region report the highest and South Central Region the lowest levels of labour productivity.

According to the statistical data, the Bulgarian mean gross monthly earnings in 2002 are more than 14 times lower than in EU-15. This fact and the observed wage dynamics cannot be interpreted as a sufficient condition for the low unit labour costs and thus for the competitiveness improvement. The main reasons for this are the above statistical data for labor productivity.

Regional disparities in the average wage are much smaller than disparities in GDP per capita. As regards to average wage by districts, a clear trend similar to GDP dynamics emerges. The relatively higher increase in annual wage in 2003 is typical for the main cities of the regions – capital of Sofia in South West Region, Bourgas in South East Region, Varna in North East Region, and Stara Zagora in South Central Region.⁴

⁴ See “Convergence and European Funds 2006”, Economic Report for the President of Bulgaria, p. 42

Table 5.3: Key Competitiveness Indicators

Indicator	Bulgaria	SWR	SCR	SER	NER	EU-25
Gross Domestic Product per Capita (2003, Euros in PPP)	4398*	6214*	3576*	3983*	3749*	22305
Labor Productivity per person employed (2004, EU25=100)	31.9	n.a	n.a	n.a	n.a	100
Unemployment Rate (2004, %)	12.0	9.3	10.5	13.5	17.6	9.0
Economic Activity Rate (2004)	49.7	54.0	48.7	49.7	50.7	57.5
Mean Gross Monthly Earnings (2002, Euros)	132	n.a	n.a	n.a	n.a	1,887

Notes: * BGL in current prices

SWR - South West Region, SCR - South Central Region, SER - South East Region, NER - North East Region.

Source: National Statistical Institute, Eurostat

The unemployment rate in Bulgaria is also relatively higher than the average for the EU member countries (in 2004, it was 12% compared to 9% in EU). At the same time unemployment is lower compared to the new Member states as Poland (19.2%) and Slovakia (17.1%). Since 2001 the rate of unemployment has been gradually decreasing but with different pace across planning regions. Due to the capital of Sofia, the best results are obtained in South West Region, where the unemployment rate is similar to that of EU average. On the second place is South Central Region with unemployment rate of 10.5%. The situation is the worst in North East Region with unemployment rate of 17.6%.

The economic activity rates also differ considerably among planning regions. The higher rates are observed in South West Region (54%) and North East Region (50.7), whereas its values for the South East Region and the South Central Region are completely the same and lagging behind the country's average correspondingly.

Table 5.4 presents SWOT summary of the competitiveness of four Bulgarian planning regions, included in the MIRIAD region.

Table 5.4: Competitiveness SWOT Summary*

Strengths	Macroeconomic stability, positive economic growth, stable and well developed banking system, relatively high investment dynamics, improving labour productivity, relatively cheap labour force, high educational level of the labour force, high number universities and research centres, good preconditions for high-tech sector development, increasing economic activity rates, falling unemployment rates, positive changes in the business environment, increasing share of the private sector in the
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	economy, rising contribution of the SME sector to total GDP, opportunities for cross-border co-operation and for development of tourism, relatively steady increase in foreign direct investment, relatively small inter-regional differences (except the South West Region).
Weaknesses	Low level of GDP per capita, not enough level of productivity and not sufficient decrease of unit labour costs compared with EU, unfavourable demographic trends, relatively low living standards, relatively high unemployment rate in the North East Region, relatively underdeveloped banking system, old economic structure in the majority of the planning regions, insufficiently effective business structure, not enough business experience, restrictions for SMEs for doing business relatively old of fashion technical infrastructure, low energy efficiency and high resource dependency of the economy, low development of the information society and the knowledge-based economy, low investment in R&D, insufficient co-operation between business and universities and research institutions, lack of adequate information about the EU Structure Funds and the Cohesion Fund, not enough administrative capacity for EU funds utilization, shortage of equity funds for co-financing, rather high intra-regional disparities in all competitiveness indicators.
Opportunities	EU accession, increase the trade with EU, EU funds utilization, steady growth of investment, improvement of the production technologies, ongoing inflow of foreign investments, investment in R&D and in regional and local infrastructure, support for the innovations' and technology's development, transition to information society, increase the SMEs' share in GDP, stopping brain-drain and attracting high qualified Bulgarian citizens from abroad, increase the labour productivity, facilitate the construction of the European

	cross-border, trans-national and trans-regional cooperation, integration of the cross-border areas, potential to improve linkages and interaction within and between regions.
Threats	Diminishing the attractiveness of the region for foreign investors due to political instability in Southeast Europe, inability of many (and especially SME) to meet the high European standards, external competition on main exporting sectors, unfavourable demographic development, high emigration level, low proficiency in entrepreneurship, low speed of transition to knowledge based economy, low investments in R&D, growing regional disparities, insufficient capacity for EU funds absorption, insufficient level of co-financing, other negative external economic shocks.

* Table relies heavily on the National Regional Development Strategy of the Republic of Bulgaria, 2005 and National Development Plan of the Republic of Bulgaria over the 2007-2013 period.

The key stakeholders in relation to improving the competitiveness of the MIRIAD Bulgarian region are: the Bulgarian government, the districts' administrations, the Regional Development Councils, Bulgarian association of regional development agencies (BARDA) and the Regional Development Agencies.

Table 5.5: Role of Key Competitiveness Stakeholders

Stakeholder	Role
Bulgarian government and region's districts administrations	Stimulating and improving the competitiveness of the Bulgarian economy as a whole, and the region's districts competitiveness. The institutional framework includes the legal regulations and the organizations (state, public and private) that directly shape and govern the enhancing of the competitiveness at both national and regional level. The government and region's districts administrations undertake special economic measures and initiatives, directed to the increase of the economy competitiveness. The leading role on the national level is taken by the Bulgarian Ministry of Economy and Energy and the Ministry of Regional Development and Public Works.
Regional Development Councils	Implementing the state regional development policy at the level of the Planning Region (NUTS 2). (It is composed by the representatives of the Ministry of Regional Development and Public Works, Ministry of Finances, Ministry of Environment and Waters, Ministry of Agriculture and Forestry, Ministry of Economy and Energy, Ministry of Labor and Social Work, Ministry of Transport, also district governors of the

	districts included in the planning region and representatives of the municipalities of every district included in the planning region).
Bulgarian association of regional development agencies (BARDA) and the Regional Development Agencies	Acting as an umbrella association of independent regional and local economic development agencies and SME support centres. It is as a forum for coordination of information and services, development of joint projects, attraction of investment, and joint participation in national and international programmes. BARDA provides training, capacity building assistance, and information to its members, as well as supports the establishment of similar structures in other regions. It works closely with the relevant ministries and government agencies and assists the development of national policies for business and regional development. Its members come from local government, chambers of commerce, branch unions, local business associations, vocational training institutions, academia, banks, and private companies.

Table 5.6 presents the key competitiveness policies impacting on the Bulgarian MIRIAD region. The National Government attempts to strengthen regional development by implementing the National Development Plan of the Republic of Bulgaria over the 2007-2013 period and the National Regional Development Strategy of the Republic of Bulgaria. According to above strategy, the Regional development plans for the four planning regions were introduced. The strategy for the development of each of the planning regions is formulated within the framework of the regional development plans.

Table 5.6: Summary of Key Competitiveness Policies

Policy	Objectives
National Development Plan of the Republic of Bulgaria over the 2007-2013 period	The first goal is to reach and sustain high economic growth rate and it is strongly corresponding to the level of the Bulgaria's competitiveness on the world markets. The second goal is to increase the country's human capital potential. According to the economic theory, the first goal realization depends strongly on the level and the rate of growth of Bulgaria's innovations. The National Development Plan defines the main strategic priorities of the country on the road of EU accession.
National Regional Development Strategy of the Republic of Bulgaria	The National Regional Development Strategy of the Republic of Bulgaria was adopted in 2005 in line with NUTS 2 level. Its primary objectives are to present comparative analysis of the planning regions' profiles, to do SWOT analysis of the regions as a whole and to outline the main planning regions' priorities. The detailed picture of each of the planning regions is given in their regional development plans.
Regional development plans for each planning regions (at NUTS 2 level)	The regional development plans present brief information about region's profile as: its area, external borders, administrative division, total population and density, labour force and economic activity coefficient, distribution of

District's development strategies (at NUTS 3 level)	employment and the unemployment rate, GDP and main economic sectors. It also gives other relevant information as: cross border points, first class roads of international importance, European transnational transport corridors, geographical information, key strategic and planning documents for development of the region, definition of the Regional Development Plan's vision, goals and priorities.
Municipal's development plans (at LAU 1 level)	<p>The Strategy for the development of each planning region is formulated within the framework of the Regional Development Plan, which seeks to define an agreed vision for the region and to frame the strategic priorities and objectives which will lead to its achievement. The definition of the regional development plan vision is: "Strengthening the position of the planning region in the socio-economic development of the Republic of Bulgaria". The main strategic objective is defined on the basis of the vision for development: "Balanced development of the planning region, through achieving regional economy growth, which is to ensure more and better working places, improve quality of life, preservation of natural, cultural and historic heritage, protection and restoration of the environment."</p> <p>For achieving the main objective the following strategic objectives are formulated:</p> <ul style="list-style-type: none"> a) Realization of economic growth and increase employment b) Achieving a sustainable regional development and decrease the interregional disparities c) Economic and social cohesion with the rest regions in EU.

5.3 R&D Investment

The key R&D investment indicators for Bulgaria are summarised in Table 5.7. It is clear that the region possesses an R&D investment gap when compared with the UK and EU averages. South-West region, including Sofia, confirms its leadership position in terms of R&D expenditure. The largest share of R&D expenditure in the country (almost 80%) is there as well. North Central Region ranked second with 7% of the total R&D expenditure. In sum, statistical data clearly display the main characteristic of the Bulgarian innovation system - its high centralisation and concentration of resources and activities in the capital.

Table 5.7: Regional R&D and Innovation Performance in Bulgaria in 2003

Region	R&D expenditure by regions (%)	Share of R&D in local GDP (%)	Value added per employee (Eur)
North-West	0.2	0.02	10617.1
North Central	4.4	0.17	11079.1
North-East	6.6	0.23	9434.3
South-East	2.0	0.11	9665.6
South Central	7.1	0.18	10039.6
South-West	79.7	1.05	8657.2
National level	100.0	0.5	13378.0

Notes: 1.All indicators are measured in percentages.

2. The shaded regions are those included in the MIRIAD region.

Source: National Statistical Institute

Table 5.8 presents a SWOT summary of Bulgarian R&D investment. It further highlights the potential to fully exploit the R&D capabilities and commercialisation potential of the region's higher education and research institutions sector. The potential problem in relation to regional intervention is the dependency on national institutions and decision-making authorities as the main source of funding for higher education and research in the country.

Table 5.8: R&D Investment SWOT Summary

Strengths	<ul style="list-style-type: none"> • R&D units located in the region are in the fields identified as priority sectors for economic development • Significant research potential and good qualifications of the staff
Weaknesses	<ul style="list-style-type: none"> • The innovation activities of researchers are limited to the development stage only • A clear lack of R&D investment by the business sector, which is largely dominated by SMEs. • Insufficient funding of R&D activities and lack of enough training of R&D staff

Opportunities	<ul style="list-style-type: none"> • Participation of the institutions from the region in the European and global initiatives and access to European programs such as ISPA, SAPARD, PHARE, Sixth Framework Programme. • Macroeconomic stabilisation and sustainable economic growth; • New forms of economic co-operation (for example regional clusters)
Threats	<ul style="list-style-type: none"> • Emigration of high quality R&D staff • Insufficient level of innovation culture among national and regional administration • Lack of co-ordination among institutions and policies on R&D

As shown by Table 5.9, the key stakeholders involved in policies relating to R&D investment are the Bulgarian National Government, District Innovation Commissions Regional Innovation Commission Regional Innovation Commission and Regional Development Council. District Innovation Commissions are in process of establishment. They are formed as private-public partnerships and will be responsible for the implementation of concrete innovation projects for the districts as well as for identifying and developing new project proposals at district level.

Table 5.9: Role of Key R&D Investment Stakeholders

Stakeholder	Role
Bulgarian Government	The Government's aims are: i) to encourage industrial research and cooperation between the research organizations, universities and business; ii) to improve the financing of innovations and setting up mechanisms for attraction of private investment; promotion of innovative activities and technology transfer; iii) to stimulate creation of clusters of innovative companies; iv) to assist innovative start-ups and spin-offs and strengthen the innovative potential of SMEs; to develop mechanisms for foreign investment in industrial research and technology development..
District Innovation Commissions	Responsible for the implementation of concrete innovation projects for the districts as well as for identifying and developing new project proposals at district level.
Regional Innovation Commission	Responsible for the implementation of regional innovation plans as well as identifying and developing new project proposals at district level.
Regional Development Council	Responsible for monitoring of implementation of Regional Innovation Strategy and the annual Regional innovation Plans as well as the work of the Regional and District Innovation Commissions.

National Innovation Strategy (2004) and National Strategy for Science, Research and Development (2005) are the two recently elaborated policy documents that define the

framework for R&D and innovation in Bulgaria. Currently, Bulgarian government aims at creating conditions for the implementation of innovations resulting from industrial research. The process is supported by both public funds and private capital. The state seeks to create conditions conducive to undertaking higher risk and investment in market oriented products by the entrepreneurs. The main novelty introduced by the National Innovation Strategy (2004) is the establishment of the National Innovation Fund (NIF) with the main task of financing market-oriented R&D activities of real sector (enterprises). NIF together with the National Science Fund (NSF) managed by the Ministry of Education and Science bring competition to the procurement of public funding for research and innovation that is a well established practice in developed market economies. At the current stage, there are still not enough data on the utilizations and effectiveness of these funds.

National Strategy for Science, Research and Development (2005) is designed as a concretization of the National Innovation Strategy. It aims to correspond closely to the objectives and activities of the NIS and to set the performance evaluation and targets against the achievements of leading OECD and EU countries. The strategy states that Bulgaria needs a Science, Technology and Innovation (STI) policy in order to: strengthen the competitiveness of Bulgaria's industry through science, technology and innovation; strengthen the science and technology sector through co-operation and concentration and intensifying the relationship with industry; provide a favourable climate for keep Bulgarian graduates in science and technology in Bulgaria.

In addition to the two strategies described above *a substantial number of other policy documents have direct influence on the development of science, research and technology in Bulgaria*. There are many overlaps in the objectives, actions and areas of implementation envisaged in these documents⁵. At the same time co-ordination and common vision is missing. Even more serious issues arise during the implementation process. Insufficient financing and delays in the approval and carrying out the projects are frequent characteristics of the policy implementation. Un-coordinated activities result in dispersion and inefficient use of limited resources and holds back the knowledge creation and R&D investment.

Traditionally the knowledge creation and transfer system in Bulgaria has been highly centralized with the dominant role of the state in governing the process. The first step towards increasing the role of regional initiative in research and innovations in Bulgaria was the joining the EU network of innovating regions in Europe and developing Regional Innovation Strategies for each of the six planning regions in the country. The pilot initiative for Bulgaria to analyze and map the regional innovation system of South-Central Region (that is one of the 4 planning regions covered by the current project) was undertaken in 2001. The RIS project had been developed from 2001 to 2004.

The RIS identifies three major strategic priorities: to improve the competitiveness of the regional SMEs through innovation; to enhance innovation culture in the region; to

⁵ Among all National Strategy for Small and Medium-Sized Enterprises Development and Promotion (2000-2006); The National strategy for Life-Long Learning in Professional Education (2005-2010); Strategy for Establishment of Electronic Government (2002) National strategy for the Introduction of ICT in Bulgarian Schools (2005).

develop further and to optimize the RIS. To achieve the three priorities 30 practical measures were proposed (9 for the first priority, 6 for the second one, and 15 for the third one). The RIS implementation was planned for 2004-2009 period. In the first annual innovation plan 12 pilot projects were included.

Table 5.10: Summary of Key R&D Investment Policies

Policy	Objectives
National Innovation Strategy (2004)	The essential objectives of the innovation policy are: improving the competitive position of companies through innovation; increasing the focus and upgrade the quality of the science and technology sector; strengthening the link science - education - economy – society; keeping young/good scientists and engineers in Bulgaria.
National Strategy for Science, Research and Development (2005)	The main goals are: i) to strengthen the competitiveness of Bulgaria's industry through science, technology and innovation; ii) to strengthen the science and technology sector through co-operation and concentration and intensifying the relationship with industry; iii) to provide a favourable climate for keep Bulgarian graduates in science and technology in Bulgaria.
Regional Innovation Strategy	The RIS identifies three major strategic priorities: to improve the competitiveness of the regional SMEs through innovation; to enhance innovation culture in the region; to develop further and to optimize the RIS.

5.4 Knowledge Supply and Creation

South West Bulgaria (including Sofia) has a considerable potential for development of a sound research and innovation infrastructure. Sofia is the location of the Bulgarian Academy of Sciences and the Centre for Agrarian Sciences including advanced research institutes as well as of more than 50% of the universities in Bulgaria (Sofia University, the Technical University, the University of National and World Economy and many others) and most of the development units of large enterprises. National ministries are also located in Sofia. In addition, Bulgaria's small private innovative enterprises are highly concentrated in Sofia, as well as almost all banks, financial institutions, venture capital funds, and guarantee funds and programmes. Therefore, the capital is both a key location for the generation of knowledge and of the potential finance to commercialise it, and is crucial to the overall national economic development of Bulgaria.

South West hosts the densest research and development infrastructure, concentrates the highest entrepreneurial activity and attracts the highest level of foreign direct investment in the country. However, the region shares the general drawbacks of Bulgarian research and innovation system of the last decade, such as constantly decreasing spending levels on R&D (both public and private), a significant reduction of the number of R&D personnel, and a deterioration of the role of the universities in research and innovation activities, combined with weak clustering between enterprises, universities and R&D centres/institutes. In addition, there is a lack of a coherent national and regional policy for integrating Bulgarian R&D and innovation activities into EU structures.

South Central Region hosts the University of Plovdiv (Paisiy Hilendarski), the Agricultural University of Plovdiv, the Medical University, and the Plovdiv branch of the Technical University of Sofia. There are also several higher education and research institutes, such as the Institute of Canning Industry, the Institute of Fresh Water Fishery and the Regional Institute of Veterinary and Medicine. With the support of the German government, two centres for providing additional qualifications to university graduates recently have opened doors in Stara Zagora and Pazardjik.

The South East Region of Bulgaria hosts one of the oldest Technological Universities in Bulgaria, 'Prof. Dr Assen Zlatarov', which is linked to the Petro Chemical Plant in Bourgas. Bourgas Free University, the Technical College in Yambol (a branch of the Thracian University in Stara Zagora) and a branch of the Technical University of Sofia based in Sliven are also part of regional university network. There are several advanced professional schools and ten vocational centres that provide specialised training. There are also about twenty research institutes and centres, such as the petrochemical research institute in Bourgas, the agriculture institute in Karnobat, and the selection centres in Sliven. There are ten business centres in the region, some of them with business incubators that are linked in a network established with the support of the UNDP JOBS programme. The region is not among the leading in R&D activities in the country but has very experienced research experts mainly in the chemical and agricultural sectors.

North East Bulgaria has the most developed and dynamic tourism industry among all regions in the country and tourism is perceived as a tool for boosting the development of the region as a whole. Other important industries are maritime industry, construction, agriculture including food-processing industry, textile and tailoring industry, wood-processing industry, machine-building industry and transport. Industry employs in total a third of the workforce, while over 60% work in the service sector. The key regional actors in the field of innovations are the University of Economics - Varna, Varna University of Medicine, the Technical University of Varna, the Nicola Vaptsarov Naval Academy, Varna Free University, as well as the following scientific and research institutes: the Institute of Oceanology, the Bulgarian Ship Hydrodynamics Centre, the Institute of Metal Sciences, the Institute of Water Transport, the Institute of Fisheries and Aquacultures, and the Institute of Chemical Technologies and Biotechnologies – Razgrad. The regional branches of the SME support agency, the regional development agencies and a large number of centres for training and professional qualification are also active in the region.

Table 5.11 presents distribution of R&D personnel and researchers by planning regions. The MIRIAD region covers 93% of the staff involved in such activities in the country. Within the region South-West part concentrates more than 80% of the R&D personnel and researchers.

Table 5.11: Regional R&D and Innovation Performance in Bulgaria in 2003

Region	Number of R&D personnel and researchers
North-West	91
North Central	1101
North-East	1578
South-East	504
South Central	1718
South-West	12408
National level	17400

Notes: 1. All indicators are measured in percentages except for R&D personnel.
2. The shaded regions are those included in the MIRIAD region.

Source: National Statistical Institute

Table 5.12 presents a SWOT summary of knowledge supply and creation in South-East Bulgarian regions. According to the Accreditation Agency of the Ministry of Education and Science (MES) the total number of the universities and other high schools in the country is 43 including six private universities. 21 of them or approximately half of them are concentrated in the capital Sofia. The South-Central planning region occupies second place with its 9 universities, 6 of which are concentrated in Plovdiv. The less developed region with respect to that criterion is South-Eastern planning region, where only two universities are located. Table 5.2

contains the list of the universities and higher schools closely related to the supply of R&D activities and distributed by planning regions.

Table 5.12: Knowledge Supply and Creation SWOT Summary

Strengths	<ul style="list-style-type: none"> • Knowledge creators located in the region are in the fields identified as priority sectors for economic development; • Significant research potential and good qualifications of the staff;
Weaknesses	<ul style="list-style-type: none"> • The innovation activities of researchers are limited to the development stage only; • Lack of investments in research infrastructure; • Insufficient funding of R&D activities and lack of enough training of R&D staff; • Highly centralised old system that does not correspond to the needs of business sectors
Opportunities	<ul style="list-style-type: none"> • Increasing number of students in the innovations-related subjects • Commercialisation of research activities is becoming priority for the higher education institutions and Bulgarian Academy of Sciences • Participation of the institutions from the region in the European and global initiatives and access to European programs such as ISPA, SAPARD, PHARE, Sixth Framework Programme. • Macroeconomic stabilisation and sustainable economic growth;
Threats	<ul style="list-style-type: none"> • The ability and willingness of the region's higher education sector to prioritise regional knowledge transfer activities; • Delay in the implementation of national and regional innovation strategies; • Lack of willingness and capacity in the old structures for reforms.

In sum, currently Bulgaria has a two-tier knowledge and innovation system - old state research institutes and universities on the one hand and numerous newly established private universities, non-governmental institutions and firms on the other. The two tiers fail to synergize on scarce public and private resources in the country. The old innovation infrastructure has not been reformed to address new and emerging needs of the economy and has remained primarily government financed without private support. Companies and newly emerging innovation structures on the other hand respond to international competitive pressure and trends and have established parallel innovation efforts, which usually are isolated and small scale. Market forces will surely find their way in imposing a new innovation system but this would likely take much more time, efforts and resources if the public and private sectors are not working in a consensus.

Table 5.13: Role of Key Knowledge Supply and Creation Stakeholders

Stakeholder	Role
Bulgarian Academy of Sciences	It is an autonomous scientific organization and national centre in the fields of fundamental and applied research in within mathematics, physics, chemistry and biology, as well as within technical, social sciences and humanities. In the first 5 years of transition to a market economy, the number of organizational units within the Academy was reduced by one third. Currently BAS comprises 51 scientific institutes, one national and 12 regional laboratories, 8 research centres, 3 technical support facilities and 10 auxiliary units. Most of the divisions are located in Sofia.
Universities	Main knowledge producers with strong national and local connections with both policymakers and business
National Centre for Agrarian Sciences	The primary target of the NCAS is to restore and develop the link “science – production – business – state” in the fields of agriculture and forestry.
Other non-governmental organisations	Innovation centres and other non-governmental institutions can be interpreted as both R&D creators and R&D intermediaries. The reason is that they act simultaneously as organizations, undertaking and disseminating its own research.

5.5 Knowledge Demand and Absorption

Knowledge demand and absorption is necessarily a difficult area of analysis and measurement. At a regional level, the best available indicators relate to industrial structure and the human capital capacity of the existing workforce. Industrial structure analysed in terms of the knowledge intensity of the region’s businesses is a useful indicator of the potential demand for knowledge, while human capital capacity indicators are able to monitor the likely ability to absorb appropriate knowledge. As shown by Table 5.14, the proportion of businesses within the South and Eastern Bulgaria varies considerably. The share of persons with tertiary education ranges from 16.5% in South Central to 20% in North Central Region. In North-Central Bulgaria the share of employed in medium and high-tech manufacturing is 1.5 times higher compared to the MIRIAD region. The largest proportion of employed in medium and high tech manufacturing is observed in North Central Region followed by South Central in 2004.

Table 5.14: Key Knowledge Demand and Absorption Indicators

Region	Employment in medium and high-tech manufacturing	Employment in high-tech services	Population with tertiary education	Live-long learning
North-West	2.3	2.0	17.5	16.5

North Central	6.6	2.2	21.0	18.5
North-East	4.6	1.9	18.2	18.2
South-East	3.4	1.7	17.8	18.9
South Central	6.1	1.9	16.5	17.3
South-West	3.4	4.4	31.1	25.3
National level	4.7	2.7	21.7	19.9

Notes: 1. All indicators are measured in percentages except for R&D personnel.
2. The shaded regions are those included in the MIRIAD region.

Source: National Statistical Institute

Table 5.15 presents a SWOT summary of knowledge demand and absorption of the South-East Bulgaria. Based on the apparent available evidence, it is suggested that the region faces a number of issues in this area that require addressing. At present, however, there is little substantive information of the complexities and specificities relating to these issues. It is the aim of the forthcoming workpackages of the Miriad initiative to provide and gather more detailed evidence in this area, so as to fully inform regional R&D investment strategy making.

Table 5.15: Knowledge Demand and Absorption SWOT Summary

Strengths	<ul style="list-style-type: none"> • Highly-qualified labour force; • Sustainable economic growth and macro economic stability
Weaknesses	<ul style="list-style-type: none"> • Low wages in the SMEs do not stimulate productivity and quality of manufacturing; • Old and obsolete infrastructure, machinery and equipment;
Opportunities	<ul style="list-style-type: none"> • Build the quantity and quality of the knowledge demanded by the region's large SME base; • Increasing need to increase competitiveness of regional SMEs through innovations;
Threats	<ul style="list-style-type: none"> • A continuing inability of many firms to be aware of the need for knowledge to stimulate their innovation capability and overall competitiveness.

Knowledge demand and absorption is largely lies with the strategies pursued by the region's business community. This community is represented at the regional (and national) level by a number of 'umbrella' institutions, the most important of which are the Chambers of Commerce, various branch associations, regional development agencies and business incubators.

Table 5.16: Role of Key Knowledge Demand and Absorption Stakeholders

Stakeholder	Role
Chambers of Commerce	Representative organisation for the region's business community
Agencies for Regional	Representative organisation for the region's key businesses and organisations

Development	
Agency for Support of SMEs	Representative organisation for the region's small and medium sized businesses

At both national and regional level, the policies relating to knowledge demand and absorption tend to be an implicit feature of other policies targeted at the private sector, rather than explicit policies in themselves.

Table 5.17: Summary of Key Knowledge Demand and Absorption Policies

Policy	Objectives
National R&D Policies	<ul style="list-style-type: none"> • The instruments the Government uses to narrow the difference between the benefits to the economy and to the company of R&D, and to spread risk
Regional Innovation Strategy	<ul style="list-style-type: none"> • Improve knowledge and skills of SMEs to develop and implement innovations; • Developing co-operation among enterprises; • Promoting technology transfer.

5.6 Knowledge Transfer and Flow

Although in Bulgaria R&D expenditure and personell data are collected by surveys that follow guidelines and definitions outlined in the Frascati Manual and the Regional Manual of Eurostat, data on the 20 SII indicators are not completely available, especially at regional level. The collection of regional data still faces major methodological difficulties that impedes the comparability among regions and also provides distorted picture of regional R&D. Some of the data are collected by sample surveys. Due to the insufficient sample size many of the traditional used indicators for measuring R&D activities are not computed at regional level in Bulgaria. There are also special problems with measuring R&D activities at regional level because if R&D is not performed at the location where the unit is registered, the reporting unit may have problems with breakdown of R&D expenditure and personell by regions. The small size of the country and in particular the small scope of some R&D and innovation activities such as number of patents per year makes regional breakwon useless⁶. A large group of indicators measuring transmission and application of knowledge and innovation, finance and markets (groups 3 and 4 in Summary Innovation Index indicators) are still unavilable for several new member states and applicant countries, including Bulgaria (EU, 2006). In Bulgaria two pilot surveys on innovations among enterprises and on internet use in the financial sector are planned to be conducted till the end of 2006.

Table 5.18 presents a SWOT summary of knowledge transfer and flow within the Yorkshire and Humber region. Overall, there is currently an evidence gap of the type of transferring occurring, its density and frequency, as well the flow directions. It is this evidence gap that Miriad aims to go someway to narrowing.

⁶ For example in 2003 the number of patents applied for at the European Patent office per million population was 0,6 in Bulgaria compared to 26,0 for EU25.

Table 5.18: Knowledge Transfer and Flow SWOT Summary

Strengths	<ul style="list-style-type: none"> • Traditions to work with research organisations and business; • Good awareness of EU funding programs; • A wide network of regional branches with good local connections and reputation. • Good level of using information technologies;
Weaknesses	<ul style="list-style-type: none"> • Lack of understanding of the specific role of intermediary organisations in the field of innovations; • Low level of engagement in international knowledge transfer practices. • Underdeveloped skills in the legal protection of intellectual rights for local SMEs
Opportunities	<ul style="list-style-type: none"> • To take advantage of the increasing public sector investment in knowledge transfer policies and joining EU.
Threats	<ul style="list-style-type: none"> • The unknown appropriateness of the potential knowledge that can be supplied with that being demanded. • Lack of co-ordination among institutions and policies.

As shown by Table 5.19, there is a relative plethora of stakeholders with some form of responsibility for knowledge transfer and flow within South-Eastern Bulgaria. A large number of private non-profit organizations that help in knowledge transfer and absorption have been operating at both national and regional level. Among all regional development agencies, commercial chambers, regional and branch associations, technology transfer centres, business innovation centres, business incubators and other organizations supporting SMEs have been the most active in the field of knowledge transfer. Our impression from the interviews was that the intermediary organizations have no clear idea and understanding about their role in transfer of knowledge and innovations to the enterprise sector.

Table 5.19: Role of Key Knowledge Transfer and Flow Stakeholders

Stakeholder	Role
Bulgarian Association of Regional Development Agency (BARDA)	It was established in July 1997 and includes 21 agencies and business centres, situated in all 28 districts of Bulgaria. BARDA acts as an umbrella association of independent regional and local economic development agencies and SME support centres.
Chamber of Commerce	It is a non-governmental public organization that facilitates, promotes, and represents the interests of its members, and contributes to the development of international economic cooperation. The BCCI structure consists of 23 independent and autonomous registered regional chambers, and of 88 sectoral organizations, incorporates over 20 000 economic agents on the territory of the country, irrespective of the form of ownership.
Bulgarian Industrial Association (BIA)	BIA was established in 1980 as a successor of the Union of Industrialists from 1884. It is a voluntary, non-governmental

	economic union of branch, regional and other associations, state private and cooperative companies; research organizations; institutes; banks; etc. It is a union of collective and individual members, including 28 regional associations representing the interests of the members of the regions; 49 branch chambers acting on behalf of the branch industries;
Association of SMEs	ASME is a new, voluntary and non-governmental organization. It facilitates, promotes, and represents the interests of its members – the small and medium size enterprises. The main goal of the Association is to strengthen the SMEs’ business and to achieve international standards and the modern business practices. (The organization process of the Association is now ongoing).

Table 5.20: Summary of Key Knowledge Transfer and Flow Policies

Policy	Objectives
Bulgarian Government	To facilitate the contacts between knowledge producers and knowledge absorbers; To improve understanding of the role of intermediaries in knowledge transfer; To improve infrastructure and extend the use of IT in knowledge diffusion;
Regional Innovation Commissions	To work with government on simplifying business support services as a key tool in driving up the quality, effectiveness and penetration of business support as well as making sure that public sector business support gets to the heart of business needs.
Agency for support of SMEs	To enhance innovation culture of SMEs; Discussions on prioritising technology development Enhance participation in technology clusters.

5.7 Regional Knowledge Model

Figure 5.1 presents a broad conceptualisation of knowledge creation, demand, transfer and flow based on the evidence collected to date. In summary, it highlights the following:

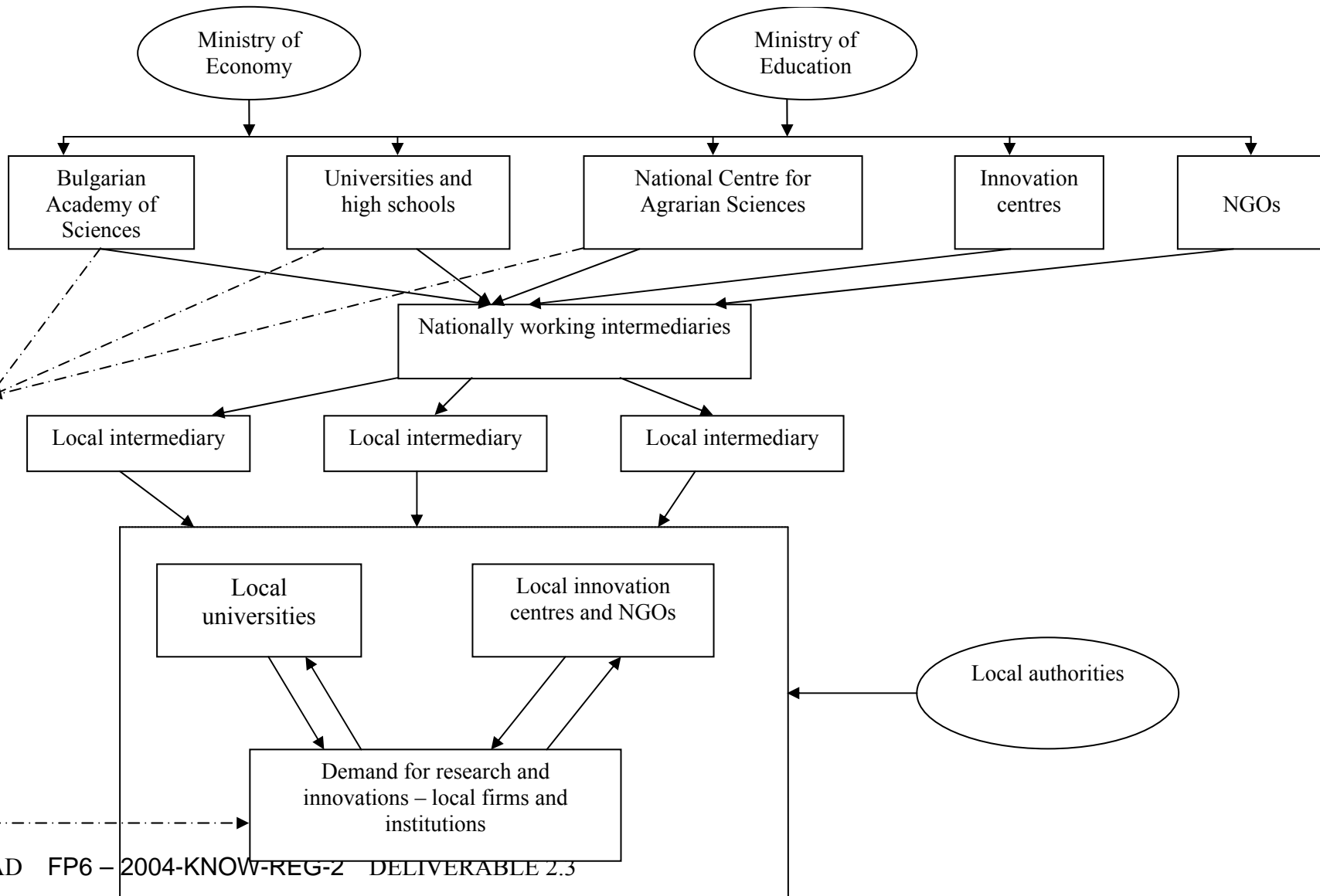
- Currently Bulgaria has a two-tier knowledge and innovation system - old state research institutes and universities on the one hand and numerous newly established private universities, non-governmental institutions and firms on the other. The two tiers fail to synergize on scarce public and private resources in the country.
- The old innovation infrastructure has not been reformed to address new and emerging needs of the economy and has remained primarily government financed without private support. Companies and newly emerging innovation structures on the other hand respond to international competitive pressure and trends and have established parallel innovation efforts, which usually are isolated and small scale.
- Traditionally the knowledge creation and transfer system in Bulgaria has been highly centralized with the dominant role of the state in governing the process. This model resembles the characteristics of the “Triple Helix I”(Erkowitz, 1998) and has been observed in other former socialist economies as well.
- During the transition period through reducing the role of the state the national research and innovation system has shifted from Socialist type of a Triple Helix model to a “laissez-faire” type of model. The model has also to be described as non-linear one that takes both interactive and recursive terms into account.
- Universities have been traditionally viewed as a source of human capital, future employees and, secondarily, as a source of knowledge useful to the firm.
- Demand for research and innovations by private firms were described as rudimentary and scarce.
- Unrecognized importance of innovations for sustainable development among SMEs managers is as important factor explaining low demand as the lack of financial resources.
- Traditional forms of academic-industry relations still prevail. They include rendering personal or team consultations and services to the firms and participation in liaison programs.
- The more intensive and formal institutional ties between universities and firms are still missing.

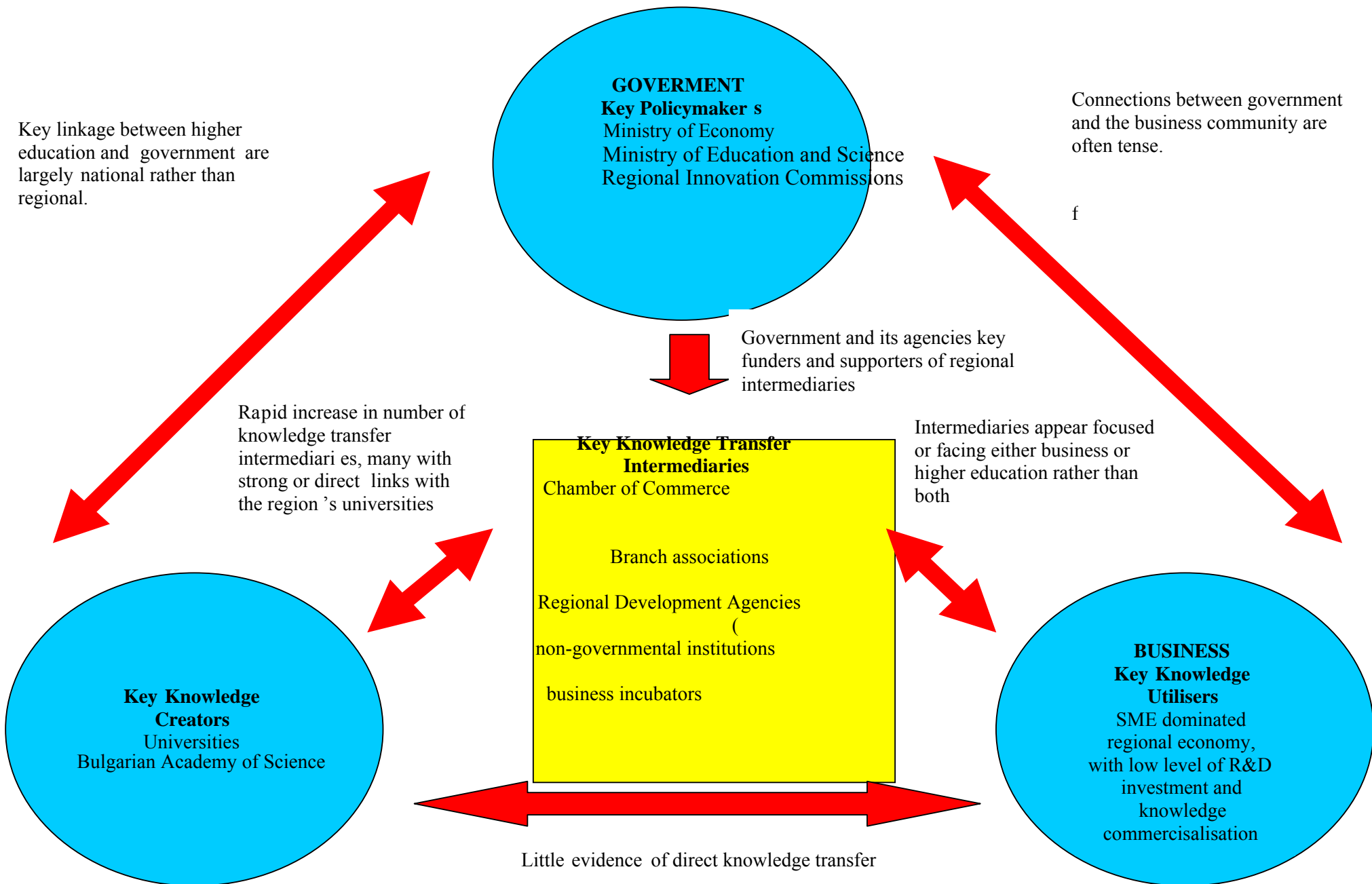
- Real estate development and formation of spin-off firms are still in embryonic phase. Some isolated and separate initiatives related to the extension of university research into development took place mainly confined to the establishment of applied research centres, NGOs and private firms by academics.

Figure 5.2 presents a further representation of knowledge flow within the region based on conceptualisation set within the framework of the Triple Helix model. From this conceptualisation the following is apparent within South-East Bulgaria:

- **Government** – key policymakers are the Ministry of Economy, Agency for Support of SMEs, Ministry of Education and Science and at regional level – Regional Innovation Commissions and Regional Development Councils
- **Business** – SME dominated regional economy with low levels of R&D investment and knowledge commercialisation.
- **Knowledge producers (Universities and Higher Education and Bulgarian Academy of Science)** – large-scale knowledge creation appears mainly restricted to a small number of higher education institutions.
- **Government-Knowledge Creators Interface** - key linkages between higher education and government are largely national rather than regional. The linkages primarily involve the National Science Fund for Bulgaria.
- **Knowledge Creators -Business Interaction**– little evidence of direct knowledge transfer. Intermediaries act as key facilitators of this interaction, with government and its agencies being a key source of funds and supporters of regional intermediaries. In general, there has been a rapid increase in number of knowledge transfer intermediaries, many with strong or direct links with the region's universities. Many intermediaries appear focused or facing either business or knowledge producers rather than both.
- **Government-Business Interaction** - connections between government and the business community are often tense.

Figure 5.1: Bulgaria –Regional Knowledge Model





5.8 Summary of Indicators

Regional R&D and Innovation Performance in Bulgaria in 2003

Region	Population with tertiary education	Live-long learning	Medium and high-tech manufacturing	Employment in high-tech services	Number of R&D personnel and researchers	R&D expenditure by regions	Share of R&D in local GDP	Value added per employee
North-West	17.5	16.5	2.3	2.0	91	0.2	0.02	10617.1
North Central	21.0	18.5	6.6	2.2	1101	4.4	0.17	11079.1
North-East	18.2	18.2	4.6	1.9	1578	6.6	0.23	9434.3
South-East	17.8	18.9	3.4	1.7	504	2.0	0.11	9665.6
South Central	16.5	17.3	6.1	1.9	1718	7.1	0.18	10039.6
South-West	31.1	25.3	3.4	4.4	12408	79.7	1.05	8657.2
National level	21.7	19.9	4.7	2.7	17400	100.0	0.5	13378.0

Notes: 1. All indicators are measured in percentages except for the number of R&D personnel and researchers.

2. The shaded regions are those included in the MIRIAD region.

Source: National Statistical Institute

Key Competitiveness Indicators

Indicator	Bulgaria	SWR	SCR	SER	NER	EU-25
Gross Domestic Product per Capita (2003, Euros in PPP)	4398*	6214*	3576*	3983*	3749*	22305
Labor Productivity per person employed (2004, EU25=100)	31.9	n.a	n.a	n.a	n.a	100
Unemployment Rate (2004, %)	12.0	9.3	10.5	13.5	17.6	9.0
Economic Activity Rate (2004)	49.7	54.0	48.7	49.7	50.7	57.5
Mean Gross Monthly Earnings (2002, Euros)	132	n.a	n.a	n.a	n.a	1,887

Notes: * BGL in current prices, SWR - South West Region, SCR - South Central Region, SER - South East Region, NER - North East Region.

Source: National Statistical Institute, Eurostat

Chapter 6 – Comparison and Conclusion

This section presents an overall comparison of the regions under investigation in this project and offers some broad conclusions describing general patterns observed among them. Table 6.1 provides a comparison of the regions on eight key indicators; GDP per capita, labour productivity, unemployment, economic activity, monthly earnings, R&D expenditure by businesses, R&D employment by businesses and the percentage of the population with tertiary education. These indicators offer a wide-ranging look at both the state of the region's economies and also the level of R&D undertaken. These indicators are also compared against the average for the EU-25 (where available) in order to understand their relative level of development.

6.1 Overview and Comparison of Regional Economies

Firstly, in terms of GDP per capita, only Yorkshire and Humber has GDP per capita above the EU-25 average, 21,832 Euros compared with 20,685 Euros. The Greek regions lag the EU-25 average, with Central Macedonia around 80% of the EU-25 average and East Macedonia-Thrace around 60%. The Turkish region of Thrace and the Bulgarian regions substantially lag the UK and Greek regions, as well as the EU-25. GDP per capita in Trace (Turkey) is around 10% of the EU average and six times lower than the worst performing Greek region (East Macedonia and Thrace). The Bulgarian regions are performing slightly better than the Trace (Turkey), however, the North Eastern, South Eastern and South Central regions all have GDP of less than 20% of the EU-25 average. The fourth region, South Western Bulgaria, fares slightly better with GDP per capita around 30% of the EU-25 average.

With respect to labour productivity all the regions lag the EU-25. Labour productivity is highest in Yorkshire and Humber, with an index score of 95.1 (EU-25 = 100), and lowest in Bulgaria, with an index score of 31.9 (although this figure applies to the whole country as there is no regional data available). Within the other regions, labour productivity is less than 50% of the EU-25 average suggesting there is a need for policy measures to target increased productivity as a way of boosting these economies.

Unemployment and economic activity in the regions compare more favourably to the EU-25 average. In Greece and Turkey the unemployment rates are within 2 percentage points of the EU-25 average of 9%. In Bulgaria the unemployment rates vary between 9.3% in the South Central region, which is similar to the EU-25 average, and 17.6% in the North Eastern region, which is almost double the EU-25. Unemployment in Yorkshire and Humber is around half of the EU-25 average at 4.6%, reflecting the prolonged period of economic growth in the UK from the mid 1990s. In terms of economic activity rates the regions perform more strongly than in terms of unemployment. The Bulgarian regions have the lowest levels of economic activity, ranging from 48.7% in the South Central region to 54% in the South West region, compared with 57.5% in the EU-25. The Greek regions also lag this figure (economic activity across Greece is 51.9%), as does Turkey (economic activity across Turkey is 51.5%). Again, Yorkshire and Humber has the highest level of economic activity of 61%, which is the only region higher than the EU-25 average.

In terms of gross monthly earnings Yorkshire and Humber is the only region where earnings are above the EU-25 average, 2242 Euros compared with 1887 Euros. Monthly earnings in the Greek regions of Central Macedonia and East Macedonia and Thrace are substantially less, 1238 and 1103 Euros respectively. Earnings in Turkey and Bulgaria are very low when compared with the EU-25 average; earnings in Thrace are 580 Euros per month and 132 Euros per month across Bulgaria. These regions lag the Greek and UK regions substantially, highlighting the disparities evident across the MIRIAD project area.

Table 6.1 contains 2 indicators for R&D within the regions. The first, R&D expenditure by business per capita, measures the level of investment in R&D by the private sector in each region. In terms of this indicator Yorkshire and Humber is highest with R&D expenditure by business of 105.2 Euros per capita; however this is less than 50% of the EU-25 average of 268.57 Euros. The second highest region is South West Bulgaria where R&D expenditure by businesses per capita is 65.25 Euros; however this figure covers all R&D expenditure as separate figures are not available. For all other regions R&D expenditure is less than 10% of the EU-25 average, highlighting the fact that these regions seriously lag behind the EU as a whole. Thus, the firms in these regions can be regarded as static, they are not changing or developing their products and production processes; a serious problem which curbs economic development.

The second R&D indicator, R&D employment by business per 1000 inhabitants, shows that, again, all regions seriously lag the EU-25 average of 2.2%. Yorkshire and Humber is the best performing MIRIAD region with 1.3% of the regional workforce employed in R&D. The 2 Greek regions, Central Macedonia and East Macedonia and Thrace, have R&D employment levels of 0.3% and 0.2% respectively and Thrace (Turkey) has a figure of just 0.15%. The figures for Bulgaria show total employment in R&D, therefore they do not offer a direct comparison. Therefore a very small proportion of the workforce in all the regions under investigation is involved in creating new knowledge, suggesting that all regions may lack the ability to become knowledge based economies as they do not possess a critical mass of knowledge workers.

Finally, in terms of tertiary education each has a significant proportion of the population who possess these skills. The region with the highest proportion is South West Bulgaria where 31.1% have tertiary education and the lowest is South Central Bulgaria with 16.5% of the population with tertiary education. In Yorkshire and Humber 22.3% of the population have tertiary education; in the Greek regions of Central Macedonia and East Macedonia and Thrace the figure is 23.7% and 17.1% respectively. The figure for Thrace (Turkey) is 21.6%. Thus all regions have a significant proportion of the population with the highest level of education, suggesting there is a pool of skilled labour available for knowledge intensive sectors. This is an interesting observation as it would suggest that the low levels of productivity observed in the regions is not the result of a lack of skilled labour, but possibly outdated and inefficient production processes or equipment. Thus, increasing R&D in the regions may tackle this problem.

Overall the Yorkshire and Humber region out-performs the other regions on all indicators. The reason for this is that the UK overall is a more advanced economy

than Greece, Turkey and Bulgaria, currently the world's 5th largest economy (ref), thus it is understandable that this region will outperform the less developed regions. However, in the context of the EU-25 all the regions can be described as lagging, especially in terms of R&D expenditure and employment, which are the main focus of the MIRIAD project.

Table 6.1 – Summary of Indicators

	UK	Greece		Turkey	Bulgaria			EU	
Indicator	Yorkshire and Humber	Central Macedonia	East Macedonia and Trace	Thrace	North East	South East	South Central	South West	EU25 Average
GDP per capita (2002, Euros ppp)	21,832.4	16,710	12,522	2522.31 ⁷	3749 ⁸	3983 ²	3576 ²	6214 ²	20,685
Labour Productivity (2004)	95.1	48 ⁹	35.7 ³	43.9 ¹⁰	31.9 ¹¹	31.9 ⁵	31.9 ⁵	31.9 ⁵	100
Unemployment Rate (2004)	4.6	10.1	11.9	11.45	17.6	13.5	10.5	9.3	9.0
Economic Activity Rate (2004)	61.0	51.9 ¹²	51.9 ⁶	51.5 ¹³	50.7	49.7	48.7	54.0	57.5
Mean Gross Monthly Earnings (2002, Euros)	2242	1238	1103	580	132 ¹⁴	132 ⁸	132 ⁸	132 ⁸	1887

⁷ This figure is for 2004

⁸ These figures are for 2003

⁹ These figures are for 2003

¹⁰ This figure is for Turkey as a whole, no regional figures are available

¹¹ This figure is for Bulgaria as a whole, no regional figures are available

¹² This figure is for Greece as a whole, no regional figures are available

¹³ This figure is for Turkey as a whole, no regional figures are available

¹⁴ This figure is for Bulgaria as a whole, no regional figures are available

R&D Expenditure by Business (2004, Euros per inhabitant)	105.2	24	14	5.09 ¹⁵	8.62 ¹⁶	4.38 ¹⁰	6.44 ¹⁰	65.25 ¹⁰	268.57
R&D employment by Business (Employees per 1000 inhabitants, 2003)	1.3	0.3	0.2	0.15 ¹⁷	1578 ¹⁸	504 ¹²	1718 ¹²	12408 ¹²	2.2
Percentage of Population with Tertiary Education (2003)	22.3	23.7	17.1	21.6 ¹⁹	18.2	17.8	16.5	31.1	N/A

Sources

Office for National Statistics (UK)
Department of Trade and Industry (UK)
Huggins and Davies (2005)
Eurostat
KOSGEB (Turkey)
BDYK (Turkey)
National Statistical Institute (Bulgaria)

¹⁵ This figure is for Turkey as a whole, no regional figures are available

¹⁶ All R&D expenditure per 1000 inhabitants

¹⁷ This figure is for 2002

¹⁸ These figures are totals, percentages are not available

¹⁹ This figure is for 2005

6.2 Conclusions

The indicators used to compare the MIRIAD regions shows that they can all be classed as lagging regions in that they lag the EU-25 average on almost every indicator. Overall Yorkshire and Humber performs best, although this is not surprising as it is located in the most developed country. As Greek, Turkish and Bulgarian economies are in state of transformation it appears a little unfair to compare them directly with the UK.

However, the data in Table 6.1 highlights the policy areas which are the key to building knowledge based economies in the regions:

- Firstly there is a need to increase R&D investment by businesses within all regions.
- Secondly, R&D employment is below average in all regions, therefore policies could be aimed at encouraging the growth of knowledge based companies in the regions.
- In each region there is a significant proportion of the workforce with tertiary education, suggesting that the workforce do have the necessary skills for high technology employment. Therefore expanding the number of high technology firms in the region is unlikely to be constrained by a lack of skilled workers.
- In the non-UK regions labour productivity is a significant problem, with productivity less than 50% of the EU-25 average in all regions. While the workforce may be well educated this has not been exploited within the regions.