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Thematic Priority: **Support for the coherent development of research and innovation policies**

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Dissemination Level		
PU	Public	**PU**
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

Workshop Materials

(Deliverable 3.1)

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 constitutes deliverable 3.1 of the MIRIAD project, which consists of materials for use in workshops with key regional stakeholders. These workshops involve outlining a number of future scenarios for each of the regions in order to promote debate on the policies necessary for the creation of a successful, knowledge driven regional economy. The report contains the scenario report developed for each region, as well as the presentations to be made by partners.

This deliverable consists of the following:

- Chapter 2 – Yorkshire and the Humber (UK) future scenarios and workshop materials.
- Chapter 3 - Central Macedonia and East Macedonia-Thrace (Greece) future scenarios and workshop materials
- Chapter 4 – Thrace (Turkey) future scenarios and workshop materials
- Chapter 5 - South and East Bulgaria (Bulgaria) future scenarios and workshop materials

CHAPTER 2
WORKSHOP MATERIALS FOR YORKSHIRE AND THE HUMBER (UK)

2.1 Introduction

This paper sets out three scenarios for the Yorkshire and Humber region regarding knowledge, RTD and innovation levels and how these will have an impact. The three scenarios comprise of a ‘base case’, where by the region follows its current trend; a ‘growing’ scenario, where a slight improvement on the current trend is observed; and an ‘optimistic’ scenario, where a large improvement on the current trend is observed.

The paper is set out as follows: section 2 briefly introduces key indicators in order to outline the present state of the region’s economy in terms of GDP, productivity, R&D, innovation levels and qualifications. These are also compared to the UK as a whole in order to highlight the relative performance of the region. Section 3 then outlines the three scenarios and the impacts these may have on the regional economy.

2.2 Setting the scene. Outline of Yorkshire’s economy

From an economic viewpoint, the Yorkshire and Humber region lags behind the rest of the UK. The latest data on regional Gross Domestic Product for Yorkshire and Humber showed the regional economy is worth over £75bn, equating to a per capita figure of just under £15,000 (Office for National Statistics). When indexed against UK GDP (UK=100) this equates to a figure of 89 (Office for National Statistics), and is showing an increasing divergence from the UK highlighted by the fact this index was 91 in 1990. This ‘lagging region’ label is again confirmed by the fact that Yorkshire and Humber ranks 61st out of 91 European regions in terms of competitiveness (Huggins and Day, 2005). This present position reflects the decline of the region, as the traditional industries such as large scale engineering, steel production, textiles and coal mining have declined without being effectively replaced by the increased presence of knowledge-based industries.

The challenge facing policymakers in the region is to reverse these trends, a challenge made increasingly more difficult by increasing levels of competition from North American and Western Europe, as well as the emerging economies in Eastern Europe and Asia, the latter benefiting from significantly lower labour costs.

RTD, knowledge and innovation are recognised both nationally and regionally as key drivers in a modern economy, and central to the transition towards a 21st century regional economy in Yorkshire and the Humber. The forthcoming European Competitiveness Index 2006 report outlines a positive relationship between total ‘knowledge employment’ and regional competitiveness (Huggins and Davies, 2006). The presence of the following ‘knowledge sectors’ have the highest correlation with regional competitiveness; ICT services, telecoms, R&D and IT and computer manufacturing.

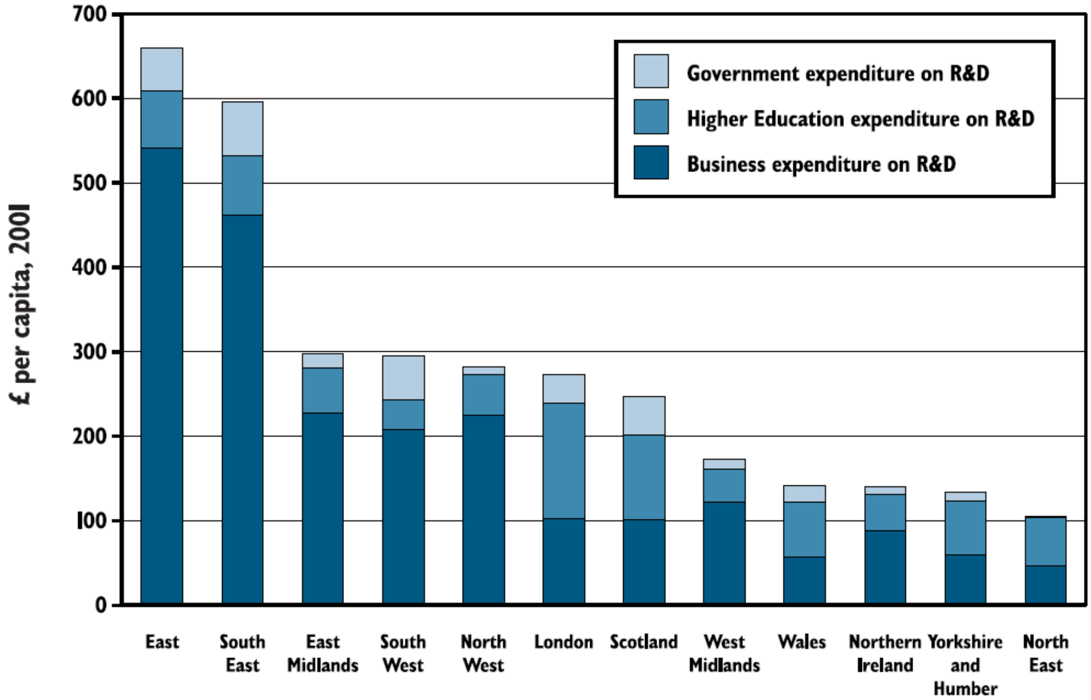

Figure 2.1 – Regional R&D Expenditure per Capita in the UK (2001)
Source: Office for National Statistics

Figure 2.1 shows that Yorkshire and Humber has one of the lowest rates of R&D expenditure per capita in the UK. On closer examination, the chart highlights that the deficit is due to the low level of expenditure on R&D by business and government sectors; expenditure by the higher education sector compares favourably with the other regions, 0.44% of GDP compared with 0.40% for the UK. Business expenditure on R&D as a percentage of R&D is 0.46% compared with 1.19% for the UK as a whole. Business expenditure on R&D in the top performing UK regions in terms of R&D, the Eastern and South Eastern regions, is 3.07% and 2.12% respectively. This highlights the large increase required for the Yorkshire and Humber region to become a knowledge driven economy.

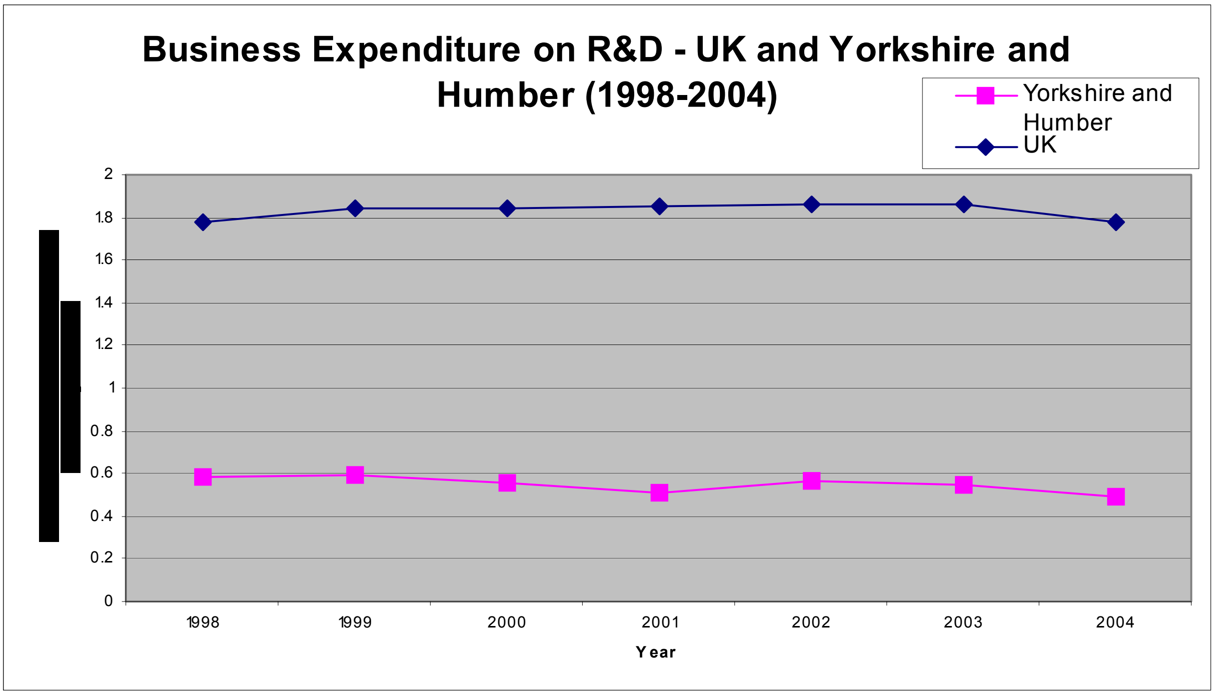

Figure 2.2 – Business Expenditure on R&D in Yorkshire and Humber and the UK (1998-2004) Source: Office for National Statistics

As noted above, business expenditure on R&D is significantly lower in Yorkshire and Humber than the UK as a whole; Figure 2.2 highlights this graphically with business expenditure on R&D in 2004 around 0.55% of GDP compared with 1.8% for the UK. The forthcoming European Competitiveness Index Report for 2006 highlights the fact that within competitive regions expenditure on R&D is around 3% of GDP or higher. Therefore, Yorkshire and Humber needs to actively promote R&D within firms in order to meet this target.

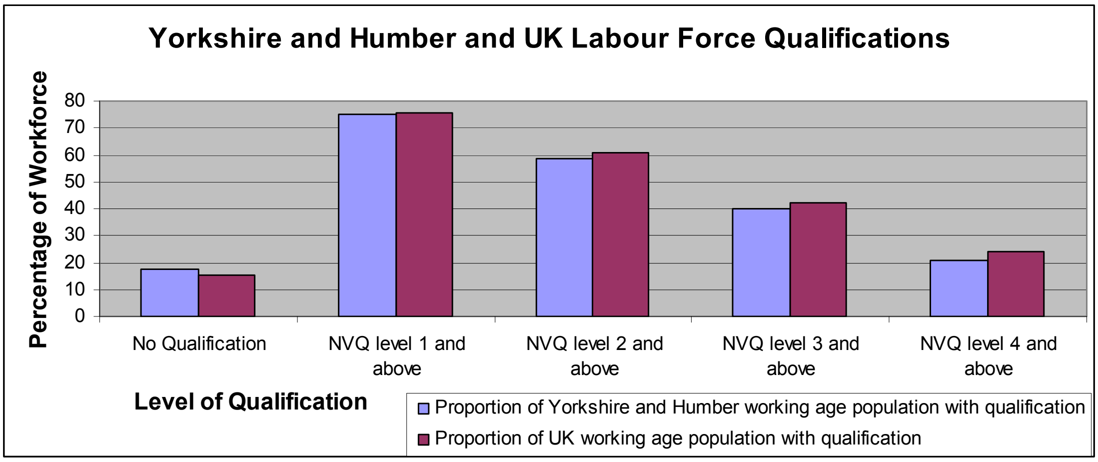

Figure 2.3 Labour Force Qualifications (2004)
Source: NOMIS (Local Area Labour Force Survey)

Figure 2.3 shows that Yorkshire and Humber lags the UK in terms of higher-level qualifications, i.e. NVQ levels 3 & 4. This lack of education may hinder the development of a knowledge-driven economy in the region, as the workforce will simply not have the required level of skills level to effectively create, absorb and transfer knowledge.

There are a number of regional policies aimed at increasing RTD in Yorkshire and Humber. The cornerstone of regional policy is the Regional Economic Strategy (RES) prepared and implemented by Yorkshire Forward, the regional development agency. Objective 2 of the RES outlines the aim to increase the innovative activity of firms within the region through:

- Using business support agencies to encourage new product development
- Promotion of knowledge transfer
- Encouraging links with universities
- Establish a network of Centres for Industrial Collaboration

There are also a number of key intermediaries in the knowledge transfer process within the region, there are:

- **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.’

2.3 Scenarios

Scenario 1 – Continuing the Current Trend

This scenario is based on R&D levels in Yorkshire and the Humber continuing at the current level of growth, which was approximately 2% per annum between 1998 and 2004 (ONS). Assuming an average increase in GDP of 2.5% per annum, business expenditure on R&D as a percentage of GDP in Yorkshire and the Humber will decrease from 0.49% to 0.39% of GDP over the next 10 years. This is illustrated in figure 2.4, which assumes that R&D expenditure as a percentage of GDP for the UK as a whole stays constant, as was the situation from 1998-2004.

Detailed statistics on R&D expenditure for the government and higher education sectors are not available; therefore this scenario focuses on expenditure on R&D by businesses. As highlighted in figure 2.4, Yorkshire and Humber compares favourably with the UK as a whole in terms of R&D expenditure by the higher education sector; therefore this scenario assumes this to continue. Investment in R&D by the government sector is also assumed to stay constant although this does lag the better performing regions. However, we assume that government R&D can be undertaken by firms instead of creating new government controlled laboratories; thus there is a less explicit role for government in these scenarios in that government can contract out R&D to the business sector in order to increase the amount undertaken by this sector.

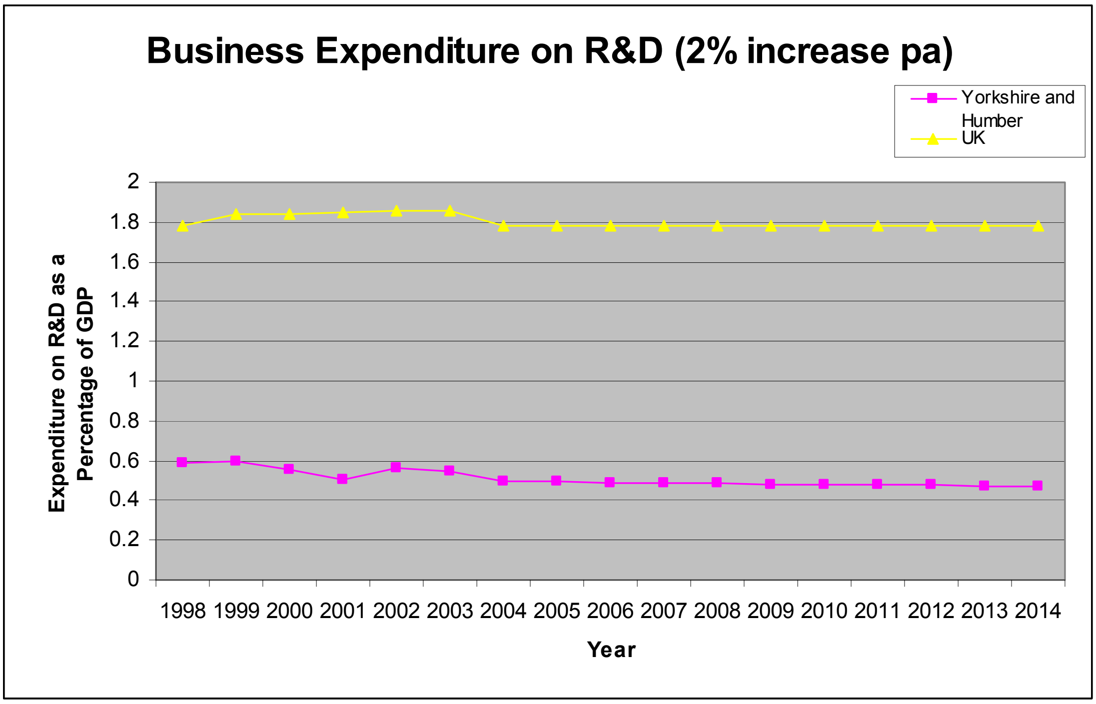

Figure 2.4 Business Expenditure on R&D 1998-2014 Based on Current Trends
Source: Office for National Statistics

Figure 2.4 shows that maintaining the current 2% per annum increase in R&D expenditure will actually decrease the proportion of GDP spent on R&D (assuming GDP grows at 2.5% per annum). Divergence from the UK as a whole will be observed, having the effect of further weakening the competitiveness of the region and ensuring that it remains substantially behind the UK as a whole. This translates into low impacts on economic growth and little in terms of demand for more highly skilled workers. The likely outcome is that the region will remain towards the lower reaches of both the UK and European Competitiveness indices and risks falling further behind as other regions develop faster.

This scenario assumes that there is very little in the way of incentives for firms within the region to undertake R&D.

The wider implications of this scenario are summarised as follows:

- Increased divergence from the more prosperous core regions of the UK and Europe as a whole. This continues the vicious circle of decline initiated by the contraction of core industries in the region over the past 3 decades.

- Further relative decline could be witnessed as regions from new member states of the EU catch up and surpass the region.

- The lack of opportunity for highly skilled jobs in high technology sectors may lead to migration of skilled workers to other regions where these jobs do exist. Yorkshire and Humber could find itself stuck in a low skill equilibrium dominated by low skilled, low paid jobs and low value added, low technology industries.

- This lack of skills and dominance of low technology sectors would deter potential FDI, especially from new technology high added value sectors which demand highly skilled labour as well as a supply chain to provide the necessary inputs.

- A lack of R&D will hamper the development of the regional clusters at the heart of the regional economic strategy. One of the key advantages of clusters is the increased level of innovation possible due to the existence of knowledge spillovers. However, there will be fewer spillovers if there is less knowledge generated.

- The lack of R&D expenditure by the business sector puts further pressure on the higher education sector to produce the knowledge necessary for the region's businesses to innovate. Thus, R&D undertaken by the higher education sector effectively substitutes rather than compliments the activities of business leading to a mismatch between knowledge demand, i.e. what the firms require, and knowledge supply, what the sector produces.

Scenario 2 – Moderate Increase in R&D expenditure

This scenario is based around a moderate increase in rate of growth of R&D expenditure from 2% per annum to 5%. Figure 2.5 shows that this would lead to an improvement in the relative position of the region (again, assuming that R&D expenditure as a percentage of UK GDP stays constant) with expenditure on R&D rising from 0.49% to 0.63% of GDP. However, this improvement is very slight and only restores the region to a level of R&D investment slightly above that of 1998 (0.59%) and, with it taking a considerably long time period to converge with the UK, even with no increase in the proportion of UK GDP spent on R&D.

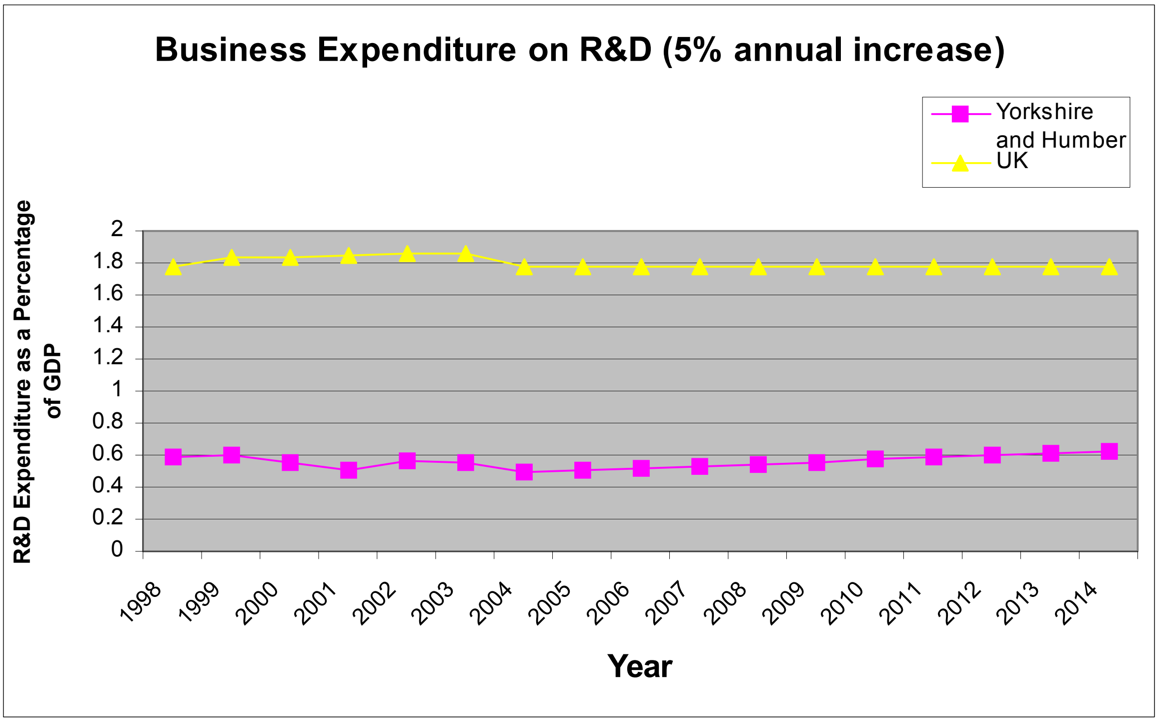

Figure 2.5 Business Expenditure on R&D 1998-2014 Based on an Increase of 5% per Year

Source: Office for National Statistics

The conditions required for this scenario to occur include:

- Increasing the incentives for businesses to undertake R&D.
- Highlighting the benefits of R&D for innovation and product development and the possibilities for expansion this opens up.
- Offering grants and/or loans for firms to undertake R&D activities.
- Outsourcing government R&D to firms within the region with the requisite ability in order to give a boost to regional R&D.
- Encouraging collaboration with other knowledge generating institutions, e.g. universities.
- Targeting the SME sector will be crucial as these firms account for the majority in the region. Thus, encouraging workforce development and knowledge transfer within these firms will encourage innovation and growth, improving the region's economy in the process.
- Formation of effective intermediaries in order to match knowledge demand with knowledge generated. These intermediaries could also regulate the knowledge transfer process between firms in order to prevent firms from obtaining knowledge and reneging on sharing their knowledge.

The wider implications for this scenario are as follows:

- The beginnings of the transition to a modern knowledge based economy will be observed. This may enable Yorkshire and Humber to be recognised as a modern economy, crucial in attracting new investors and raising the profile of the region.

- This scenario stops the divergence from the rest of the UK; while there is only a low level of growth observed it is enough to arrest the decline and offers a base to build on for the future.

- Arresting the decline may prevent the higher skilled jobs from leaving the region, ensuring there is demand for skilled workers and ending the migration to more prosperous regions.

- Pressure is eased on the higher education sector as business R&D catches up and compliments the activities of this sector.

- There is greater scope for the clusters strategy to succeed as the higher levels of R&D allow greater amounts of innovation to be undertaken and a higher level of knowledge spillovers to occur.

Scenario 3 – Substantial Increase in R&D Expenditure

This scenario is based on an increase of 10% per annum in R&D expenditure by businesses (again, assuming GDP increases at 2.5% per annum and the R&D expenditure as a proportion of GDP stays constant for the UK as a whole).

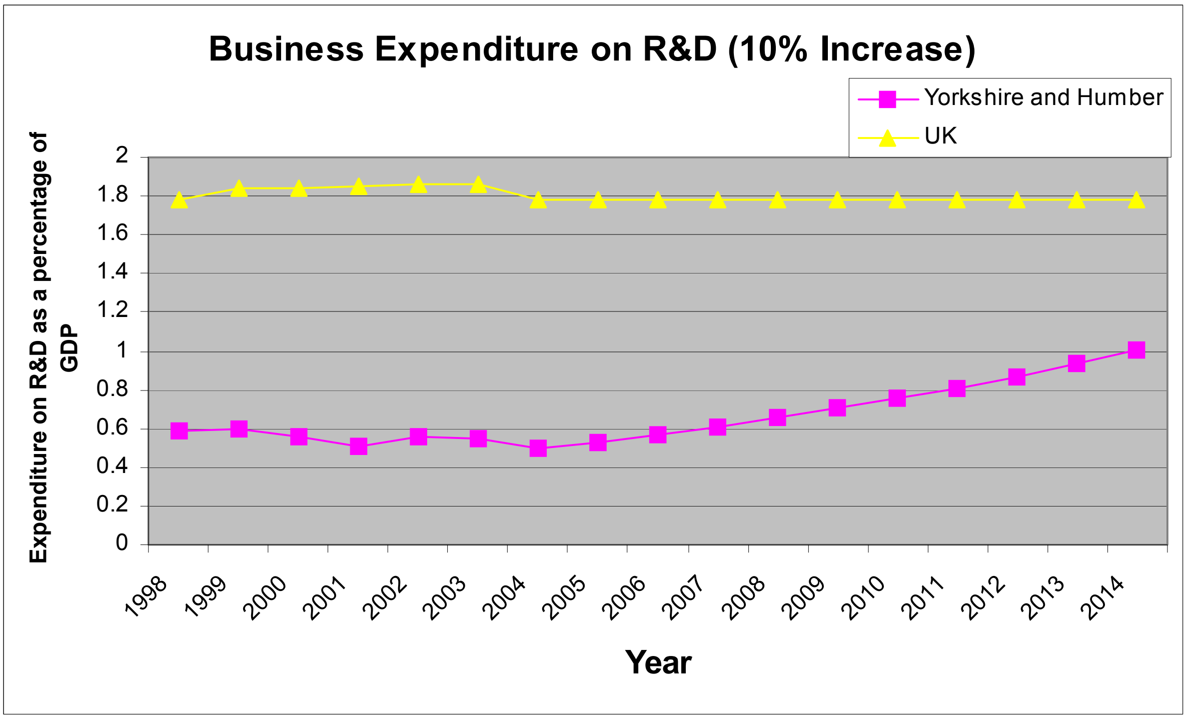

Figure 2.6 Business Expenditure on R&D 1998-2014 Based on an Increase of 10% per Year
Source: Office for National Statistics

Figure 2.6 illustrates that with a 10% increase per annum R&D expenditure shows significant convergence with the UK as a whole. Although significant convergence is observed, it would still take a long time period for Yorkshire and Humber to reach UK levels. However, it is only ensuring a scenario such as this takes place that will allow the development of a knowledge driven economy in Yorkshire and Humber

The conditions required for this scenario to occur include:

- Effective implementation of the RES, especially assisting firms to develop new and better products and promoting knowledge and technology transfer within the region.

- Increasing the proportion of SMEs undertaking R&D and encourage these firms to engage in knowledge creation and transfer through effective collaboration and partnerships with knowledge creating intermediaries.

- Provision of loans/grants to aid the purchase of capital equipment required in the innovation process

- Encouraging knowledge generating firms into the region through provision of appropriate accommodation and infrastructure. Imbedding these firms into the regional supply chain may lead to flows of knowledge into regional firms.

- Further integration of the higher education sector into the regional economy and tackle the removal of any barriers between this sector and the business sector which may prevent effective collaboration on R&D.

- Exploit any interdependencies which may exist in the region’s clusters so that collaboration is actively pursued and, in cases where it already exists, continued.

The wider implications of this scenario are:

- The increased level of R&D will create a higher number of skilled jobs which will act as an incentive for skilled workers to stay in the region as well as attracting others from the outside, preventing the region from sinking into a low skill equilibrium.

- Attraction of FDI from high added value firms further boosting the regional economy.

- The UK will be less divided as there will be more equal levels of growth, rather than a strong core and weak periphery.

- Also Yorkshire and Humber will be more competitive region in an increasingly globalised economy and be able to compete with emerging regions with significantly lower costs of production

2.4 Conclusions

- Scenario 1 – if the region continues its current trends then the regional economy will continue to diverge from the UK

- Scenario 2 – small improvements will prevent further decline relative to the UK but will merely maintain the region’s current lagging position

- Scenario 3 – large improvements in R&D expenditure will not only arrest the decline but ignite a process of catch up with the UK

2.5 Powerpoint Presentation

SIXTH FRAMEWORK PROGRAMME
REGIONS OF KNOWLEDGE 2

MIRIAD:
Managing and Infusing Research Investment and Development

D3.1 Future Scenarios Workshop

MIRIAD - Managing and Infusing Research Investment and Development

The University Of Sheffield.

Project Participants

- **University of Sheffield (UK).**
- **South-East European Research Centre (SEERC)-Thessaloniki.**
- **Istanbul Commerce University.**
- **University of National and World Economy-** Sofia.

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RATIONALE

- In the past, R&D investment policies and strategies have focused either on stimulating transfers/spillovers or facilitating knowledge absorption.
- Successful strategy building must take account of both simultaneously.
- It is the aim of this project to integrate both these aspects, so as to remove both the supply and demand-side barriers associated with R&D transfer, absorption, and investment.
- R&D investment is a function of a region's ability to transfer, spillover and absorb knowledge.
- This project will focus on the inter-connectivity of these three factors as a catalyst and stimulator of enhanced R&D investment.

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MIRIAD: AIMS AND OBJECTIVES

- **The objective of this project** is to stimulate policy intervention focused on raising levels of R&D investment in four regions across Europe. *Yorkshire in the UK,*
- *Thrace in Turkey, Central Macedonia and East Macedonia & Thrace in Greece,*
- *and South & East Bulgaria.*

- **The key aims are:**

- To formalise policies with regional and national government aimed at improving levels of R&D investment by businesses, government and higher education.
- To establish tools by which SMEs are able to identify and measure their knowledge assets through developing a range of benchmarking and scorecard instruments.
- To establish a regional mutual learning platform for promoting the trans-national exchange of practices towards enhancing regional R&D investment.
- To facilitate the transfer of good practices in terms of participation to EU funded research, links and co-operation between SMEs and research performers.
- To establish an R&D Investment Strategy for each of the regions that is complementary to the existing policy initiatives and activities already being undertaken.

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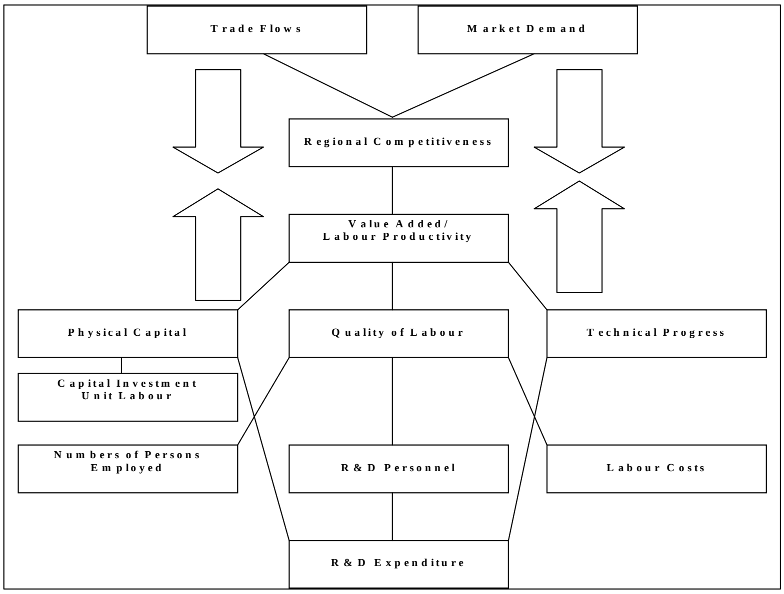
Regional Competitiveness Framework



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The Regional European Competitiveness Index 2004 (European Average=100)
Source: Robert Huggins Associates (2004) European Competitiveness Index 2004

Rank	Region	Regional European Competitiveness Index	Rank	Region	Regional European Competitiveness Index
1	Uusimaa, Finland	261.8	47	Sud-Ouest, France	91.0
2	Stockholm, Sweden	252.3	48	Schleswig-Holstein, Germany	89.8
3	Brussels, Belgium	248.1	49	Mellersta Norrland, Sweden	89.4
4	Île de France, France	230.0	50	Noord-Nederland, Netherlands	87.9
5	Switzerland	224.7	51	Est, France	87.1
6	Luxembourg	222.0	52	Südösterreich, Austria	86.4
7	Hamburg, Germany	211.5	53	Méditerranée, France	86.2
8	**London, UK**	**186.4**	54	Väli-Suomi, Finland	83.8
9	Norway	184.6	55	Nord Est, Italy	83.4
10	Bremen, Germany	178.9	56	Norra Mellansverige, Sweden	83.2
11	Baden-Württemberg, Germany	175.9	57	Bassin Parisien, France	80.6
12	**South East, UK**	**171.7**	58	Småland med öarna, Sweden	79.9
13	Hessen, Germany	170.7	59	Sachsen, Germany	79.0
14	West-Nederland, Netherlands	168.2	**60**	**Yorkshire and The Humber, UK**	**77.5**
15	Bayern, Germany	160.1	61	Centro, Italy	77.1
16	Berlin, Germany	154.9	62	Ouest, France	71.9
17	**Eastern, UK**	**152.7**	**63**	**Northern Ireland, UK**	**67.3**
18	Denmark	142.6	**64**	**Wales, UK**	**63.6**
19	Västsverige, Sweden	135.6	65	Itä-Suomi, Finland	63.0
20	Zuid-Nederland, Netherlands	135.0	66	Brandenburg, Germany	62.8
21	Ostösterreich, Austria	131.8	67	Nord - Pas-de-Calais, France	62.5
22	Östra Mellansverige, Sweden	128.2	68	Thüringen, Germany	61.9
23	Pohjois-Suomi, Finland	127.5	**69**	**North East, UK**	**59.9**
24	Sydsverige, Sweden	127.1	70	Este, Spain	59.6
25	Lazio, Italy	124.0	71	Noreste, Spain	56.4
26	Nordrhein-Westfalen, Germany	123.6	72	Région Wallonne, Belgium	55.3
27	Åland, Finland	120.6	73	Sachsen-Anhalt, Germany	52.1
28	Etelä-Suomi, Finland	117.7	74	Border, Midlands and Western, Ireland	50.1
29	Oost-Nederland, Netherlands	116.1	75	Mecklenburg-Vorpommern, Germany	49.1
30	Comunidad de Madrid, Spain	115.8	76	Abruzzo-Molise, Italy	48.8
31	Centre-Est, France	114.1	77	Portugal (Continent)	40.6
32	**South West, UK**	**112.5**	78	Attiki, Greece	38.9
33	Rheinland-Pfalz, Germany	109.7	79	Canarias, Spain	38.4
34	Lombardia, Italy	109.3	80	Sardegna, Italy	26.3
35	Övre Norrland, Sweden	107.2	81	Nisia Aigaiou, Kriti, Greece	22.4
36	Southern and Eastern, Ireland	103.0	82	Madeira, Portugal	22.1
37	Emilia-Romagna, Italy	102.5	83	Açores, Portugal	21.9
38	Saarland, Germany	101.1	84	Campania, Italy	19.5
39	Niedersachsen, Germany	100.7	85	Noroeste, Spain	18.5
40	**West Midlands, UK**	**98.8**	86	Sicilia, Italy	15.6
41	Vlaams Gewest, Belgium	98.8	87	Sud, Italy	13.9
42	**Scotland, UK**	**98.7**	88	Centro, Spain	13.6
43	**East Midlands, UK**	**98.4**	89	Voreia Ellada, Greece	11.5
44	Westösterreich, Austria	97.6	90	Sur, Spain	7.3
45	Nord Ovest, Italy	95.9	91	Kentriki Ellada, Greece	2.4
46	**North West, UK**	**92.0**			

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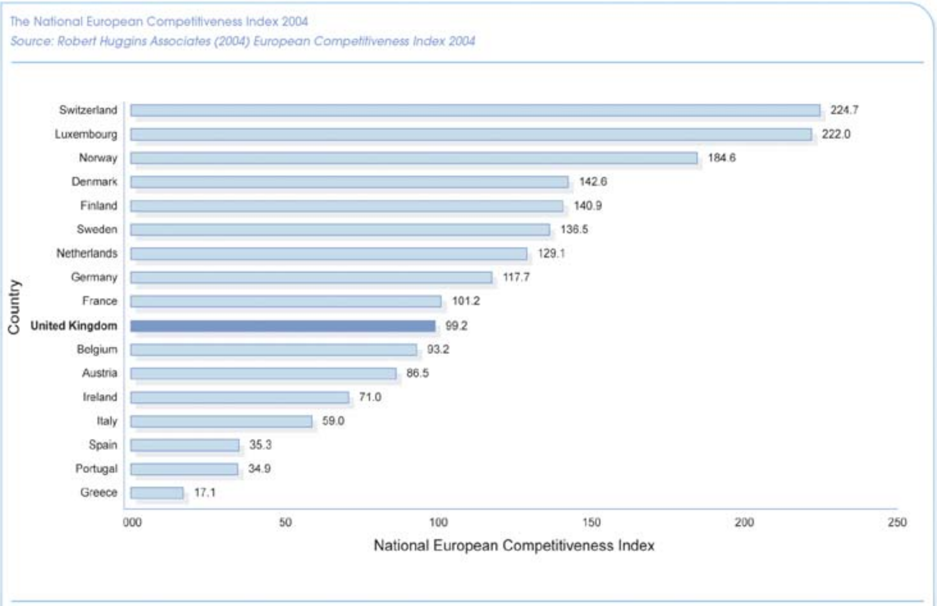

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UK Regional Competitiveness Index 2005 and 1997 (UK=100)

Rank	Region	Index 2005	Index 1997	Rank in 1997	Change in Rank	Change in Index Score
1	London	114.7	119.2	1	0	-4.5
2	South East	114.6	115.1	2	0	-0.5
3	Eastern	109.0	106.4	3	0	2.6
4	East Midlands	95.5	94.1	5	1	1.4
5	South West	93.2	91.1	7	2	2.1
6	West Midlands	91.8	94.0	6	0	-2.2
7	North West	91.2	89.9	8	1	1.4
8	Scotland	91.0	94.1	4	-4	-3.1
9	Yorkshire and The Humber	86.7	85.6	9	0	1.1
10	Northern Ireland	84.0	81.8	10	0	2.3
11	Wales	83.5	81.5	11	0	2.0
12	North East	81.2	79.2	12	0	2.0
	United Kingdom	100.0	100.0			

Table: 2.01

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Regional R&D Expenditure by Business Enterprises as a % of GDP (1997-2002)

Rank	Region	R&D Exp (as % of GDP) Business enterprise sector (2002)	R&D Exp (as % of GDP) Business enterprise sector (1997)	Rank in 1997	Change in Rank	CAGR
1	Eastern	3.07	3.41	1	0	-2.1%
2	South East	2.12	2.09	2	0	0.3%
3	East Midlands	1.63	1.34	4	1	4.0%
4	North West	1.59	1.39	3	-1	2.7%
5	South West	1.58	1.23	5	0	5.1%
6	West Midlands	0.84	0.96	6	0	-2.6%
7	Scotland	0.75	0.51	8	1	8.0%
8	Northern Ireland	0.63	0.44	10	2	7.4%
9	London	0.46	0.44	9	0	0.9%
10	Yorkshire and The Humber	0.46	0.42	11	1	1.8%
11	Wales	0.46	0.35	12	1	5.6%
12	North East	0.37	0.57	7	-5	-8.3%
	United Kingdom	1.19	1.19			0.0%

Regional R&D Expenditure by Government as a % of GDP (1997-2002)

Rank	Region	R&D Exp (as % of GDP) Government sector (2002)	R&D Exp (as % of GDP) Government sector (1997)	Rank in 1997	Change in Rank	CAGR
1	Eastern	0.32	0.44	2	1	-6.2%
2	South East	0.30	0.57	1	-1	-12.0%
3	South West	0.28	0.38	3	0	-5.9%
4	Scotland	0.28	0.37	4	0	-5.4%
5	London	0.11	0.13	6	1	-3.3%
6	East Midlands	0.10	0.12	7	1	-3.6%
7	Wales	0.10	0.08	9	2	4.6%
8	Yorkshire and The Humber	0.08	0.07	11	3	2.7%
9	West Midlands	0.06	0.23	5	-4	-23.6%
10	Northern Ireland	0.06	0.09	8	-2	-7.8%
11	North West	0.06	0.07	10	-1	-3.0%
12	North East	0.02	0.01	12	0	14.9%
	United Kingdom	0.22	0.25			-2.5%

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Regional R&D Expenditure by Higher Education as a % of GDP (1997-2002)

Rank	Region	R&D Exp (as % of GDP) HE sector (2002)	R&D Exp (as % of GDP) HE sector (1997)	Rank in 1997	Change in Rank	CAGR
1	Scotland	0.69	0.51	1	0	6.2%
2	London	0.51	0.48	2	0	1.2%
3	North East	0.46	0.35	5	2	5.6%
4	Wales	0.46	0.35	6	2	5.6%
5	Eastern	0.45	0.31	7	2	7.7%
6	Yorkshire and The Humber	0.44	0.37	4	-2	3.5%
7	South East	0.40	0.38	3	-4	1.0%
8	East Midlands	0.36	0.29	8	0	4.4%
9	Northern Ireland	0.36	0.28	9	0	5.2%
10	North West	0.34	0.27	10	0	4.7%
11	West Midlands	0.27	0.23	11	0	3.3%
12	South West	0.24	0.21	12	0	2.7%
	United Kingdom	0.40	0.36			2.1%

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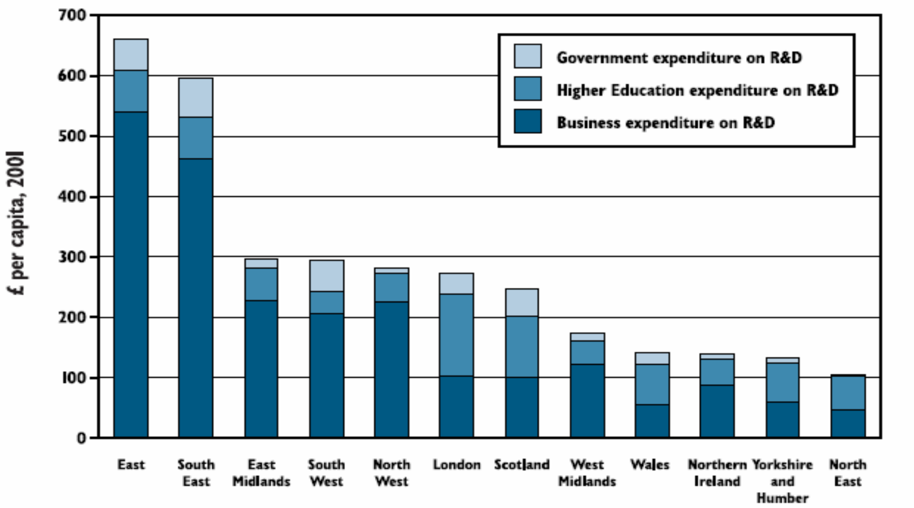
Chart 9.2: Regional investment in R&D across the UK



Source: Office for National Statistics; data for 2001

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Knowledge-Based Businesses

The OECD definition of knowledge-based businesses covers the following sectors:

- Pharmaceuticals
- Office machinery and computers
- Aerospace
- Precision instruments
- Electrical/Electronic engineering
- Telecommunications
- Financial intermediation, except insurance and pension funding
- Insurance and pension funding, except compulsory social security
- Activities auxiliary to financial intermediation
- Computer & related activities
- R&D
- Other business activities
- Motion picture and video activities
- Radio & television activities.

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Regional Proportion of Knowledge-Based Businesses (1997-2003)

Rank	Region	Proportion of Knowledge-Based Businesses (2003)	Proportion of Knowledge-Based Businesses (1997)	Rank in 1997	Change in Rank	CAGR
1	London	28.6%	27.2%	1	0	0.8%
2	South East	26.9%	24.2%	2	0	1.8%
3	Eastern	21.6%	20.0%	3	0	1.3%
4	North West	20.2%	15.5%	5	1	4.5%
5	South West	18.7%	15.6%	4	-1	3.1%
6	West Midlands	17.6%	14.2%	7	1	3.7%
7	Scotland	17.0%	13.6%	9	2	3.8%
8	East Midlands	16.6%	14.5%	6	-2	2.2%
9	Yorkshire and The Humber	15.6%	14.1%	8	-1	1.7%
10	North East	15.4%	13.5%	10	0	2.2%
11	Northern Ireland	15.2%	11.8%	12	1	4.4%
12	Wales	14.1%	11.9%	11	-1	2.8%
	United Kingdom	21.2%	18.6%			2.3%

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Proportion of Employment in Knowledge-Based Sectors

Employment 2003 (% of Total Employment)	Great Britain	North East	North West	**Yorkshire and The Humber**	East Midlands	West Midlands
Energy	1.7%	1.9%	1.4%	**1.3%**	1.4%	1.4%
Life Sciences	0.7%	0.6%	0.7%	**0.5%**	0.5%	0.4%
ICT / Computer Manufacturing	0.4%	0.4%	0.3%	**0.2%**	0.3%	0.4%
Tech Media	2.8%	2.5%	2.1%	**1.7%**	1.7%	2.3%

Employment 2003 (% of Total Employment)	Eastern	London	South East	South West	Wales	Scotland
Energy	1.6%	1.6%	2.0%	1.5%	1.3%	2.8%
Life Sciences	1.2%	0.5%	1.4%	0.7%	0.6%	0.6%
ICT / Computer Manufacturing	0.5%	0.1%	0.6%	0.5%	0.8%	0.7%
Tech Media	2.8%	4.3%	4.2%	2.3%	1.6%	2.4%

% of Knowledge-Based Sectors Workplaces as % of all Workplaces

Workplaces 2003 (% of Total Workplaces)	Great Britain	North East	North West	**Yorkshire and The Humber**	East Midlands	West Midlands
Energy	2.8%	3.2%	2.9%	**2.3%**	2.5%	2.7%
Life Sciences	0.2%	0.2%	0.2%	**0.2%**	0.2%	0.2%
ICT / Computer Manufacturing	0.2%	0.2%	0.2%	**0.2%**	0.2%	0.2%
Tech Media	4.3%	2.6%	4.0%	**2.6%**	3.0%	3.2%

Workplaces 2003 (% of Total Workplaces)	Eastern	London	South East	South West	Wales	Scotland
Energy	3.0%	2.3%	3.0%	2.7%	2.1%	3.8%
Life Sciences	0.3%	0.2%	0.3%	0.2%	0.2%	0.2%
ICT / Computer Manufacturing	0.3%	0.2%	0.3%	0.2%	0.2%	0.2%
Tech Media	4.9%	6.4%	5.7%	3.5%	2.5%	2.9%

Investment in human capital: the proportion of the workforce educated to degree level in science and engineering and other disciplines (source: Michie et al, 2004)

Region	Science and engineering degree	Other degree
	Percentage of total employees	Percentage of total employees
East Midlands	4.1	6.4
Eastern	7.3	6.5
London	9.7	18.3
North East	5.0	5.6
North West	6.0	7.7
South East	8.3	8.8
South West	5.2	7.3
West Midlands	4.3	6.1
Yorks and Humbs	5.1	6.5
Northern Ireland	7.1	10.7
Wales	5.4	5.8
Scotland	7.2	10.1
UK	**6.4**	**8.6**

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Regional Proportion of Working Age Population with NVQ Level 4 or Higher (1997-2003)

Rank	Region	Proportion of Working Age Population with NVQ Level 4 or Higher (2003)	Proportion of Working Age Population with NVQ Level 4 or Higher (1997)	Rank in 1997	Change in Rank	CAGR
1	London	30.8	26.6	1	0	2.5%
2	South East	28.5	23.3	2	0	3.4%
3	Scotland	28.4	22.6	3	0	3.9%
4	South West	26.1	21.5	4	0	3.3%
5	Eastern	23.2	18.8	5	0	3.6%
6	North West	23.1	18.4	7	1	3.9%
7	Wales	22.5	18.5	6	-1	3.3%
8	Yorkshire and The Humber	22.3	18.2	8	0	3.4%
9	East Midlands	22.2	17.8	9	0	3.8%
10	Northern Ireland	21.6	17.4	11	1	3.7%
11	West Midlands	21.1	17.5	10	-1	3.2%
12	North East	20.7	15.8	12	0	4.6%
	United Kingdom	25.1	20.6			3.3%

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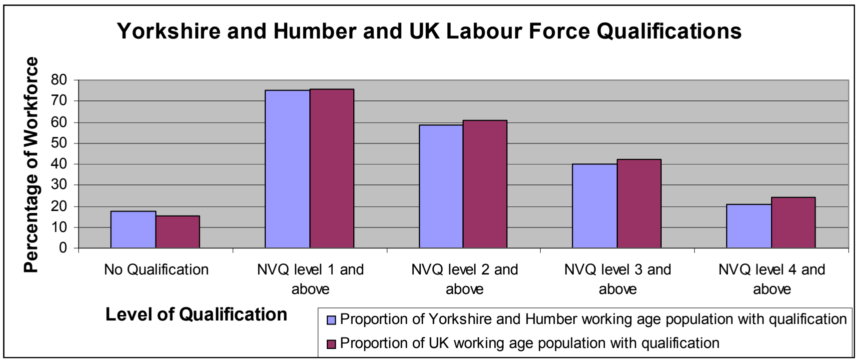
Qualifications in the Region



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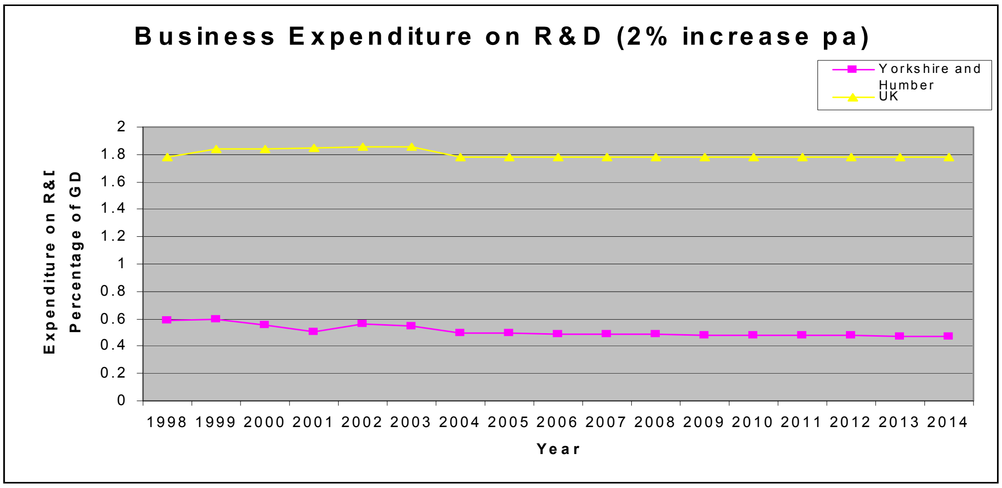
Scenario 1



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Implications of Scenario 1

- Increased divergence from the more prosperous core regions of the UK and Europe as a whole. This continues the vicious circle of decline initiated by the contraction of core industries in the region over the past 3 decades.
- Further relative decline could be witnessed as regions from new member states of the EU catch up and surpass the region.
- The lack of opportunity for highly skilled jobs in high technology sectors may lead to migration of skilled workers to other regions where these jobs do exist. Yorkshire and Humber could find itself stuck in a low skill equilibrium dominated by low skilled, low paid jobs and low value added, low technology industries.
- This lack of skills and dominance of low technology sectors would deter potential FDI, especially from new technology high added value sectors which demand highly skilled labour as well as a supply chain to provide the necessary inputs.
- A lack of R&D will hamper the development of the regional clusters at the heart of the regional economic strategy. One of the key advantages of clusters is the increased level of innovation possible due to the existence of knowledge spillovers. However, there will be fewer spillovers if there is less knowledge generated.
- The lack of R&D expenditure by the business sector puts further pressure on the higher education sector to produce the knowledge necessary for the region's businesses to innovate. Thus, R&D undertaken by the higher education sector effectively substitutes rather than compliments the activities of business leading to a mismatch between knowledge demand, i.e. what the firms require, and knowledge supply, what the sector produces.

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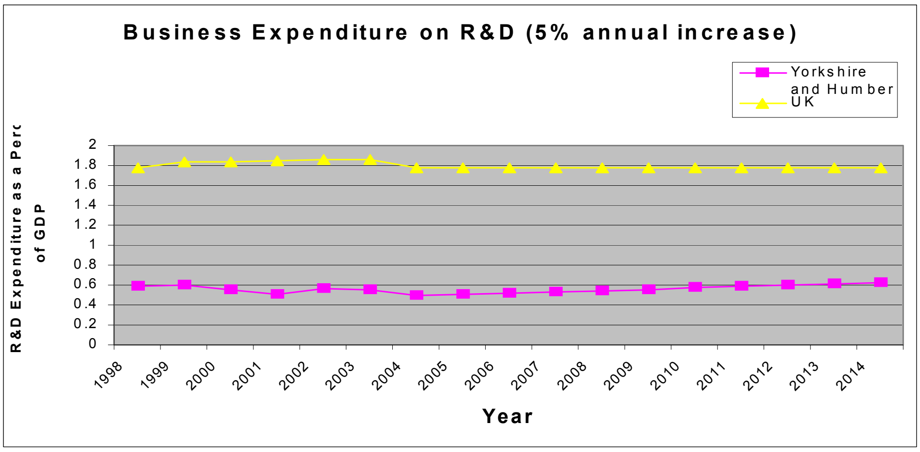
Scenario 2



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Conditions Required

- Increasing the incentives for businesses to undertake R&D.
- Highlighting the benefits of R&D for innovation and product development and the possibilities for expansion this opens up.
- Offering grants and/or loans for firms to undertake R&D activities.
- Outsourcing government R&D to firms within the region with the requisite ability in order to give a boost to regional R&D.
- Encouraging collaboration with other knowledge generating institutions, e.g. universities.
- Targeting the SME sector will be crucial as these firms account for the majority in the region. Thus, encouraging workforce development and knowledge transfer within these firms will encourage innovation and growth, improving the region's economy in the process.
- Formation of effective intermediaries in order to match knowledge demand with knowledge generated. These intermediaries could also regulate the knowledge transfer process between firms in order to prevent firms from obtaining knowledge and reneging on sharing their knowledge.

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Implications of Scenario 2

- The beginnings of the transition to a modern knowledge based economy will be observed. This may enable Yorkshire and Humber to be recognised as a modern economy, crucial in attracting new investors and raising the profile of the region.
- This scenario stops the divergence from the rest of the UK; while there is only a low level of growth observed it is enough to arrest the decline and offers a base to build on for the future.
- Arresting the decline may prevent the higher skilled jobs from leaving the region, ensuring there is demand for skilled workers and ending the migration to more prosperous regions.
- Pressure is eased on the higher education sector as business R&D catches up and compliments the activities of this sector.
- There is greater scope for the clusters strategy to succeed as the higher levels of R&D allow greater amounts of innovation to be undertaken and a higher level of knowledge spillovers to occur.

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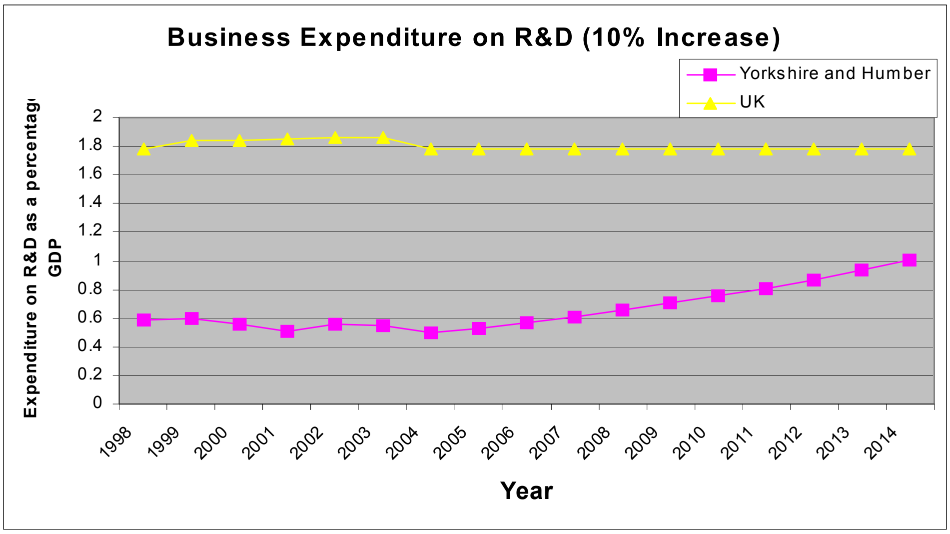
Scenario 3



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Conditions Required

- Effective implementation of the RES, especially assisting firms to develop new and better products and promoting knowledge and technology transfer within the region.
- Increasing the proportion of SMEs undertaking R&D and encourage these firms to engage in knowledge creation and transfer through effective collaboration and partnerships with knowledge creating intermediaries.
- Provision of loans/grants to aid the purchase of capital equipment required in the innovation process
- Encouraging knowledge generating firms into the region through provision of appropriate accommodation and infrastructure. Imbedding these firms into the regional supply chain may lead to flows of knowledge into regional firms.
- Further integration of the higher education sector into the regional economy and tackle the removal of any barriers between this sector and the business sector which may prevent effective collaboration on R&D.
- Exploit any interdependencies which may exist in the region’s clusters so that collaboration is actively pursued and, in cases where it already exists, continued.

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Implications of Scenario 3

- The increased level of R&D will create a higher number of skilled jobs which will act as an incentive for skilled workers to stay in the region as well as attracting others from the outside, preventing the region from sinking into a low skill equilibrium.
- Attraction of FDI from high added value firms further boosting the regional economy.
- The UK will be less divided as there will be more equal levels of growth, rather than a strong core and weak periphery.
- Also Yorkshire and Humber will be more competitive region in an increasingly globalised economy and be able to compete with emerging regions with significantly lower costs of production

Conclusions

- Scenario 1 – if the region continues its current trends then the regional economy will continue to diverge from the UK
- Scenario 2 – small improvements will prevent further decline relative to the UK but will merely maintain the region's current lagging position
- Scenario 3 – large improvements in R&D expenditure will not only arrest the decline but ignite a process of catch up with the UK

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CHAPTER 3
WORKSHOP MATERIALS FOR CENTRAL MACEDONIA AND EAST MACEDONIA-THRACE (GREECE)

3.1 Introduction-Scenario Planning: Greece and CM-EMTH

We will outline 3 scenarios. The Optimistic Scenario (OPTIM) according to which Greece reaches its target of RTD spending rising from the current rate of 0,66% of GDP to 1,5% by 2010 with corporate RTD accounting for 40% of the total from the current 30% and subsequently the regions of CM and EMTH follow national trends. The Pessimistic Scenario (PESSIM) is based on the assumption that Greece will follow the weak recent trends in RTD spending observed over the period 1999-2003 according to which small progress is achieved and the country as well as the regions actually decline with respect to the rest of the EU. The Base Scenario (BASE) is an intermediate case which assumes that RTD spending will be stronger following the trends over the period 1997-2003 where the country continues to catch up but at a moderate pace that does not allow for the RTD target to be fulfilled.

The table 3.1 below shows the evolution of RTD spending over the period 1997-2003:

Table 3.1

RTD Spending	1997	%Share	1999	%share	2003	%share	%ch97-03
Total							
Greece	663,8	100,0	976,6	100,0	1182,6	100,0	78,1
Voreia Ellada	167,9	25,3	218,5	22,4	262,5	22,2	56,4
EMTH	24,0	3,6	34,0	3,5	40,9	3,5	70,5
CM	117,8	17,8	154,8	15,8	185,9	15,7	57,8
Attiki	327,1	49,3	514,1	52,6	683,8	57,8	109,1
Corporate							
Greece	169,6	100,0	278,1	100,0	356,1	100,0	110,0
Voreia Ellada	31,5	18,5	38,1	13,7	67,3	18,9	114,1
EMTH	3,7	2,2	6,9	2,5	12,2	3,4	228,1
CM	21,4	12,6	25,7	9,3	45,5	12,8	112,3
Attiki	109,9	64,8	176,4	63,4	272,8	76,6	148,2
Government							
Greece	155,5	100,0	212,0	100,0	246,8	100,0	58,7
Voreia Ellada	27,3	17,6	29,1	13,7	35,0	14,2	28,3
EMTH	5,7	3,6	6,2	2,9	3,5	1,4	-38,5
CM	15,0	9,6	18,9	8,9	27,1	11,0	80,7
Attiki	85,4	54,9	133,2	62,8	154,0	62,4	80,4
Higher Educ.							
Greece	335,9	100,0	483,3	100,0	568,3	100,0	69,2
Voreia Ellada	104,3	31,1	152,5	31,6	158,4	27,9	51,8
EMTH	13,8	4,1	22,2	4,6	23,0	4,0	66,9
CM	83,4	24,8	109,9	22,7	106,7	18,8	28,0
Attiki	143,4	42,7	200,8	41,5	248,1	43,7	73,0
Non-Profit							
Greece	2,8	100,0	3,0	100,0	11,4	100,0	299,1
Voreia Ellada	1,2	42,3	1,3	43,2	1,8	15,5	46,2
EMTH	0,0	0,0	0,0	0,0	0,0	0,0	0,0
CM	1,2	42,3	1,3	43,2	1,8	15,5	46,2
Attiki	1,4	49,9	1,5	49,7	8,9	78,7	528,2

Source: Eurostat databanks. The corporate figures for CM and EMTH are estimates.

The average annual growth rates in RTD spending over the 1997-2003 and 1999-2003 periods are depicted as follows:

Table 3.2

Av.Annual RTD Growth	1997-03	1999-03
Greece	10,1	3,5
EMTH	9,1	3,4
CM	8,5	3,3

For all outlined scenarios the assumption for the national economy is that GDP grows at an average annual rate of 6,5% on a PPP-basis and so do the regional GDPs for CM and EMTH. This assumption is roughly equivalent to a real average GDP growth rate of 3,5% per annum and an average inflation rate of 3%.

3.2 The Optimistic Scenario

According to this scenario, very high growth rates in RTD spending (on a PPP basis) will be required for Greece to achieve targets. Such progress would be unprecedented by past standards and would constitute a structural break from previous performance.

Table 3.3
Note: The small non-profit sector is included in higher education for simplification

	2003	2004	2005	2006	2007	2008	2009	2010	*Growth*
RTD (%gdp)									**2003-2010**
Greece	0,66	0,74	0,83	0,93	1,05	1,18	1,33	1,50	*19*
EMTH	0,54	0,61	0,68	0,77	0,86	0,97	1,09	1,23	*19*
CM	0,59	0,67	0,77	0,88	1,00	1,14	1,31	1,50	*21*
EMTH/GR	82,10	82,10	82,10	82,10	82,10	82,10	82,10	82,10	
CM/GR	89,58	90,97	92,38	93,81	95,27	96,74	98,24	99,77	
RTD Shares by Sector									
Greece									
Corp.Sector	30,1	31,4	32,6	34,0	35,4	36,8	38,3	39,9	*24*
Govt.Sector	20,9	20,1	19,4	18,7	18,0	17,4	16,7	16,1	*15*
Higher Education	49,0	48,5	48,0	47,3	46,6	45,8	44,9	43,9	*18*
CM									
Corp.Sector	24,5	25,5	26,5	27,5	28,6	29,8	31,0	32,2	*26*
Govt.Sector	14,6	14,3	14,1	13,8	13,6	13,3	13,1	12,9	*19*
Higher Education	58,4	60,2	59,5	58,7	57,8	56,9	55,9	54,9	*18*
EMTH									
Corp.Sector	29,9	31,1	32,3	33,6	34,9	36,3	37,7	39,2	*24*
Govt.Sector	8,5	8,9	9,4	9,8	10,3	10,8	11,3	11,8	*25*
Higher Education	56,2	60,0	58,3	56,6	54,8	53,0	51,0	49,0	*18*

This is depicted in table 3.3 with RTD growing on average by 19% per annum with corporate RTD growing by 24% on average per annum in order to account for 40% of total RTD spending by 2010. This is done at the expense of the share of both the government and the higher education sector in total RTD. Although higher education retains an overall stronger growth outlook than the government sector. For the purpose of simplicity we have imposed the above growth rates for the whole period rather than gradually.

Regarding the regional outlook, we have assumed that the region of EMTH follows the national progress but retains its current ranking with respect to the national average while on the other hand the region of CM progresses above the national average and covers the current gap by 2010. This assumption relies on the fact that major RTD infrastructure projects are planned for the prefecture of Thessaloniki which seems to be designated to play the role of the RTD hub for the whole of Northern Greece.

The figures 3.1, 3.2, 3.3 and 3.4 depict this scenario in graphical detail. Period 1 in the charts refers to year 2003 (actual data) and the rest are forecasts up to 2010.

Figure 3.1

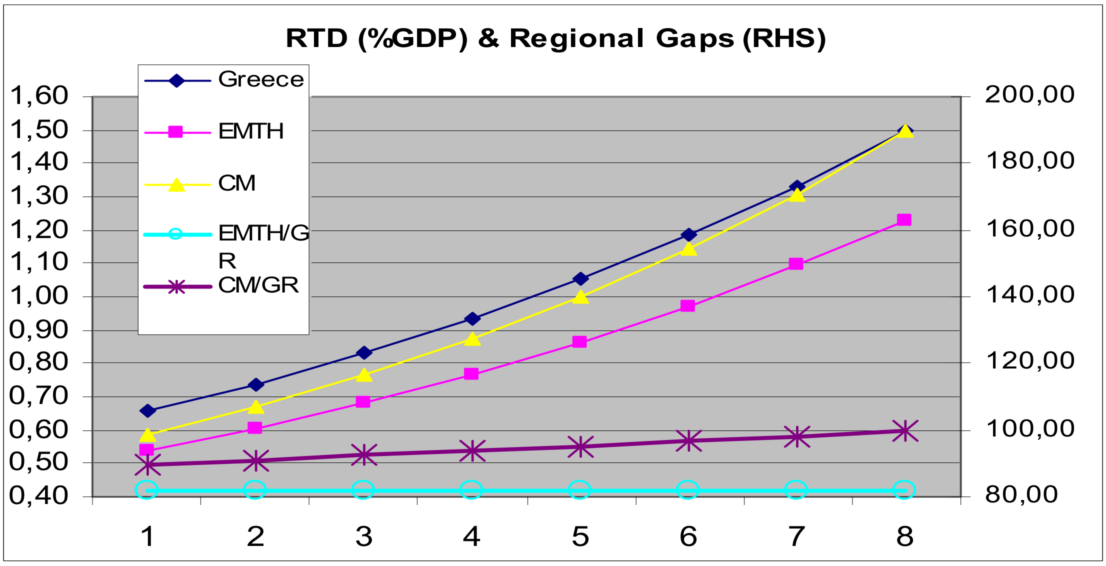


Figure 3.2

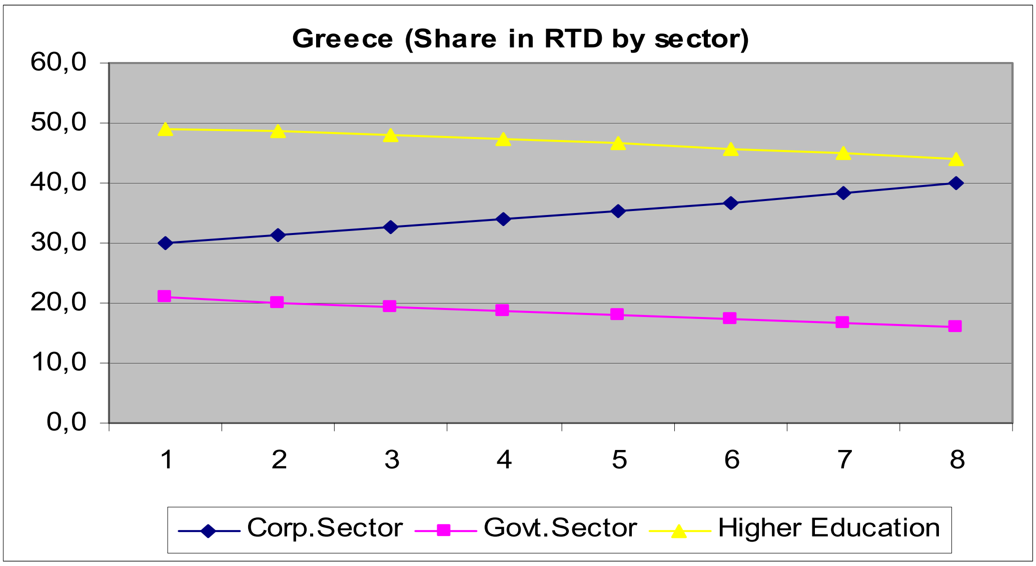


Figure 3.3

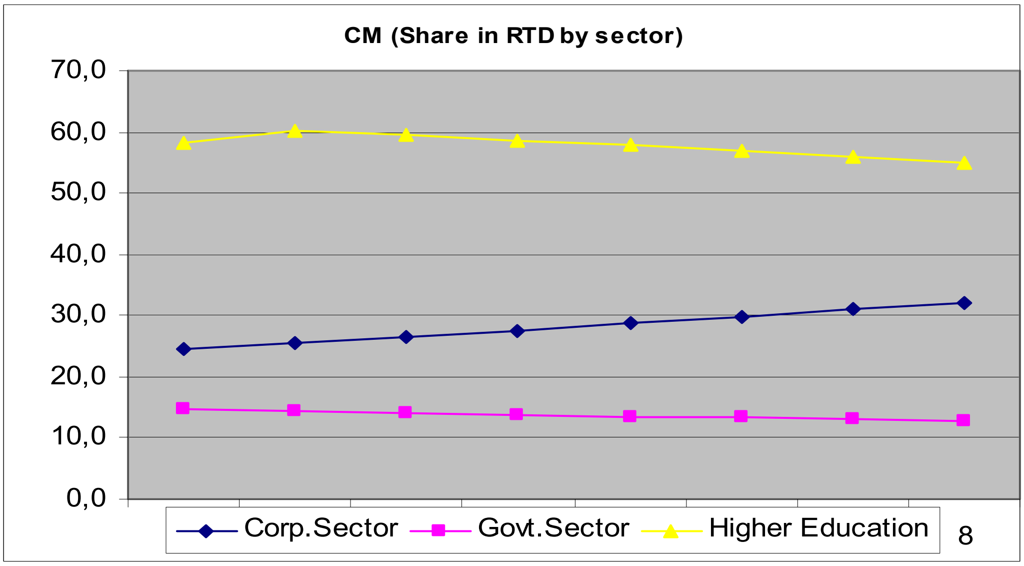
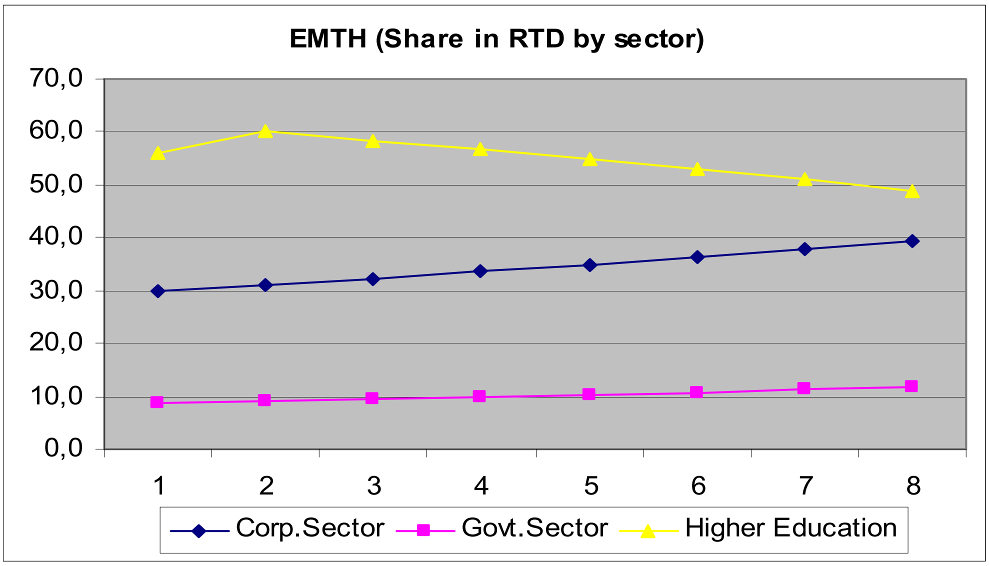


Figure 3.4



In this optimistic scenario, the corporate sector will need to play a particularly important role, which would be difficult to ensure without synergies with the higher education and government sectors and the presence of significant incentives for corporate RTD. Even so, for such an optimistic scenario to be fulfilled, innovation and RTD will need to become a stated national priority that will be reflected in the diversion of resources towards RTD spending in all sectors.

3.3 The pessimistic scenario

This scenario assumes average RTD growth of around 3,5% per annum, which would actually fall behind real GDP growth and will simply retain in real terms the current values of RTD. In this scenario, the corporate sector will most likely encounter competitiveness problems and innovative corporations will not be forthcoming to replace the declining traditional firms. Similarly, the higher education sector will not be able to make any progress in reforming itself and opening up to the real economy while the government would simply retain its current share in total RTD spending. In this scenario, the future would most likely entail a slow down in GDP growth coupled with problems in the current account and a reversal of recent trends towards reducing foreign debt.

Such a scenario would imply very limited efforts from the government to promote RTD at the national level. The regional situation would follow national trends although the higher regional share in CSF spending scheduled for the period 2007-2013 might even imply that the regions of CM and EMTH could actually improve their position regarding the national average.

The table 3.4 summarises the outlook for this scenario:

Table 3.4

	2003	2004	2005	2006	2007	2008	2009	2010
RTD (%gdp)								
Greece	0,66	0,64	0,62	0,61	0,60	0,58	0,57	0,55
EMTH	0,54	0,53	0,51	0,50	0,49	0,48	0,47	0,46
CM	0,59	0,58	0,57	0,55	0,54	0,53	0,52	0,51
EMTH/GR	82,10	82,10	82,10	82,10	82,10	82,10	82,10	82,10
CM/GR	89,58	90,01	90,45	90,88	91,32	91,76	92,21	92,65
RTD Shares by Sector								
Greece								
Corp.Sector	30,1	30,6	31,0	31,4	31,9	32,4	32,8	33,3
Govt.Sector	20,9	20,7	20,5	20,3	20,1	19,9	19,7	19,5
Higher Education	49,0	48,8	48,5	48,3	48,0	47,8	47,5	47,2

In this scenario, the actual share of RTD in GDP declines at both national and regional levels while the corporate sector raises its share in total RTD to 33% at the expense mostly of the higher education sector. At regional level, we are depicting a modest catch-up for the region of CM with respect to the national average while EMTH maintains its current relative position. We believe that under current circumstances this scenario is quite unlikely.

3.4 The base scenario

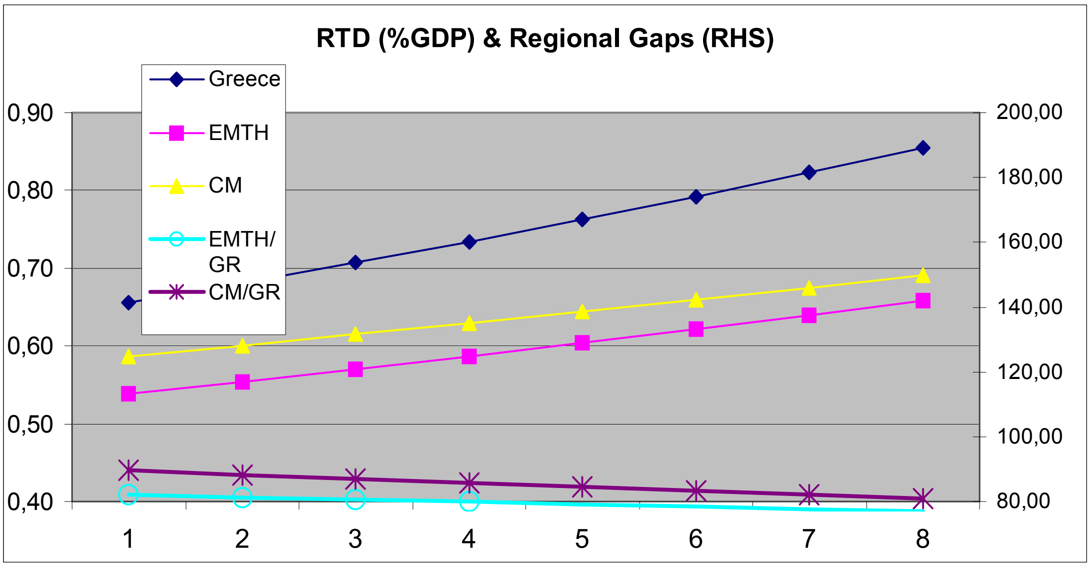
In this scenario we are simply imposing the continuation of trends over the 1997-2003 period regarding RTD spending growth. The arising outlook is quite interesting particularly from a regional point of view because it points to the fact that if the 1997-2003 trends were to be extrapolated then the regions as a whole would fall significantly behind the national average in favour of the region of Attiki around Athens.

Hence, although there is slow progress at national level with RTD rising to 0,85% of GDP, the regions decline with respect to the national average by around 10%, resulting in a rising regional gap. The other major change is that the corporate sector's share in RTD spending rises from 30% to 38% with similar figures reached also at regional level.

Table 3.5

	2003	2004	2005	2006	2007	2008	2009	2010
RTD (%gdp)								
Greece	0,66	0,68	0,71	0,73	0,76	0,79	0,82	0,85
EMTH	0,54	0,55	0,57	0,59	0,60	0,62	0,64	0,66
CM	0,59	0,60	0,62	0,63	0,64	0,66	0,68	0,69
EMTH/GR	82,10	81,35	80,61	79,88	79,15	78,44	77,72	77,02
CM/GR	89,58	88,28	86,99	85,73	84,48	83,26	82,05	80,85
RTD Shares by Sector								
Greece								
Corp.Sector	30,1	31,2	32,3	33,4	34,6	35,8	37,1	38,4
Govt.Sector	20,9	20,5	20,1	19,8	19,4	19,0	18,7	18,4
Higher Education	49,0	48,3	47,6	46,8	46,0	45,1	44,2	43,2
CM								
Corp.Sector	24,5	26,0	27,6	29,4	31,2	33,2	35,2	37,4
Govt.Sector	14,6	14,8	15,0	15,2	15,5	15,7	15,9	16,1
Higher Education	58,4	59,2	57,4	55,4	53,3	51,2	48,8	46,4
EMTH								
Corp.Sector	29,9	30,7	31,5	32,3	33,2	34,1	35,0	35,9
Govt.Sector	8,5	7,8	7,2	6,6	6,0	5,5	5,1	4,6
Higher Education	56,2	61,5	61,3	61,1	60,8	60,4	60,0	59,4

Figure 3.5



This scenario in conjunction with our optimistic scenario, basically highlight the fact that Greece requires a significant reversal in trends. Hence quite significant changes would need to occur if Greece is going on the one hand to reach its targets for 2010 and on the other to avert the possibility that in fact RTD becomes primarily an affair for the region around Athens. The latter applies particularly for the region of CM, which is supposed to be destined to fulfill a broader role in South Eastern Europe.

A summary representation for each of the RTD scenario paths for Greece and the regions of CM and EMTH is depicted in figures 3.6, 3.7 and 3.8

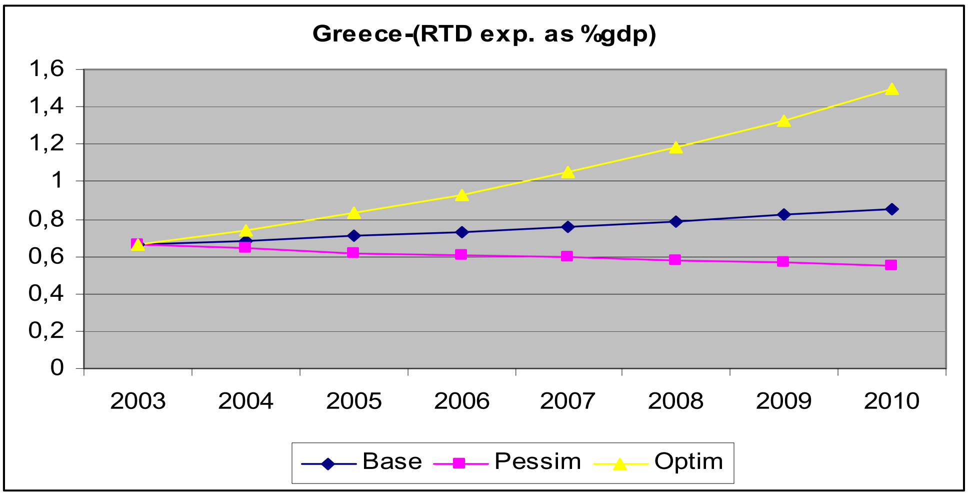


Figure 3.6

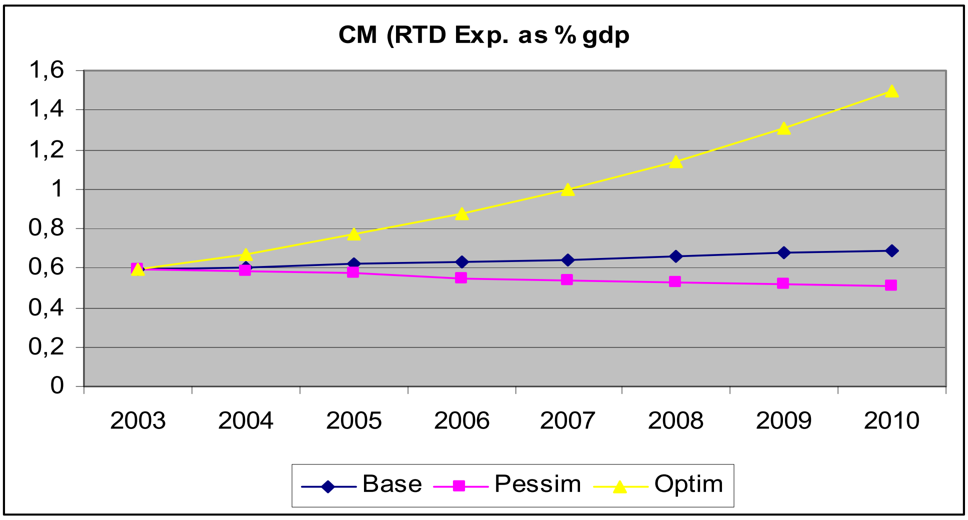


Figure 3.7

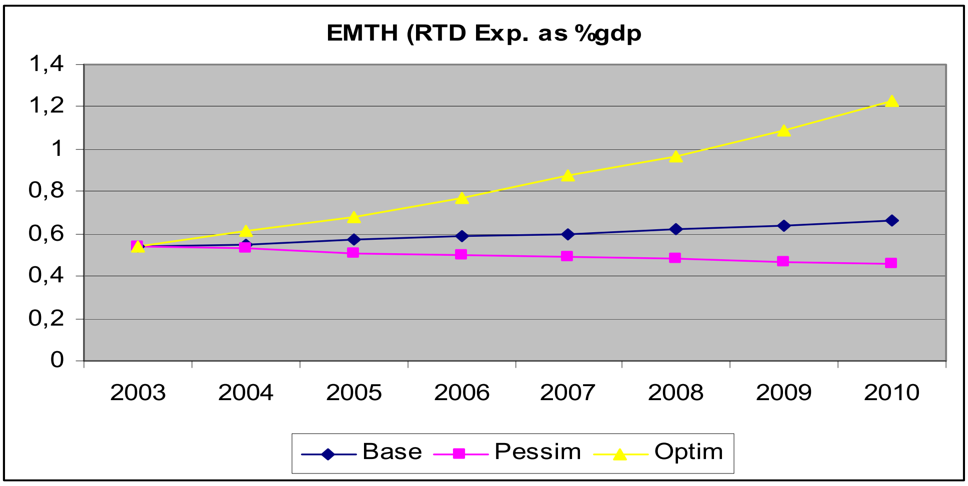


Figure 3.8

3.5 Conclusion

The region and Greece as a whole requires a significant boost in RTD investment rates, which on average need to be doubled compared to past performance, in order to reach its 2010 targets. This implies the need for serious changes at institutional level in order on the one hand to promote the triple-helix interaction and on the other to reform the higher education system and the government sector's role so that synergies actually help to boost RTD investment rates. The role of the corporate sector is very central in this process and most probably emphasis will need to be given on policies boosting corporate RTD and innovative firms most probably at the expense of the more general incentives that are in place at this point in time.

The above scenarios serve to highlight that the key issue for Greece to approach its RTD targets for 2010 will require significant effort with very fast and sizeable increases in RTD spending also at regional level. Regional RTD policy will need to be conscious in terms of what the special weight of each region in the whole RTD effort should be. Should the government believe that RTD should become more evenly spread-out at regional level then that will actually require a significant reversal in past trends regarding regional RTD spending otherwise a choice of regional RTD hubs would most likely need to be in place. The need to achieve agglomeration and critical-mass for RTD will likely play a crucial role in decision making. Regarding our regional outlook, the implication is that in any case the region of CM will need to be promoted in order to play a special role for Northern Greece and may be the Balkan region. In the case of EMTH a choice is open as to whether it should evolve in a more independent fashion regarding RTD activities or be seen as part of a broader region. Such choices could prove quite vital for the future outlook.

The other conclusion that can be drawn from the above scenario analysis is that the continuation of current RTD spending rates although they might raise the share of RTD spending in GDP will keep Greece as a laggard in EU R&D developments and increase further the regional gaps. Considering that the spending required to reach R&D targets for 2010 is quite significant, the role of policy making will prove vital especially in boosting the private sector to undertake more significant spending considering the broader resource constraints that the Greek government is currently facing with regards to its budget finances.

3.6 Powerpoint Presentation

SIXTH FRAMEWORK PROGRAMME
REGIONS OF KNOWLEDGE 2

MIRIAD:
Managing and Infusing Research Investment and Development

Project Participants

- **University of Sheffield (UK)**.
- **South-East European Research Centre (SEERC)-Thessaloniki.**
- **Istanbul Commerce University.**
- **University of National and World Economy-** Sofia.

The Rationale for Miriad

- In the past, R&D investment policies and strategies have focused either on stimulating transfers/spillovers or facilitating knowledge absorption.
- Successful strategy building must take account of both simultaneously.
- It is the aim of this project to integrate both these aspects, so as to remove both the supply and demand-side barriers associated with R&D transfer, absorption, and investment.
- R&D investment is a function of a region's ability to transfer, spillover and absorb knowledge.
- This project will focus on the inter-connectivity of these three factors as a catalyst and stimulator of enhanced R&D investment.

Miriad Project Aims

- The key aim of the project is to stimulate policy intervention focused on raising levels of R&D investment in four regions across Europe.
- These four regions consist of Yorkshire and the Humber in the UK, the Western Turkish region from Istanbul (inclusive) to the Greece and Bulgarian borders of Turkey, East Macedonia and Thrace (including Thessaloniki) in Greece, and the South Eastern Bulgarian region from Sofia (inclusive) to the border with Greece and Turkey, including also the Bulgarian Black Sea region.
- **To formalise policies with regional and national government aimed at improving levels of R&D investment by businesses, government and higher education.**

Miriad Project Aims (Continued)

- To establish tools by which SMEs are able to identify and measure their knowledge assets through developing a range of benchmarking and scorecard instruments.
- To establish a regional mutual learning platform for promoting the trans-national exchange of practices for enhancing regional R&D investment.
- Facilitate the transfer of good practices in terms of participation to EU funded research, links and co-operation between SMEs and research performers.
- Establish and launch a R&D Investment Strategy for each of the regions that is complementary to the existing policy initiatives and activities already being undertaken.

Key Tasks: Scoping and Analysis of R&D Performance

- **Identification and Analysis of Key Regional R&D Indicators and Initial Consultation Process** - initial scoping and analysis of the R&D performance of the regions, and an initial consultation process primarily consisting of the stakeholders relating to R&D investment and knowledge transfer. Total of 20 interviews per region consisting of 10 universities and research centres, 5 innovation and technology transfer intermediaries and 5 policymakers.
- **Development of Regional Knowledge-Based Models** - based around a conceptual framework focused on: Knowledge transfer/spillover; Knowledge absorption; and Knowledge investment.
- **Preparation of Regional Knowledge Scorecards** - Develop an underlying framework for the establishment of regional knowledge scorecards. This will consist of the operationalisation of the regional knowledge models in order to produce a regional benchmarking instrument for use by policymakers and policy providers.

Foresight and Scenario Workshops

- **Preparation of Workshop Materials** - The scorecard and benchmarking tools will provide a focus for engaging regional stakeholders in a series (one per region) of foresight and scenario workshops. The materials gathered will be synthesised in order to establish a number of scenarios (three per region) for the future development of each respective region from the perspective of R&D investment strategies.

- **Facilitation of the Workshops** - The focus of the workshops will be to identify key demand and supply-side priorities for future knowledge-based and R&D-focused policies.

- **Workshop Proceedings** - The results and findings of each workshop will be compiled in individual reports.

Benchmarking Regional Knowledge Demand and Transfer

- **Development of Business Scorecards** - the task will involve the production of a 'business scorecard' methodology that seeks to measure the knowledge and intellectual assets SMEs already have and those that they should be demanding.

- **Data Gathering Through SME Interaction** - this task will consist of a range of interactions with SMEs in their respective regions through interviews, consultations and focus group events (with a minimum of 50 SMEs from a range of sectors being surveyed per region).

- **Reporting on Regional Knowledge Demand and Absorption** - A report for each region that identifies the research and knowledge SMEs require, as well as effectively absorbing the research and knowledge they know already exists.

Benchmarking Regional Knowledge Supply and Transfer

- **Data Gathering on Knowledge Supply** - Through a series of structured interviews (the actual number of interviews will depend on, and vary by region according to, the number and range relevant of knowledge supply actors identified by the earlier workpackages, but will consist of a minimum of eight interviews per region) and focus groups/workshops (one per region).
- **Data Gathering on Knowledge Transfer** - Data regarding existing knowledge transfer and barriers to such transfer will also be gathered through these interviews and workshops.
- **Reporting on Regional Knowledge Supply and Transfer** - A report for each region that identifies the knowledge they create and the R&D they currently undertake, as well as existing modes of transfer and barriers hindering such transfer.

Regional Policy Roundtables

- **Facilitation of Regional Policy Roundtables** - The focus of these roundtables will be on how increased knowledge spillovers can be generated through more robust transfer and absorption processes.

- **Key Strategic Regional Intervention Reports** - The reports will produce a framework for the thematic strategic intervention that will provide a bespoke template for each of the respective Regional R&D Investment Strategies.

Trans-National Regional Learning Platform

- **Exchange Visits** - Meeting and exchange visits to each of the participating regions This will consist of one study visit to each of the regions, which will be organised by the partners and the coordinators.

- **Synthesised Documentation** - The development of synthesised documentation, reporting, and scorecard/benchmarking materials.

- **Trans-National Network** - The establishment of a trans-national network of relevant policy actors, which will be catalysed by allowing stakeholders access to an intranet system acting as a clearing house for R&D information and data.

- **Website** - An initial website outlining the scope, objectives, and proposed actions of the project will be established at the outset of the project, but it is at that this point that the materials developed will allow the website to become fully functional, acting as a focal point for exchange and external visibility.

Regional R&D Investment Strategies

- **Establishing the Regional R&D Investment Strategies** - the production of the draft regional R&D investment strategies will consist of a collaboration between the partners and the coordinators, ensuring that the strategies are complementary to the existing activities being undertaken in the region.
- **Ensuring Regional Buy-In: Final Consultation** -The draft investment strategies will be subject to a final round of consultation not only with policy actors, but government research bodies, higher education institutions, indigenous SMEs and foreign investors. This consultation will consist of those relevant actors being sent by post or email a copy of the draft investment plan during month 18 and being given approximately one month to respond with their comments.
- **Launch of the Regional R&D Investment Strategies** - the final stage of the project, along with project reporting, will consist of the official launch of the strategies. Specifically, the official launch will consist of the publication of the strategy, its presentation at a regional workshop (one per region) to an audience of relevant stakeholders, as further dissemination of the report to interested parties via the website.

MIRIAD

Preliminary Issues on R&D

MIRIAD: "Knowledge Infusion in SEE"

Supply of Knowledge: Stock of R&D, Higher Education System, R&D Infrastructure, institutional framework for R&D.

Demand for Knowledge: The corporate sector, comparative advantage and sectoral allocation of economy, Foreign Investment.

Knowledge Diffusion: The Triple-Helix interaction between *Research Performers-Corporate Sector-Policy Makers.*

Policies for R&D: Creating the critical-mass for R&D, developing domestic skills and competencies, accessing global networks.

Regional Synergies: Cooperation for upgrading the regional R&D potential.

The goal: Accession into the European Knowledge Economy

The Greek Regions, the SEE Region and the UK

The Greek Regions:
•Regarding R&D as well as broader Economic indicators, Central Macedonia is more evolved in comparison to East Macedonia & Thrace.
•Their overall performance is around 30% below Attiki
•Advantage: Opening of SEE, a tradition of reliance on private sector economic activity and rich natural resources
•Disadvantage: Limited public resources in comparison to Attiki

The SEE region:
•Synthesis for the future (moving towards EU Integration and rising economic interaction)
•SEE synergies: In R&D infrastructure, networks, collaboration, corporate sector M&A
•SEE projects (Interreg)

The UK:
•Transfer of Know-How for policy makers and researchers
•Relevance of UK experience (Institutional structure, Industrial renovation, Education system, R&D Collaboration).

The Region of SEE

The stabilisation of the Economies of SEE since 2001 has been sustainable with growth averaging around 4% and inflation stabilising at single digit figures. The process of economic liberalisation and the transposition of EU law (Aquis Communitaire) is keeping the regional effort towards *European integration* alive.

However, permanent reliance on privatisation and the offer of low wages to attract FDI is neither possible nor desirable. *Domestic capacity needs to be built in order to fully benefit from absorbing the transfer of know-how from abroad and adding further value.*

Hence, macro-economic stability, transposition of European institutions and attraction of FDI are only the *prerequisites for sustained growth…*and enabling economies to face the new challenge: Integration into the new Global Knowledge Economy

The new challenge: Integrating into the global knowledge Economy

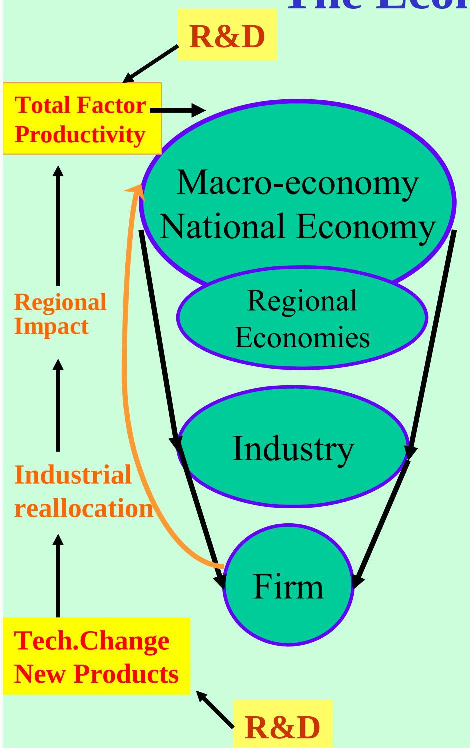
•The present-day characteristics of the global economy go beyond free trade and competition.

•The new aspect is the creation of networks of excellence amongst institutions-corporations-research performers within a global knowledge economy that relies on continuous product innovation and technological change.

•Competitiveness through co-operative outcomes between business, nations/regions and institutions is the EU's post-modern paradigm in this era of permanent change and uncertainty management in a world of diminishing national ownership.

•Sustainable growth not simply an issue of sufficient financial resources but being able to offer the suitable skills and infrastructure to gain membership into such networks and tap into the unlimited resources & opportunities offered by the new era.

The Economic Impact of R&D



❑The overall Economic outlook affects industry outlook and both determine the corporate outlook.

❑In the long-run, causality reverses. Technological innovation at firm level affects the industry and the overall economy.

❑The role of R&D in this process is vital as it affects economy-wide productivity.

❑R&D can impact economic performance at different levels.

❑The ability to diffuse the gains from R&D through-out the economy is the key policy issue.

The Economy and R&D

Variables affecting R&D activity

Economy/National level:
•Macroeconomic & Institutional outlook ⟶ Business Environment
•R&D Stock (Scientists, R&D organisations, R&D Investment, R&D institutional structure/organisation)

Regional Level
•Comparative position of region in economic, institutional and R&D characteristics
•Locational issues, Clustering, regional knowledge systems

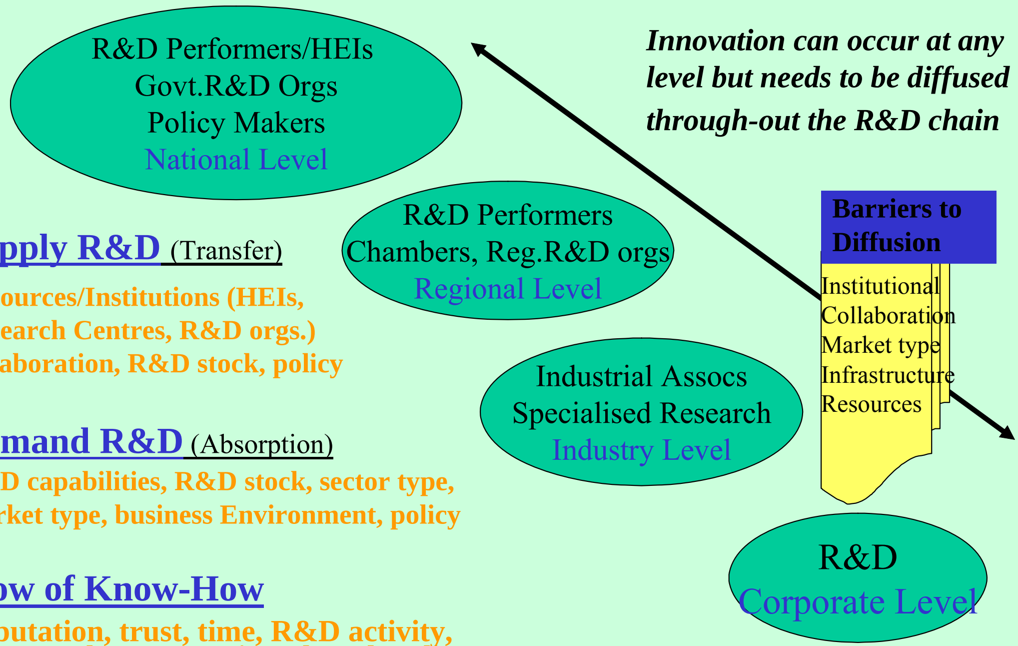
Industry Level
•Type of Sector: Knowledge Intensive, traditional
•Cross-sectoral links and international exposure

Firm Level
•Market type: Firm type/size, oligopoly, FDI-MNCs, unofficial economy
•R&D Capabilities: In-house, network co-op., R&D capacity utilisation

R&D is an economic function that has strong multiplier effects on the economy through its effect on all other economic sectors by raising the combined productivity of labour and capital. The intensity and speed of the process depends on the ability to diffuse knowledge.

Diffusion: Flow of knowledge within and across levels

The R&D Function



Supply R&D (Transfer)

Resources/Institutions (HEIs, Research Centres, R&D orgs.) collaboration, R&D stock, policy

Demand R&D (Absorption)

R&D capabilities, R&D stock, sector type, market type, business Environment, policy

Flow of Know-How

Reputation, trust, time, R&D activity, R&D stock, costs, socio-cultural, policy, collaboration-networks, access/info, mobility of scientists and capital

R&D Investment Strategies

The determinants of R&D Investment:

•**Availability of resources:** Scientists, institutions, finance

•**Institutional Links**: Govt.-Business-R&D Performers

•**Access to Know-How**: Domestic, Intl (FDI, Research, trade in R&D)

•**Stock of Know-How**: Share of R&D-investment in Total, share of Hi-tech Sectors in economy, Share of Scientists in Employment, IPR, Patents

•**R&D Policy & Environment**: free trade & FDI, competition law, incentives structure, research performance, competitive R&D market

•**Market structure/competition**: Industry Market type (& firm size)

R&D Policy Objectives

Innovative Policies: Vision, networks, understanding (drivers-forces), use of Policy Instruments and Public R&D agents---MIRIAD contribution

Innovative Environment: Public Procurement, admin./trans. costs, infrastructure (spending in ICT-R&D), institutions/policies

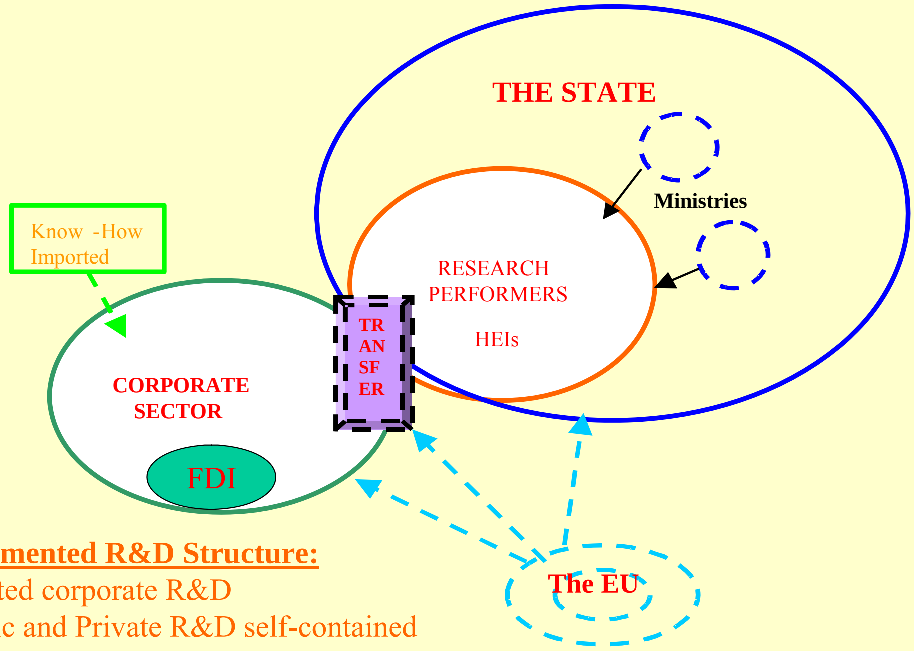
Innovative Enterprises:infrastructure for technology, entry&VC-incentives, finance, capabilities (in-house, co-op, utilisation)
Innovative Sectors: Hi-tech (computer-instruments, aerospace, electronics, chemicals, pharmaceuticals, biotech etc) (national goals)

Transfer of Know-How: infrastructure (HC, ICTspending, Web), incentives (tax/Subs, synergy), clustering, collaboration (firms-R&D actors)

Entry to innovation: Diffusion, Commercialisation (IPR,Patents)

Measuring the impact of R&D strategies: Diffusion, synergies
Assessing the Barriers: Collaboration & Incentives(Synergies v Crowding- out), structural, institutional.

The Typology of R&D in SEE



Fragmented R&D Structure:
Limited corporate R&D
Public and Private R&D self-contained
Small transfer-diffusion activity
Missing institutional links & coordination

Barriers to R&D Diffusion

•Globally there appears to be an abundant supply of R&D personnel. Recent studies have shown that in developing economies only 13% of available young professional are suitable for employment at multinational company level compared to 75% for the advanced economies. Hence the *reform of the higher education system* is the priority issue.

Other key barriers include:
•The *structure of the economy* concentrated in low technology sectors dominated by small firms and overwhelming reliance on imported technology
•Fragmented *institutional framework* for R&D
•Lack of *awareness of globalisation trends*
•A technology and risk averse *culture/entrepreneurship*
•Limited access to *finance*

Policy Issues for R&D

- Developing the ***Critical-Mass for R&D*** with the efficient use of financial resources, infrastructure, human capital, external links.
- Cooperation between ***Research/HEIs-Businesses-Policy Makers*** to develop the suitable human skills and core competencies
- Blending domestic ***comparative advantage with the right sectoral focus*** e.g. primary production-agrobiotech-life sciences-tourism-environmental technologies or full ***reliance on market forces.***

The international experience: Many small open economies have attempted this forward leap successfully:

- Ireland: from high unemployment and immigration to record FDI attraction and export-led growth.
- Asian Tigers: fast recovery from the 1990s crisis utilising their small size next to the large Chinese market.
- Chile: from military junta and agrarianism to becoming an R&D hub in Latin America through public-private cooperation.
- Finland: developing domestic R&D capacity geared to exports.

MIRIAD

THE CASE OF GREECE

The Case of Greece

Overall economic outlook

Impressive progress over 2000-04 in growth performance and macro-indicators:
Average growth at 4%, GDPpc=85% of EU25, Productivity=98% of EU25, Inflation=3%, booming private investment (22% gdp)

Negative aspects:
•High Unemployment (11%), low employment rate (52% work-age pop.)
•Low FDI (0,9% of GDP)
•Industrial structure technologically backward dominated by SMEs and an inefficient public sector
•Limited spending on R&D by both public&private sectors
•Hi-Tech exports at 0,5% of GDP.

Global rankings: competitiveness 37 out of 104, technology 38 out of 80, business environment 41 out of 80

Sustainability issue: Recent macroeconomic performance in disarray with microeconomic outlook and the role of Greece in the global knowledge economy

Current levels (2003) and Relative Improvement of Greece with respect to Lisbon Criteria over 1999-2003

Lisbon Criteria Indicators	Year	Greece	EU15	Greece: %Change over 1999-2003	EU15: %Change over 1999-2003
GDP per capita	2003	73,0	100,0	3,9	1,4
Productivity	2003	90,3	100,0	3,9	0,7
Elderly Employment participation	2003	42,1	41,7	0,8	1,0
Total Employment	2003	57,8	64,4	0,6	0,5
Education Performance 20-24	2003	81,7	73,8	0,6	0,3
RTD expenditure %gdp	2003	0,6	2,0	-0,02	0,02
Corporate Investment %gdp	2003	21,8	16,7	0,7	-0,3
Relative price level	2002	80,0	100,0	-1,2	0,0
% Population in poverty trap	2003	20,0	15,0	-0,5	0,0
% Long-term Unemployed	2003	5,1	3,0	-0,3	-0,2
Regional Employment Differential	2003	3,6	12,0	-0,4	-0,5
Emissions C02	2002	126,5	97,1	3,6	0,3
Energy Intensity	2002	258,0	191,0	-1,7	-2,3
Transport Volume	2002	127,0	102,0	-5,0	0,0

Greece: R&D Outlook

R&D/Innovation outlook

Scores negatively in 15 out of 20 international indicators.

Weakest in: Hi-Tech employment and production, lifelong learning, new products, patents.

According to EU Innovation reports:
•There is a technology averse culture
•HEIs resist change (lowest R&D expenditure per researcher in EU)
•R&D not yet a national policy priority

Targets:
R&D spending at 0,66% of GDP and targeted to reach 1,5% of GDP by 2010. The private sector accounts for 30% of spending and targeted to reach 40% by 2010. EU-funds account for 21% of R&D spending.

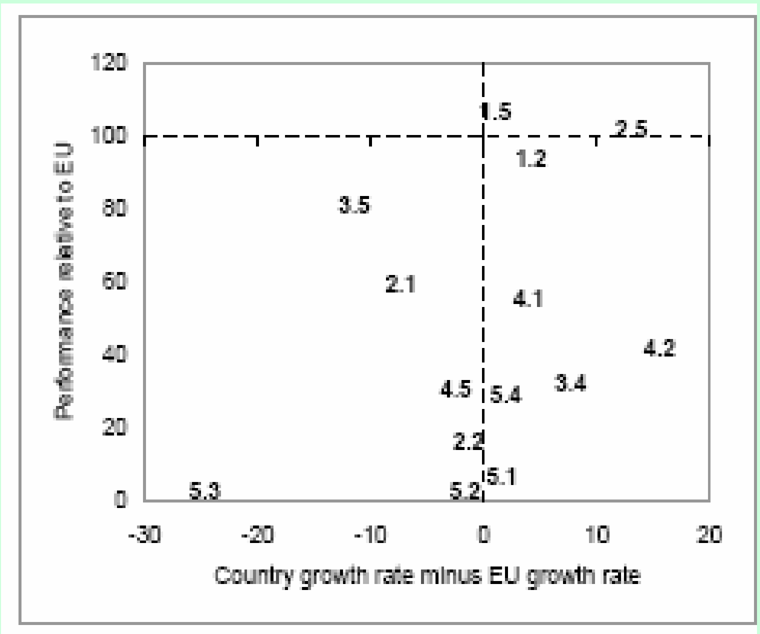
Although catching-up in some areas, the overall rate of improvement is below the speed of competitors.

R&D Indicators for Greece

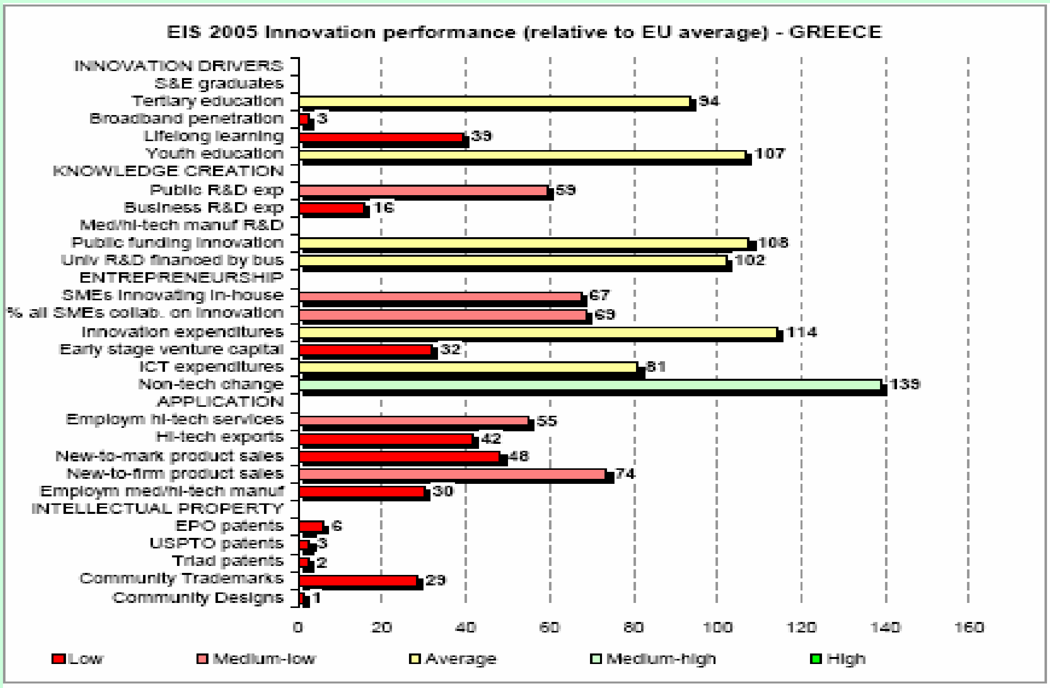
1.1 S&E graduates
1.2 Tertiary education
1.3 Lifelong learning
1.4 Employment medium/high-tech manufacturing
1.5 Employment high-tech services

2.1 Public R&D
2.2 Business R&D
2.3.1 EPO hi-tech patents
2.3.2 USPTO hi-tech patents
2.4.1 EPO patents
2.4.2 USPTO patents

4.5 ICT expenditures
4.6 Value-added high-tech manufacturing



R&D Indicators for Greece



Greek R&D Policy Priorities

Major actors: Ministry of Economy. The Ministry of Development (GSRT) and the Ministry of Education account for over 90% of Public R&D related spending.

Policy Pillars: 1.Research policy and 2. incentives for private investment.

The Objectives:

•Raise demand for new knowledge (modernise traditional sectors, develop new knowledge intensive sectors)
•Reorganise research framework and integrate with intl. networks
•Develop R&D infrastructure (emphasis on ICT)
•Sector priorities: tourism, culture, sports, food-agriculture, transport, renewable energy, health, environment, work organisation, e*learning, e*business.

Impact of policies:

•Limited and slow moving
•R&D diffusion is considered to be quite weak.

Barriers to R&D

•**Education system**: Limited links to economic activity and lack of direction towards the needs of a modern economy.

•**Training**: Weak in Entrepreneurship, Lifelong, Technological

•**Cultural/behavioural**: technology averse, risk averse, limited understanding of global trends.

•**Institutional**: (a) Poor policy coordination (between Ministries of Education and Development). (b) Lack of innovative policies at sectoral and regional levels.

Other factors to consider: Corporate characteristics, economic structure, R&D incentives system, R&D networks.

MIRIAD

Regional R&D Performance: Central Macedonia and East Macedonia-Thrace (Greece)

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

Competitiveness SWOT

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.

R&D Expenditure 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

R&D Investment SWOT

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.

R&D Supply

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

R&D Supply: Outlook and Policies

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.

	R&D Supply Policy Objectives
National Government level- GSRT	Restructure R&D supply system: GSRT supervised research performers to engage with corporations, promote academic research to support 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 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 Plans (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.

R&D Demand

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

R&D Demand Outlook

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.

R&D Demand Policies

Policy	Objectives
National R&D Policies	Increase R&D demand: 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 sector/thematic priorities with cross-sector synergies (see section 3.3). Main policy tools are primarily subsidation 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.

Matching Regional RTD Demand with Supply- Transfer & Diffusion

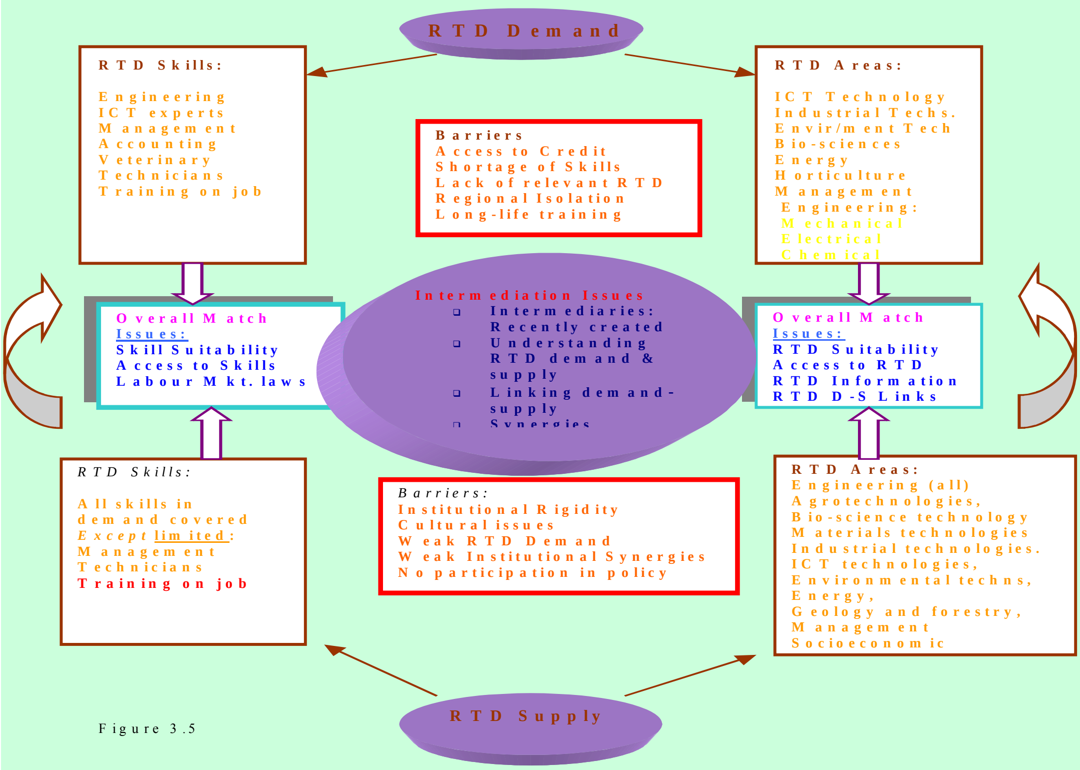


Figure 3.5

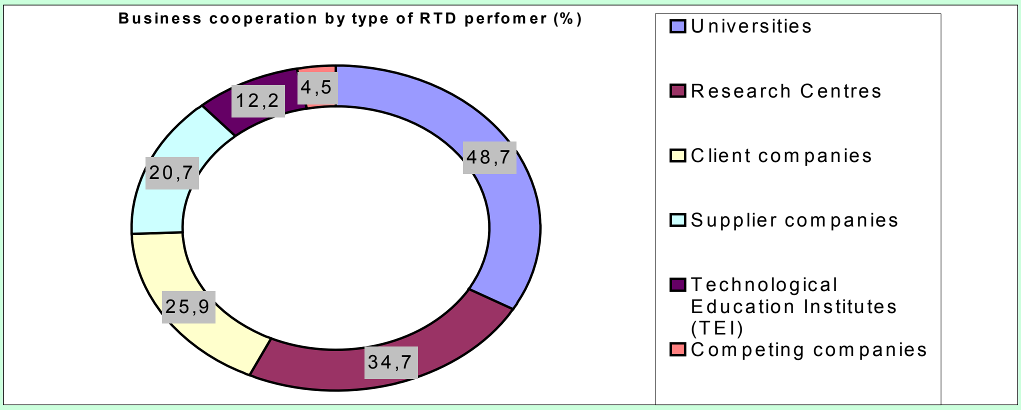
R&D Transfer indicators

Evolution of innovation indicators amongst companies in the manufacturing and services sectors								
	1994-1996		1996-1998		1998-2000		%ch.96-00	%ch.96-00
Innovation Indicators	Manufact.	Services	Manufact.	Services	Manufact.	Services	Manufact.	Services
Innovative firms	26,5	11,1	30,3	15,5	**29,2**	**31,9**	-3,6	105,8
Innovating within the firm	20,6	37,5	21,2	40	**25,3**	**20,3**	19,3	-49,3
Firms with new products	10,4	na	14	na	**11,9**	**15,9**	-15,0	na
RTD firms	15,8	8,3	18,9	13	**20**	**16,1**	5,8	23,8
RTD innovative firms	59,7	75	62,3	84	**68,5**	**72**	10,0	-14,3
RTD-systematic Firms	5,1	5,6	7,1	5,6	**9,4**	**10,5**	32,4	87,5
RTD personnel (for innov.firms)	1	na	1,4	na	**3,4**	**8,5**	142,9	na
Innov.exp/sales (for innov.firms)	na	na	na	na	**5,2**	**4,4**	na	na
RTD exp./Sales (for innov.firms)	na	na	na	na	**1,6**	**1,5**	na	na
%sales from innovative products	13,9	na	12,4	na	**7,8**	**13,6**	-37,1	na
%sales from new products	3,6	na	2,3	na	**1,8**	**6,6**	-21,7	na
Cooperation (% of innov.firms)	17,7	56,3	21,4	36	**20,4**	**39,7**	-4,7	10,3
Innov.firms coop with HEIs	1,3	na	9,9	5	**9,1**	**17,5**	-8,1	250,0
Innov.firms coop with Res.Centrs	4.4	na	2,6	2	**7,9**	**10,5**	203,8	425,0
HEIs as source of know-how	10	na	6,3	na	**1,8**	**10,9**	-71,4	na
Res.Centr. as source of know-how	10	na	7,3	na	**1,5**	**4,2**	-79,5	na
Source: National Innovation Surveys over the years 1994-2000								

Regions	%Innovative Firms (1998-2000)	%Innovative Manufacturing Firms	% Innovative Services Firms
East Mac.& Thrace	**15,1**	**14,7**	**23,2**
Central Macedonia	**23**	**22,1**	**30,8**
Western Macedonia	25,5	27,1	_
Ipeiros	27,5	28,7	7,9
Thessalia	4,2	4,4	_
Ionian Islands	5,2	_	_
Western Greece	25,1	19,2	58,4
Sterea Ellada	36,0	35,2	100
Peloponnisos	21,3	23,9	0
Attiki	30,9	30,3	33,3
Northen Aegean	17,8	18	20
Southern Aegean	14,7	11,9	34,1
Kriti	23,1	28,4	2,6
Total (Greece)	***27,3***	***26,4***	***31,9***
EMTH/Greece	*55,3*	*55,7*	*72,7*
CM/Greece	*84,2*	*83,7*	*96,6*

Source: National Innovation Survey 1998-2000, GSRT, 2004

R&D Transfer and Diffusion

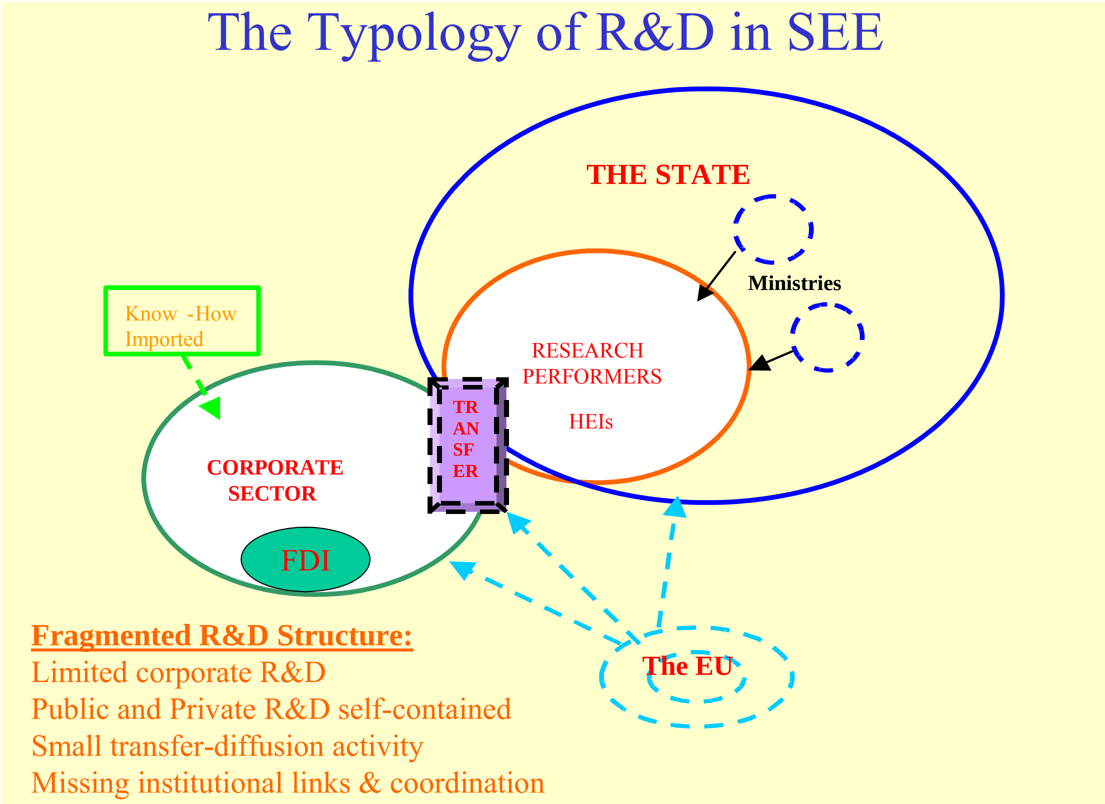


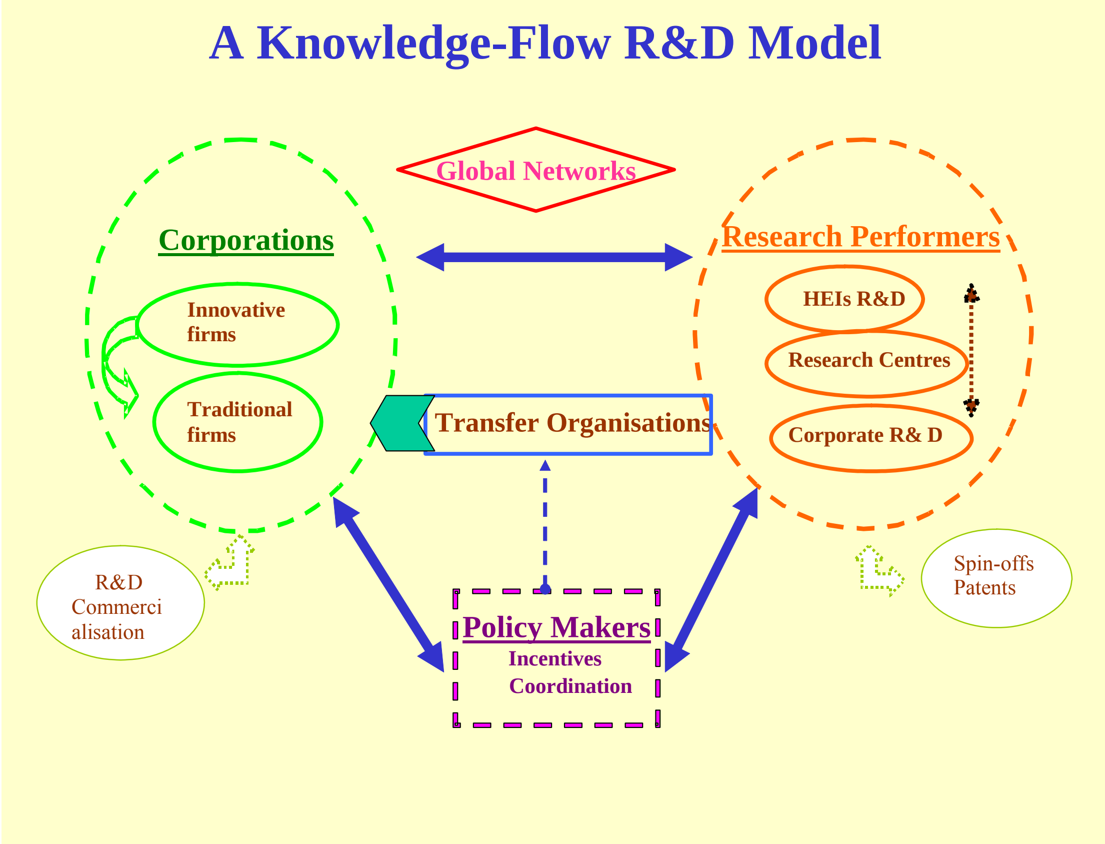
Strengths	Growing cooperation amongst innovative businesses.
Weaknesses	Overwhelming knowledge transfer from abroad with limited value added at domestic level.
Opportunities	Growing public sector investment in knowledge transfer policies including the recent growth of intermediaries.
Threats	A weak response by stakeholders to promote triple-helix interaction. Matching knowledge supplied with that being demanded.

RTD Interaction via Funding (Source and Use of funds I-O Table)

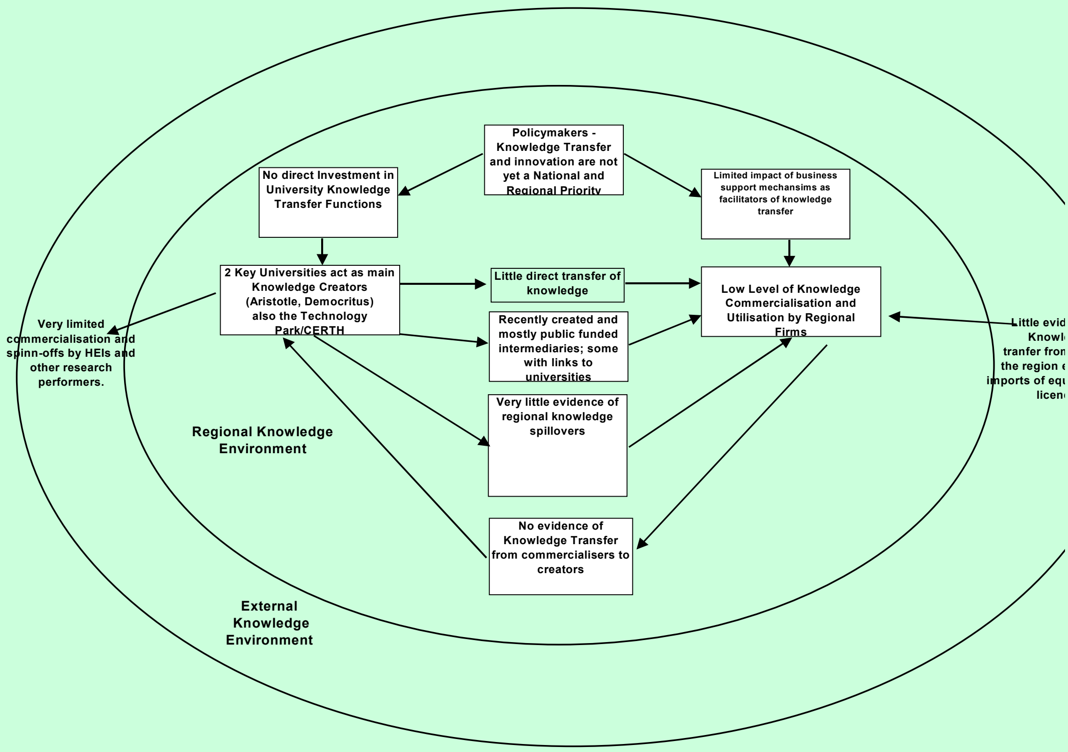
	Recipient of RTD funds					
Financier of RTD. Allocation of funds in % by financier (1999)	**Public Research centres**	**Higher Education Insts**	**Public Companies**	**Private Companies**	**Non-Profit Insts.**	**Total (% share by financier)**
Public finances	48,86	46,82	0,28	3,61	0,41	25,87
Hirger Education Institutes	0,00	100,00	0,00	0,00	0,00	21,23
EU-Funds	21,26	56,91	1,55	20,19	0,10	13,61
Retained earnings of insts.	42,36	56,25	0,00	0,00	1,39	3,79
Public companies	4,39	26,02	69,28	0,31	0,00	4,20
Private companies	0,40	6,92	0,33	92,35	0,01	19,96
Non-profit private Insts.	3,18	95,45	0,00	0,00	0,00	0,29
EU-FP	40,77	30,32	4,26	23,35	1,29	10,19
Other Abroad	15,38	52,31	16,92	15,38	0,31	0,86
Total						100

	Recipient of RTD funds. Allocation of funds in % by recipient (1999)					
Financier of RTD	**Public Research centres**	**Higher Education Insts**	**Public Companies**	**Private Companies**	**Non-Profit Insts.**	**Total**
Public finances	58,24	24,47	1,92	3,79	34,78	
Higher Education Institutes	0,00	42,88	0,00	0,00	0,00	
EU-Funds	13,33	15,65	5,48	11,16	4,35	
Retained earnings of insts.	7,39	4,30	0,00	0,00	17,39	
Public companies	0,85	2,21	75,68	0,05	0,00	
Private companies	0,36	2,79	1,71	74,80	0,43	
Non-profit private Insts.	0,04	0,56	0,00	0,00	0,00	
EU-FP	19,15	6,24	11,30	9,66	43,48	
Other Abroad	0,61	0,90	3,77	0,53	0,87	
Total (% share by recipient)	21,70	49,51	3,84	24,64	0,31	100,0


The Typology of R&D in SEE
THE STATE
Ministries
RESEARCH PERFORMERS
HEIs
Know -How Imported
CORPORATE SECTOR
FDI
TR AN SF ER
The EU
Fragmented R&D Structure:
Limited corporate R&D
Public and Private R&D self-contained
Small transfer-diffusion activity
Missing institutional links & coordination


A Knowledge-Flow R&D Model
Global Networks
Corporations
Innovative firms
Traditional firms
Research Performers
HEIs R&D
Research Centres
Corporate R& D
Transfer Organisations
R&D Commerci alisation
Spin-offs Patents
Policy Makers
Incentives
Coordination

Knowledge Flow Model for CM and EMTH



The Knowledge Flow Model

•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.

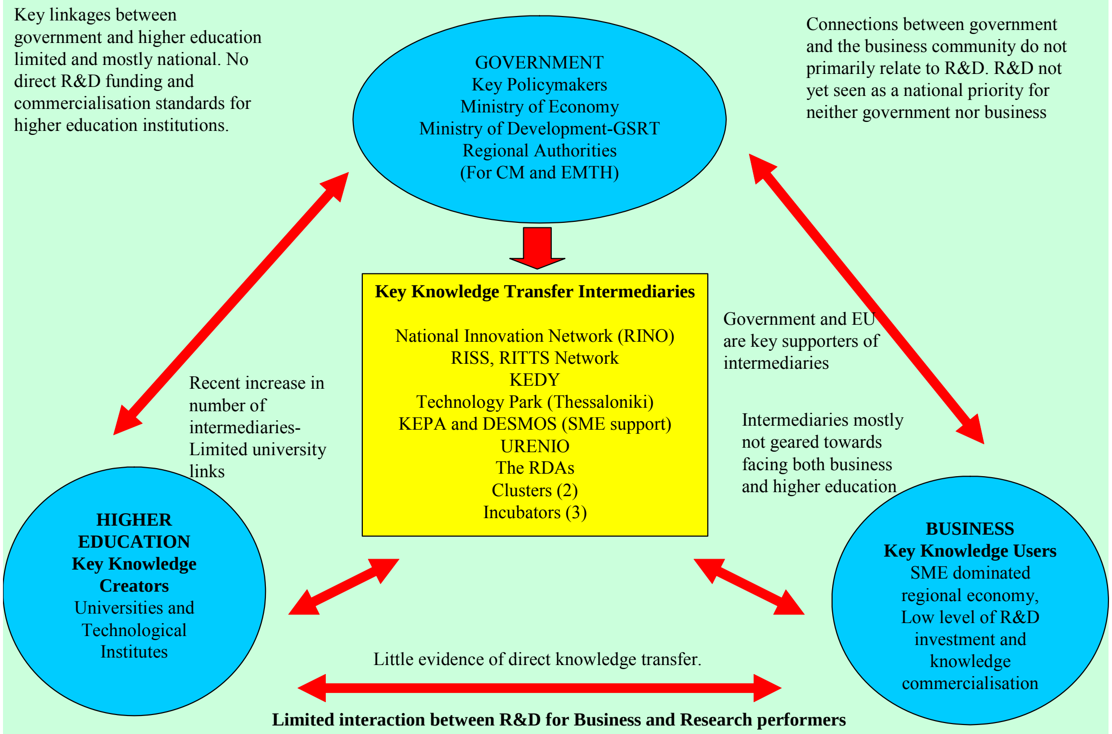
•At both the national and regional level there is limited investment in university knowledge transfer functions.

•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.

Triple Helix Knowledge Flow Model: CM & EMTH



Triple Helix Interaction

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

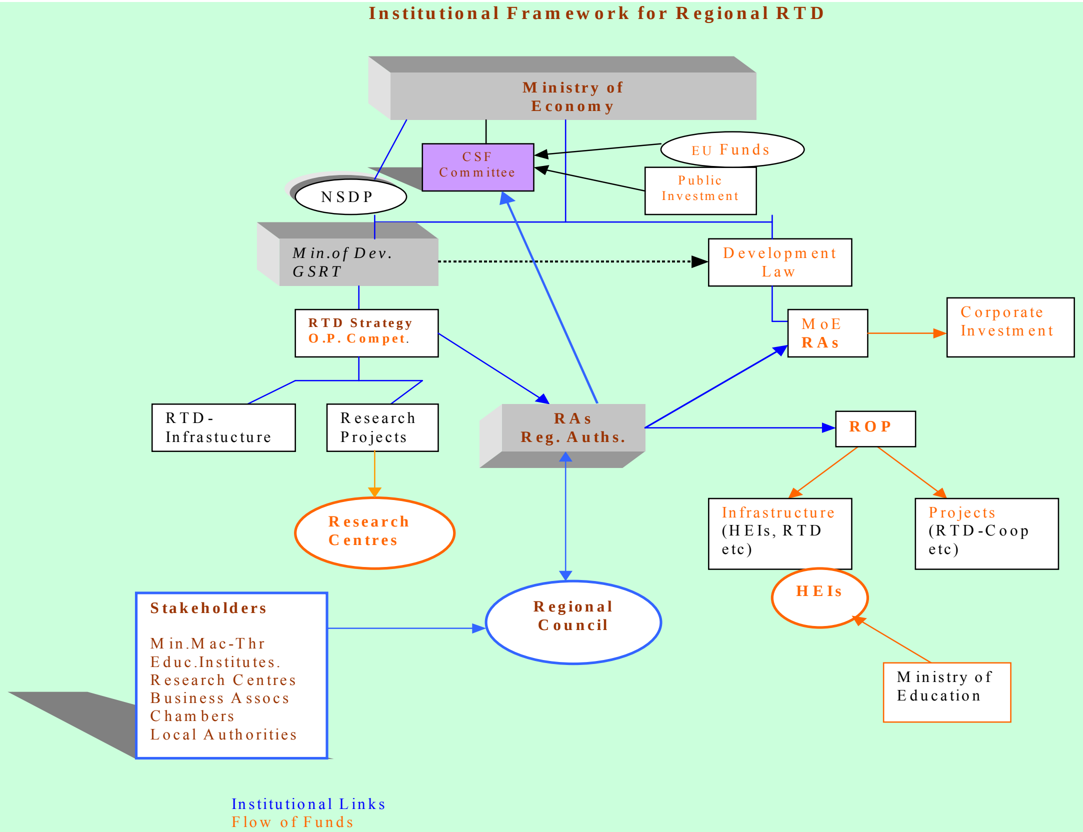
• **Business** – SME dominated regional economy with low levels of R&D investment and knowledge commercialisation.

• **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.

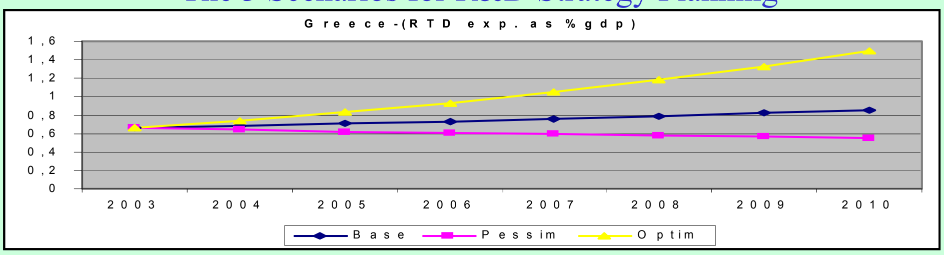
• **Government-Higher Education Interface** - key linkages between higher education and government either lack coordination and decisive initiative or are limited at both national and regional level.

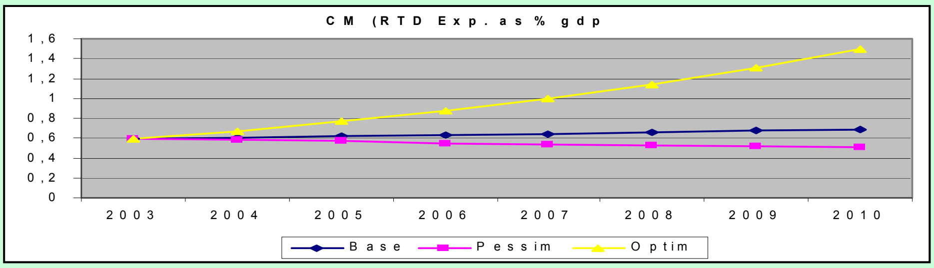
• **Higher Education-Business Interaction**– little evidence of direct knowledge transfer and even less of reverse transfer. Intermediaries act as key facilitators, with the government being the key funder. Although, there has been a rapid increase in number of knowledge transfer intermediaries the process 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.

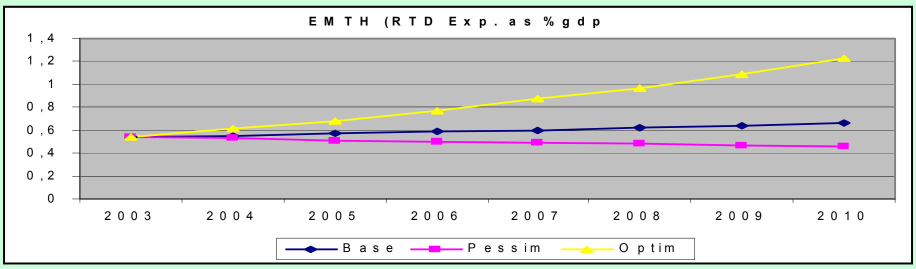
• **Government-Business Interaction** - connections between government and the business community with regards to R&D are limited at both national and regional levels or lack decisive initiative.



The 3 Scenarios for R&D Strategy Planning

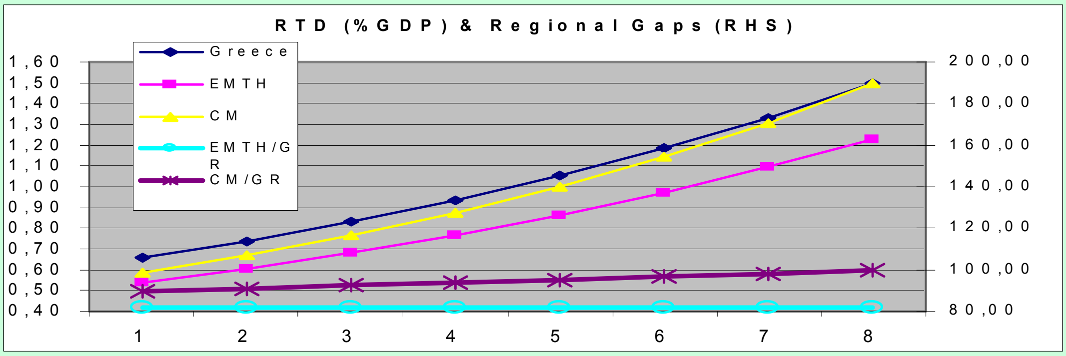


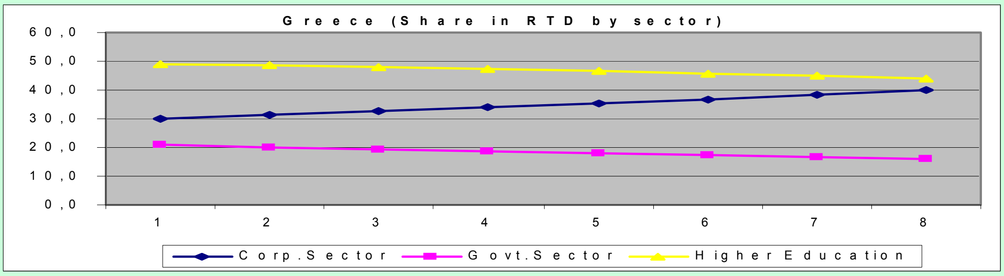


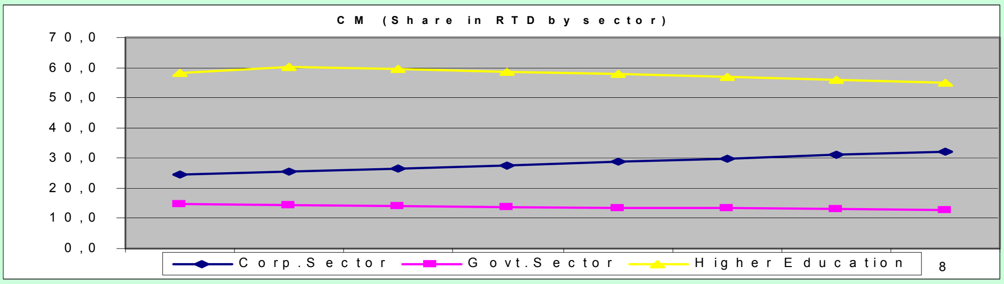


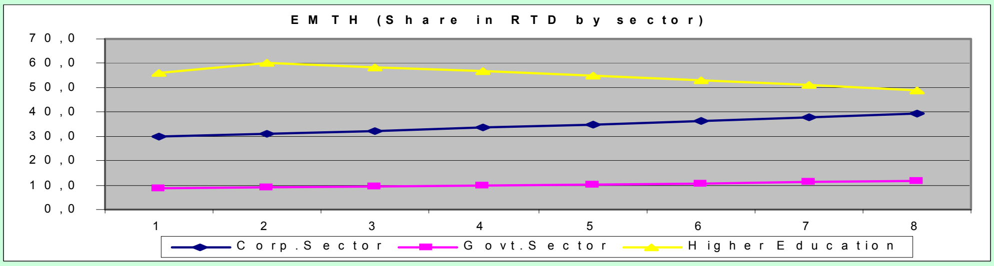
Optimistic Scenario: Reaching the 2010 targets

	2003	2004	2005	2006	2007	2008	2009	2010	*Growth*
RTD (%gdp)									**2003-2010**
Greece	0,66	0,74	0,83	0,93	1,05	1,18	1,33	1,50	*19*
EMTH	0,54	0,61	0,68	0,77	0,86	0,97	1,09	1,23	*19*
CM	0,59	0,67	0,77	0,88	1,00	1,14	1,31	1,50	*21*
EMTH/GR	82,10	82,10	82,10	82,10	82,10	82,10	82,10	82,10	
CM/GR	89,58	90,97	92,38	93,81	95,27	96,74	98,24	99,77	
RTD Shares by Sector									
Greece									
Corp.Sector	30,1	31,4	32,6	34,0	35,4	36,8	38,3	39,9	*24*
Govt.Sector	20,9	20,1	19,4	18,7	18,0	17,4	16,7	16,1	*15*
Higher Education	49,0	48,5	48,0	47,3	46,6	45,8	44,9	43,9	*18*
CM									
Corp.Sector	24,5	25,5	26,5	27,5	28,6	29,8	31,0	32,2	*26*
Govt.Sector	14,6	14,3	14,1	13,8	13,6	13,3	13,1	12,9	*19*
Higher Education	58,4	60,2	59,5	58,7	57,8	56,9	55,9	54,9	*18*
EMTH									
Corp.Sector	29,9	31,1	32,3	33,6	34,9	36,3	37,7	39,2	*24*
Govt.Sector	8,5	8,9	9,4	9,8	10,3	10,8	11,3	11,8	*25*
Higher Education	56,2	60,0	58,3	56,6	54,8	53,0	51,0	49,0	*18*









Policy Issues

Questionable regional viability for RTD. Address the question of whether regional breakdown to 13 regions is viable from the point of view of achieving economies of scale/critical-mass for RTD and whether issues should be addressed at cross-regional level. (Join CM with EMTH or all engulfing within Voreia Ellada)

Sectoral allocation of the economy might call for a more focused RTD strategy. Given comparative advantage in traditional sectors and small market size. might require a policy focus towards RTD agglomeration in selective sectoral synergies rather than attempts to shift the economy towards hi-tech and highly innovative products. (An example would be agriculture-tourism-ecology-life sciences with Thessaloniki at the core)

The role of market forces in driving RTD strategy. An alternative strategy could arise as a result of more horizontal-neutral policies like combining the triple-helix interaction, the play-out of market forces and state-of-the-art scientific practices. Are these strategies totally incompatible or is it possible to strike a balance?

Policy makers, taking the initiative and developing leadership. Particularly at regional level by upgrading expertise to implement policies suited to the region and become more independent from national policy making.

Building efficient institutional links and coordination. Required at both national and regional levels as coordination amongst ministries, private-public sector synergies and regional actors has not in practise been effective despite the presence of institutional forums.

Targeted allocation of financial resources. Maximising impact through strategic focus rather than fragmented use of financial resources based on general criteria, availability of funds or ease of implementation.

Building synergies between research performers and corporations. Break the self-contained nature of private and public sector RTD to achieve cooperative outcomes and economies of scale.

Reforming the Higher Education System. This is the a major weak link in achieving RTD skills and outcomes that link skill development and research content with relevance to the needs of the economy.

Upgrading the level of entrepreneurship. Information, dissemination of technological developments, training in new technologies, improving the business institutional environment.

Cultivating the right culture amongst economic actors. Awareness of globalisation trends, the place of Greece in this process and what is required by economic actors and institutions in order to achieve sustainable competitiveness.

Scenario Strategy Planning Implications

•Greece requires a significant boost in RTD investment rates, which on average need to be doubled compared to past performance, in order to reach its 2010 targets.

•Need for serious changes at institutional level to promote the triple-helix interaction and reform the higher education system and the government sector's role. Synergies are needed to boost RTD investment rates and enhance their economic impact.

•The role of the corporate sector is central in this process and possibly the focus should be on policies boosting corporate RTD and innovative firms, at the expense of more general incentives.

•Regional RTD policy will need to be conscious in terms of what the special weight of each region in the whole RTD effort should be.

•Should the government believe that RTD spending must be more evenly spread-out across regions then that will require a significant reversal in past trends regarding allocation of resources otherwise a choice of regional RTD hubs would most likely need to be in place.

•The need to achieve agglomeration and critical-mass for RTD will likely play a crucial role.

•The region of CM will likely be promoted to play a special role for Northern Greece and may be the Balkan region. In the case of EMTH the choice is open as to whether its RTD outlook should evolve in a more independent fashion or be seen as part of a broader region.

•The continuation of current RTD spending trends will raise the share of RTD spending in GDP but still keep Greece as a laggard in EU innovation developments over the medium-term and increase the regional gaps.

•The high spending required to reach 2010 targets implies the importance of the private sector in undertaking RTD spending given also the budgetary constraints the Greek government is currently facing.

CHAPTER 4
WORKSHOP MATERIALS FOR THRACE-TURKEY

4.1. Introduction

This report sets out three scenarios for the Thrace-Turkey region regarding knowledge. RTD and innovation levels and how these may impact on the regional economy. The three scenarios comprise of an 'optimistic scenario'. whereby the region follows the national policies of Supreme Court of Science and Technology (BTYK) and the Ninth Development Plan of State Planning Organisation (SPO) as well as the suggestions by the National Initiative of Innovation and Knowledge Society Action Plan prepared by the Prime Ministry; a 'pessimistic scenario'. where the political and economic developments cause instability in the hype of improvement; and a 'base scenario'. where the current trend is followed with a small improvement.

The report is set out as follows: section 2 briefly introduces key indicators in order to outline the present state of the region's economy in terms of GDP, productivity, R&D, innovation levels and qualifications. These are also compared to the national figures of Turkey as a whole in order to highlight the relative performance of the region. Section 3 then outlines the three scenarios in detail, and finally, the impacts of the described scenarios on the regional economy will be discussed.

4.2. The Outline of the Thrace Economy

From an economic viewpoint, the Thrace region produces 23.8 % of the GDP in Turkey, where 30 % of the active business enterprises and 34.5 % of the working population reside. Istanbul is considered as the number one leading city in terms of the development index calculated by the SPO. The regional GDP per capita is US$3024 very close to the national average of US$3044 though Kırklareli with US$3590 and Istanbul with US$3063 are higher. Even if Istanbul is one of the leading manufacturing centres of Turkey, it has an unemployment percentage of 12.30% higher than the national average of 10.30%. The rest of the cities have low unemployment rates mainly because of agricultural activities and small companies in the textile industry.

The local governors of Edirne and Kırklareli are enthusiastic about improving the development by more investments in the tourism sector, whereas Tekirdağ and Istanbul are supporting the research projects to increase the number of innovative manufacturing.

Although RTD, knowledge and innovation are recognised as drivers of development nationally by the government and the business organisations Turkey ranks as the 66th in the European Scorecard for Innovation in 2005. Very recently, the strategies and the action plan for the knowledge society have been prepared for the Prime Ministry. aligned with the science and technology goals and activities lead by TUBITAK. The suggestions of the National Initiative for Innovation lead by Sabanci University and Turkish Industrialists' and Businessmen's Association (TUSIAD) will be public only on September, where the regional innovation is foreseen to be the only driver of economic development. These changes will have an impact on the scorecard of 2006. RTD expenditure increased from 0.67 % of GDP in 2002 to 0.8% in 2006. 60 % of the RTD is still realised by the 77 universities in Turkey and the business takes only the 33%. There are 9 state Universities and 15 Foundation Universities in the Thrace region, which support the RTD expenditure of 0.51% of GDP in the region. The innovation indicators of the Thrace region are given in Table 4.1 and the human resource qualifications in Table 4.2.

Table 4.1: Innovation indicators in Thrace (2002-2004)

	Number of Enterprises	Innovative SME (%)	Number of Projects /(1.000)			Number of Patents (TPI)		
	2004	2002-2004	2002	2003	2004	2002	2003	2004
Edirne	82		0	0	0	1	1	-
Istanbul	12.270	11.4	38	37	24	151	213	324
Kirklareli	61		-	1	-	1	-	1
Tekirdag	337	3.8	4	-	2	1	1	1
THRACE	12.750	11.1	42	38	26	154	215	326
TURKEY	43.642	30.24	390	458	416	388	465	633

Source: KOSGEB. TPI

Table 4.2: Human Resource Qualification (2005)

	Edirne Kirklareli Tekirdag	Istanbul	Thrace	Turkey
No of enterprises (A)	480	12.270	12.750	43.642
No of employments (B)	11.948	251.845	263.793	604.432
No of owners (C)	480	12.270	12.750	43.642
University Educated Shareholders (% of C)	37.58	34.42	34.54	50.57
University Educated Workers (% of B)	7.22	10.41	10.27	8.3
Technical Consulting Outsource (% of A)	13.94	11.81	11.89	8.73
Technical Training Outsource (% of A)	19.28	16.62	16.72	9.96
External Laboratory Utilisation (% of A)	53.85	42.55	42.98	27.14

Source: KOSGEB 2005

These tables show the lack of innovation and competence awareness in the region except in Istanbul. This fact highlights the need for the collaboration of regional policy makers. The first collaboration is initiated among the municipalities (TRAKAB) of the region.

The Thrace region is expected to have at least the national targets of increasing the RTD expenditure in 2013 to 2%. This can only be possible by:

- Government- high education interaction. not only in funding but collaborating in research to avoid redundancies and fortifying the knowledge of local governments.
- Higher education- business interaction. both to improve the regional awareness and supporting the regional business enterprises in development.
- Increase the dynamics of the intermediary organisations by knowledge transfer.
- Encourage the innovative large enterprises to collaborate with the SME in knowledge transfer and increase the innovative activity by synergy.

The key intermediaries in the region are as follows:

- **KOSGEB-Thrace:** Recently established to make research on the regional SME and transfer knowledge for technology investment. collaboration with the other SME. entrepreneurship in technology centres and evaluate the technical inventions to be granted.

- **Commerce and Industry Chambers:** In Edirne. Kırklareli. Tekirdağ and the region chambers are to be separated since the commerce people running the chambers lack the awareness of the industrial innovation issues.

- **Istanbul Commerce Chamber:** Making great efforts in knowledge transfer by training and collaborating with the foreign commerce chambers in European projects. They can be encouraged to be more effective in knowledge dissemination.

- **Istanbul Industry Chamber:** The most effective intermediary in knowledge transfer. Booklets prepared for the industry leading for utilisation of the government grants and training sessions are repeated. They have projects executed for increasing the effectiveness of university-industry collaboration. where they act as the link. They can be encouraged to lead the other chambers in the region for increasing the awareness.

- **TUSSIAD:** They have started projects with the Universities of the region and planning to transfer knowledge for the large organisations.

- **KALDER:** Giving efforts to establish the quality based culture which is quite important in innovation and exportation.

- **Turkish Informatique Foundation (TBV):** Active in knowledge transfer but does not act as an intermediary between the information technology firms and the business industries. This can be encouraged in collaboration with the Universities.

- **Textile Exporters Association (ITKIB):** Active in knowledge transfer for training. quality. innovation and exportation of textile producers. Supporting for foreign trade shows and international correspondences. The training for clustering in textile sector is started. They can be consulted for clustering in the other sectors by the rest of the intermediaries.

4.3. Future Scenarios for Thrace Turkey

Scenario 1- Substantial Increase in expenditure: This scenario is based targeting to have RTD expenditure of Turkey as 2% of GDP in 2013 as stated in the Ninth Development Plan and Vision 2023. The region has the competence to set the same goal. The national figures for 2002 are taken from European Scorecards and the figures for 2006 were taken from TUBITAK. The best fit study has shown a polynomial regression with the following equation:

$$y = 0.0126x^2 - 0.018x + 0.67$$

The figures for Thrace-Turkey are fit into polynomial regression as well using the 0.51 % in 2002 and 0.7 % in 2006 and targeting 2 % in 2013. The following equation is achieved for the forecast:

$$y = 0.0126x^2 - 0.0028x + 0.51$$

Table 4.3. Forecasts with Optimistic Scenario

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
RTD(%GDP)												
Turkey	0.67	0.66	0.68	0.73	0.80	0.90	1.02	1.16	1.33	1.53	1.75	2.00
Thrace	0.51	0.52	0.55	0.62	0.70	0.81	0.95	1.11	1.29	1.51	1.74	2.00
Thrace/Turkey	0.76	0.78	0.81	0.84	0.88	0.91	0.93	0.95	0.97	0.98	1.00	1.00
RTD shares by sector												
Turkey												
Corp. Sector	28.70	30.69	32.82	35.09	37.52	40.12	42.90	45.87	49.05	52.45	56.09	59.97
Govt. Sector	7.00	6.79	6.58	6.39	6.19	6.01	5.83	5.65	5.48	5.31	5.15	5.00
Higher Educ.	64.30	62.52	60.60	58.52	56.29	53.87	51.27	48.48	45.47	42.23	38.76	35.03
Thrace												
Corp. Sector	30.60	32.43	34.37	36.43	38.61	40.92	43.36	45.96	48.71	51.62	54.71	57.98
Govt. Sector	2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02
Higher Educ.	67.38	65.55	63.61	61.55	59.37	57.06	54.62	52.02	49.27	46.36	43.27	40.00

The share of Corporate Sector in RTD expenditure was 28 % in 2002 and the target is to increase the share up to 60 %. An exponential distribution with respect to the total expenditure is defined as follows:

$y_{1C} = 28.7 * e^{-0.067x}$ **Error! Bookmark not defined.**

The Government sector had a share of 28 % in 2002 and the target is stated to be down to 5%. where the higher education share is targeted to reduce from 64 % in 2002 to 35 % in 2013. Hence. the formulas are:

$y_{1G} = 7 * e^{-0.0306x}$ and

$$y_{1H} = 100 - y_{1C} - y_{1G}$$

Figure 4.1 illustrates that with a polynomial regression trend the national targets can also be reached in the region by 2013, which briefly means that knowledge driven economy will be effective in the Thrace region. This is an optimistic scenario since the conditions required to realise it are very aggressive as follows:

- Continuous stability of the national economy and no radical changes in politics.
- Determination of regional strategies for innovative development and execution of these strategies by the local authorities.
- Provision of loans and grants for the region.
- Effective synergy of the intermediary organisations and the SMEs in order to increase the proportion of SMEs in RTD investment
- Effective collaboration of Local Government and HEI to establish the knowledge based culture in the region.
- Effective collaboration of the business sectors and HEI with the help of the intermediaries in order to invest in technology based products for the market, innovation in processes, in organisation structures and improving the production processes.
- Encouraging the creation of new knowledge-generating firms of the region to share knowledge with the SME. by establishing the supply value chains.

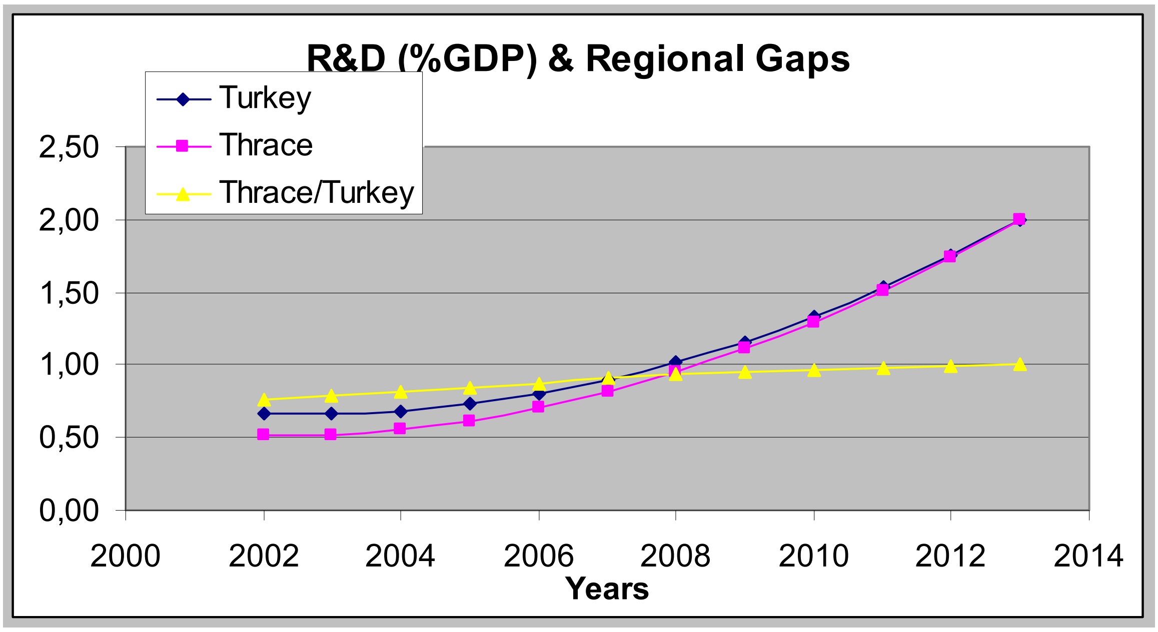


Figure 4.1. Optimistic Scenario

The wider implications of this scenario are:

- The increased level of RTD will lead the SME shareholders to have a quality and innovation based culture rather than cost based culture. This will facilitate the development strategic plans for the business instead of crisis management and increase the employment.
- Increasing the awareness of RTD and innovation in the region will create a higher number of skilled jobs which will act as an incentive for skilled workers to stay in the region as well as attracting educated employees from the other regions. The economy in the four cities of the region can be more balance by keeping the skills in the region.
- Attraction of FDI from high added value firms further boosting the regional economy.
- If Thrace-Turkey becomes a more competitive region. the competitive collaboration in the whole Thrace can be possible allowing to have effective competence to compete with the emerging regions in Europe.
- Increasing the share of corporate sector and decreasing the share of HEI (Figure 4.2) will allow job opportunities for more university graduates, hence decreasing unemployment.

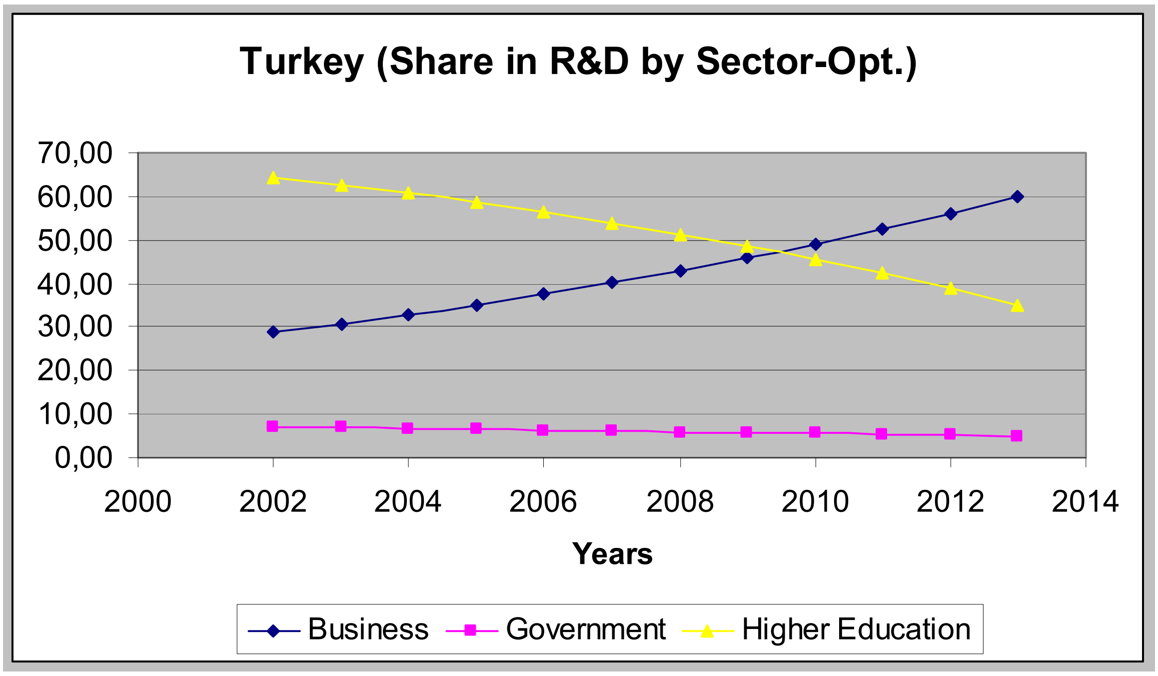


Figure 4.2 Shares in R&D Sector (Optimistic Scenario)

Scenario 2 – Pessimistic with decrease in corporate R&D investment

This scenario is based on having the same pace as 2002-2003 in Turkey to continue without any improvements. This will not allow the R&D expenditure to be more than 1% in 2013 and the business investment is reducing. Table 4.4. and Figures 4.3 and 4.4. are demonstrating this case. This is a scenario taken by the labor unions which see the possibility of radical politics and the impact of the instability in the Middle East.

Table 4.4 Pessimistic Scenario

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
RTD(%GDP)												
Turkey	0.67	0.71	0.74	0.77	0.80	0.82	0.84	0.86	0.87	0.88	0.89	0.89
Thrace	0.51	0.57	0.62	0.66	0.70	0.73	0.76	0.78	0.79	0.80	0.81	0.80
Thrace/Turkey	0.76	0.80	0.83	0.86	0.88	0.89	0.90	0.91	0.91	0.91	0.90	0.90
RTD shares by sector												
Turkey												
Corp. Sector	28.70	28.82	28.93	29.05	29.16	29.28	29.40	29.51	29.63	29.75	29.87	29.99
Govt. Sector	7.00	7.16	7.33	7.50	7.67	7.85	8.03	8.21	8.40	8.59	8.79	9.00
Higher Educ.	64.30	64.02	63.74	63.46	63.17	62.87	62.58	62.27	61.97	61.65	61.34	61.01
Thrace												
Corp. Sector	30.60	30.15	29.71	29.27	28.84	28.42	28.00	27.59	27.18	26.78	26.39	26.00
Govt. Sector	2.02	2.19	2.38	2.59	2.81	3.05	3.31	3.60	3.91	4.24	4.60	5.00
Higher Educ.	67.38	67.66	67.91	68.14	68.35	68.53	68.69	68.82	68.91	68.98	69.00	69.00

Continuing with the polynomial regression the best fit for Turkey is:

$$y = -0.0017x^2 + 0.0391x + 0.67$$

Reflecting the same changes in Thrace to have only 0.8 in 2013 the best fit forecast equation becomes:

$$y = -0.003x^2 + 0.0596x + 0.51$$

Corporate sector share is expected to reduce to 30 % in 2013, hence

Error! Bookmark not defined. $y_{3C} = 28.7 * e^{0.004x}$

Government share is expected to increase to 9 % in 2013, which has the exponential function:

$$y_{3G} = 7 * e^{0.0228x}$$

The HEI share is also expected to reduce to 61.00 in 2013.

Accordingly in the Thrace regions the business sector share is expected to reduce to 26 %, the government share to increase to 5 % and the HEI share to increase to 69%. The explicit focus is on the HEI share, since there are number of young foundation universities which are expected to develop research centres in the future.

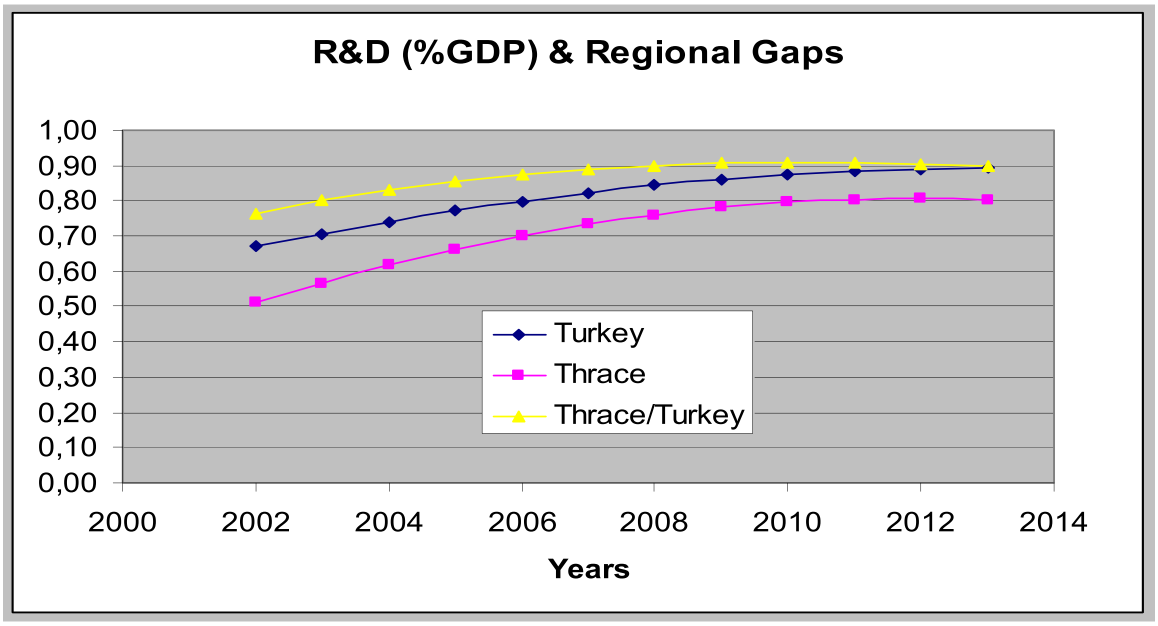


Figure 4.3 Pessimistic Scenario

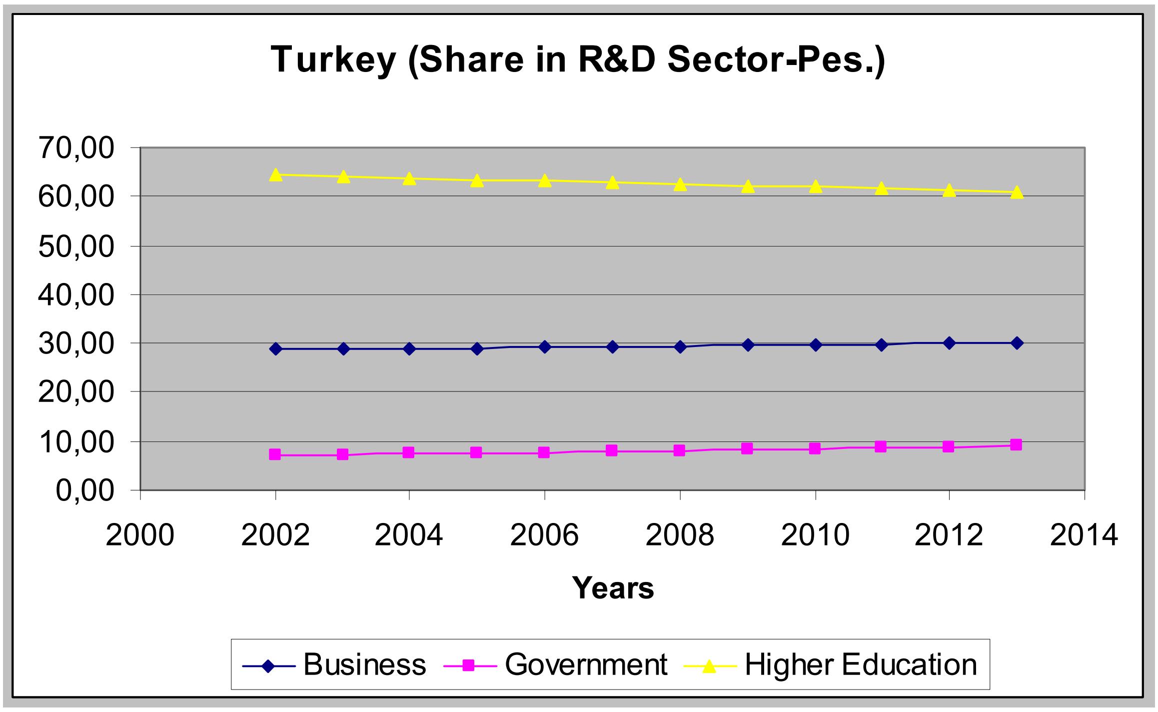


Figure 4.4 Shares in R&D investment -Pessimistic Scenario

Figure 4.3 shows that if there is no aggressive improvement. the expenditure will actually decrease the proportion of GDP spent on R&D. A divergence from the European countries as a whole will be observed. Further weakening causes the competitiveness of the region to remain behind Turkey as a whole. This translates into low impacts on economic growth and little in terms of demand for more highly skilled workers.

This scenario assumes that there the business within the region refuses to undertake R&D.

The wider implications of this scenario are summarised as follows:

- The Universities will not be able to make a reform to open to the real economy.
- The business sector will loose the competitive advantages.
- The unemployment of the university graduates will increase.
- The GDP growth will not keep its current pace.
- The Government will face difficulty to pay the foreign debts.
- This scenario will cause Turkey to stay far behind Europe and become a third world country.

Scenario 3 – Base Scenario: moderate increase in R&D expenditure

This scenario is based on a moderate increase in rate of growth of R&D expenditure from 0.67% per annum to 1.28%. Since there was no resource found for this scenario taking a constant growth of 6 % in GDP (current growth) was not satisfactory enough for the forecast and therefore, Project Evaluation and Review Technique (PERT) is used. PERT allows the estimation by using the optimistic and pessimistic values as well as reducing the errors on the calculations. The general formula for PERT is as follows:

$$y = (\text{optimistic value} + \text{pessimistic value} + 4 * \text{base value}) / 6$$

As seen in Table 4.5. the R&D expenditure share in GDP of the region can only go up to 1.20 % in 2013, where the business sector has a share increase up to 44.83 % government has a very slight increase up to 3.84 % but the HEI share is reduced down to 55.49 %.

Table 4.5. Base Scenario- Moderate Increases

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
RTD(%GDP)												
Turkey	0.67	0.69	0.72	0.76	0.80	0.85	0.90	0.97	1.03	1.11	1.19	1.28
Thrace	0.51	0.55	0.60	0.65	0.70	0.76	0.82	0.89	0.96	1.04	1.12	1.20
Thrace/Turkey	0.76	0.80	0.83	0.85	0.88	0.90	0.91	0.92	0.93	0.94	0.94	0.94
RTD shares by sector												
Turkey												
Corp. Sector	28.70	29.84	31.03	32.29	33.60	34.98	36.43	37.95	39.55	41.22	42.98	44.83
Govt. Sector	7.00	6.99	6.99	6.98	6.98	6.98	6.98	6.98	6.98	6.98	6.99	7.00
Higher Educ.	64.30	63.17	61.98	60.73	59.42	58.04	56.59	55.07	53.47	51.79	50.02	48.17
Thrace												
Corp. Sector	30.60	31.33	32.10	32.90	33.73	34.60	35.51	36.46	37.45	38.48	39.55	40.68
Govt. Sector	2.02	2.14	2.26	2.39	2.53	2.68	2.84	3.02	3.20	3.40	3.61	3.84
Higher Educ.	67.38	66.53	65.64	64.71	63.74	62.72	61.65	60.53	59.35	58.12	56.84	55.49

The conditions required for this scenario to occur include:

- Increasing the incentives for businesses to undertake R&D.
- Highlighting the benefits to business of R&D for innovation and product development and the possibilities for expansion this opens up.
- Offering grants and/or loans for firms to undertake R&D activities.
- Slight increase in the government investments, mainly by the local governments.
- Encouraging collaboration of the SME with the universities.
- Encouraging workforce development and knowledge transfer within the SME.
- The intermediaries accept the importance of innovation and become more effective on SME.

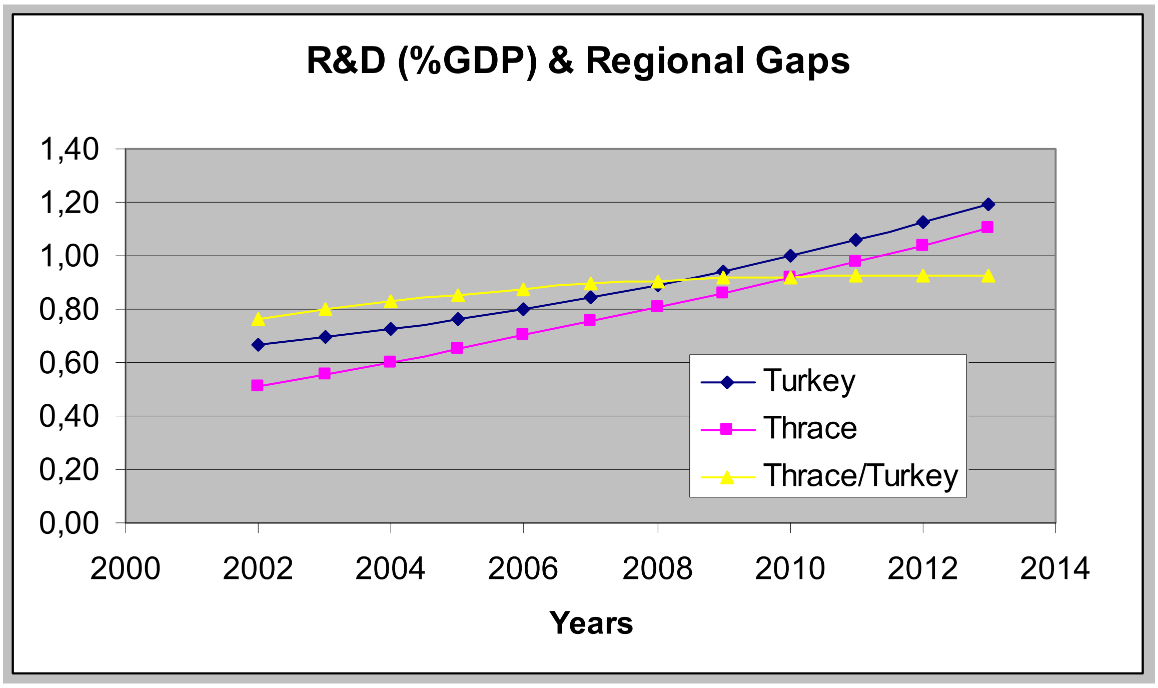


Figure 4.5. Base Scenario

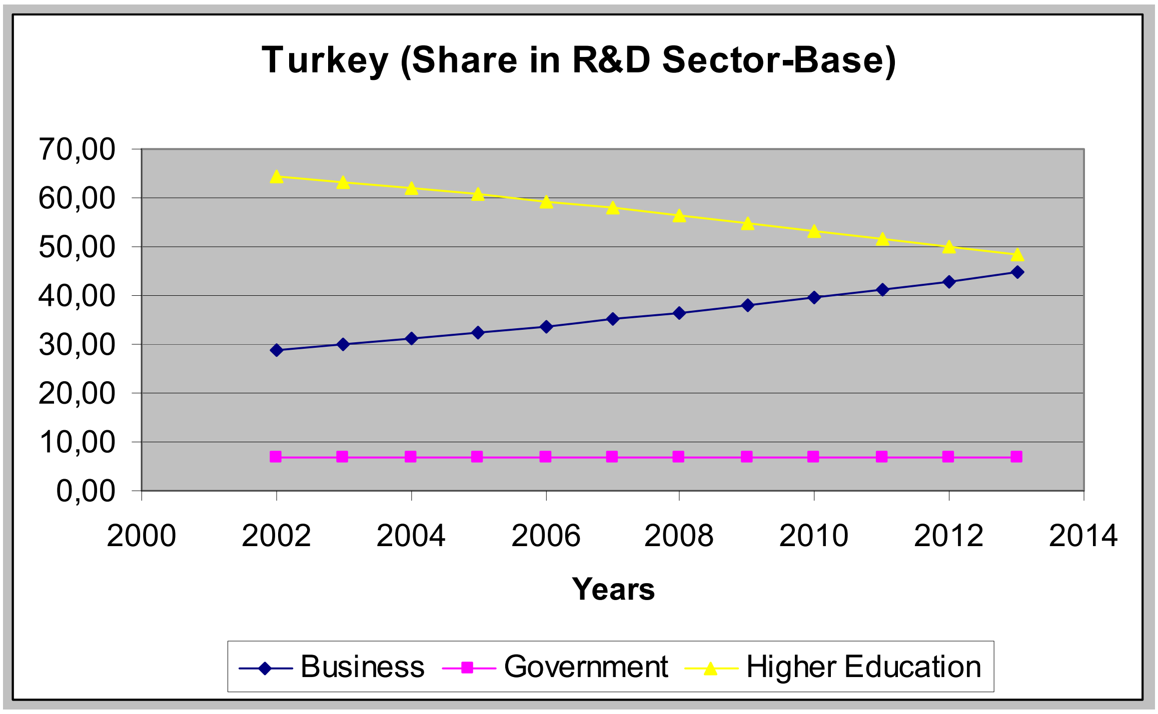


Figure 4.6 National Shares in R&D Sector (Base Scenario)

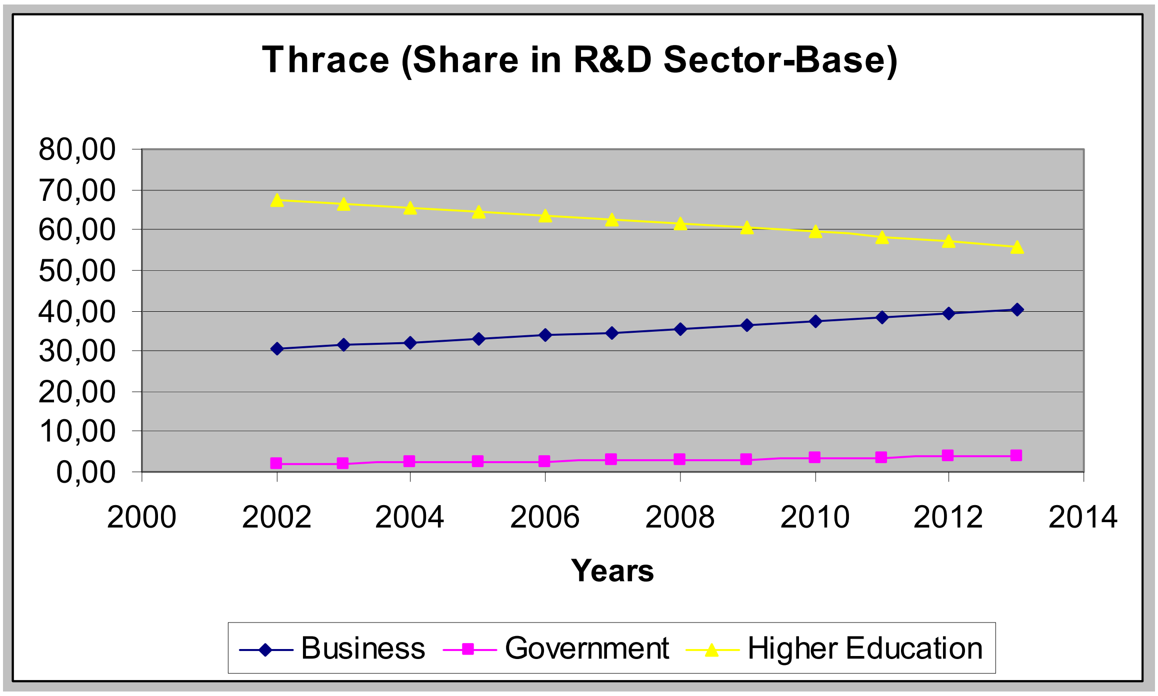


Figure 4.7 Regional Shares in R&D Investment (Base Scenario)

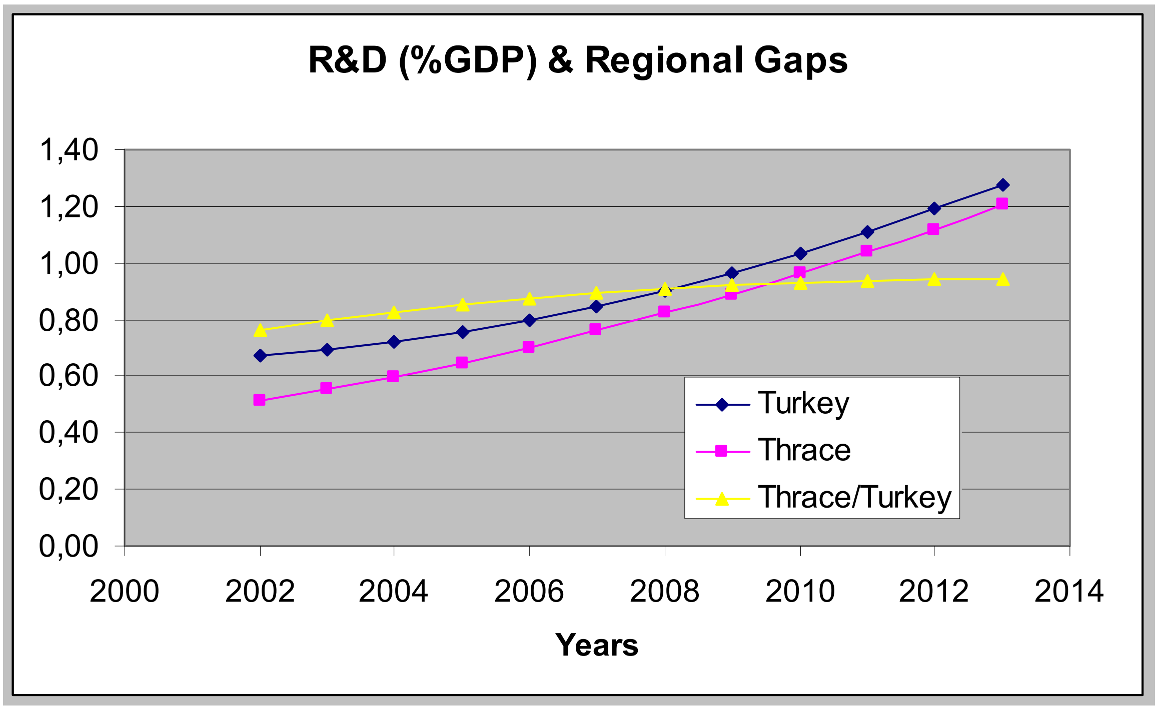


Figure 4.8 Thrace versus Turkey (Base Scenario)

As it is seen in the Figures 4.5-4.8, the base scenario leads for the development of the regional competence, although it stays behind the European countries aiming an R&D expenditure of 3 %.

4.4 Conclusion

The comparison of optimistic, pessimistic and the base scenarios given in Figure 4.9 and 4.10 prove that Turkey requires a substantial leap in RTD investment rates with an exponential growth in the following years so that the targets for 2013 are reached. This actually implies the need for cultural change in the business sector and the government sector so that the collaborations among the three parties can be more effective. Improving the awareness of the SME is not satisfactory; the knowledge creators are also looking for better regulations to improve institutional research rather than individual activities. As Istanbul Industry Chamber representatives stated, this aggressive approach can only be realised if the intermediaries are more effective, which are also supported by the government policies.

The above scenarios serve to highlight that the key issue for Turkey to achieve its RTD targets for 2013 requires agility and sizable increases in RTD expenditure at the regional level. Regional RTD policies will need the collaboration of the local governments and local knowledge creators as well as business chambers. The fact that Istanbul is one of the development leaders in Turkey, the region has the chance to act more independently in RTD activities in case of regional instabilities or economic problems. Because of being part of a larger region of the Balkans, the Thrace region can also have the chance to act internationally. Using such opportunities can be vital for the EU evaluations.

It is also obvious that even the optimistic scenario does not avoid Turkey being a laggard in the EU mainly because of the high population. However, the cultural change of the business to be able to foresee the future in the long term is crucial and unavoidable for the development of both regional and national economies. The other conclusion that can be drawn from the above scenario analysis is that the continuation of current RTD spending rates although they might raise the share of RTD spending in GDP will keep Greece as a laggard in EU R&D developments and increase further the regional gaps. Considering that the spending required to reach R&D targets for 2010 is quite significant, the role of policy making will prove vital especially in boosting the private sector to undertake more significant spending considering the broader resource constraints that the Greek government is currently facing with regards to its budget finances.

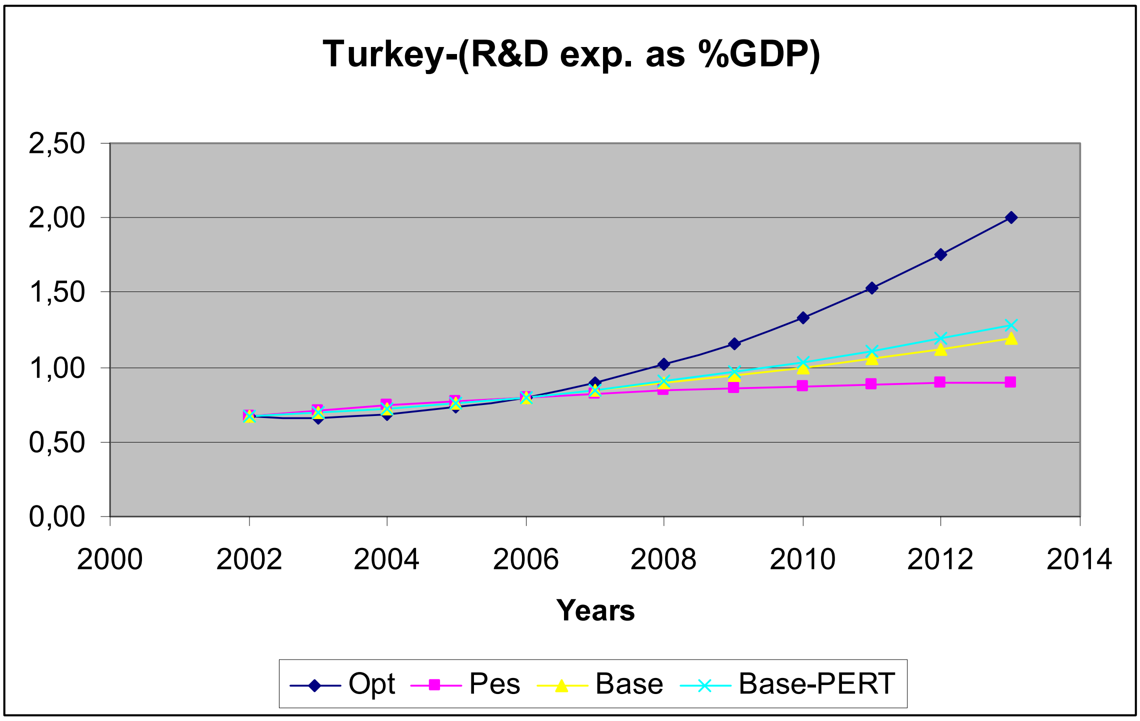


Figure 4.9. Comparison of the three scenarios in Turkey

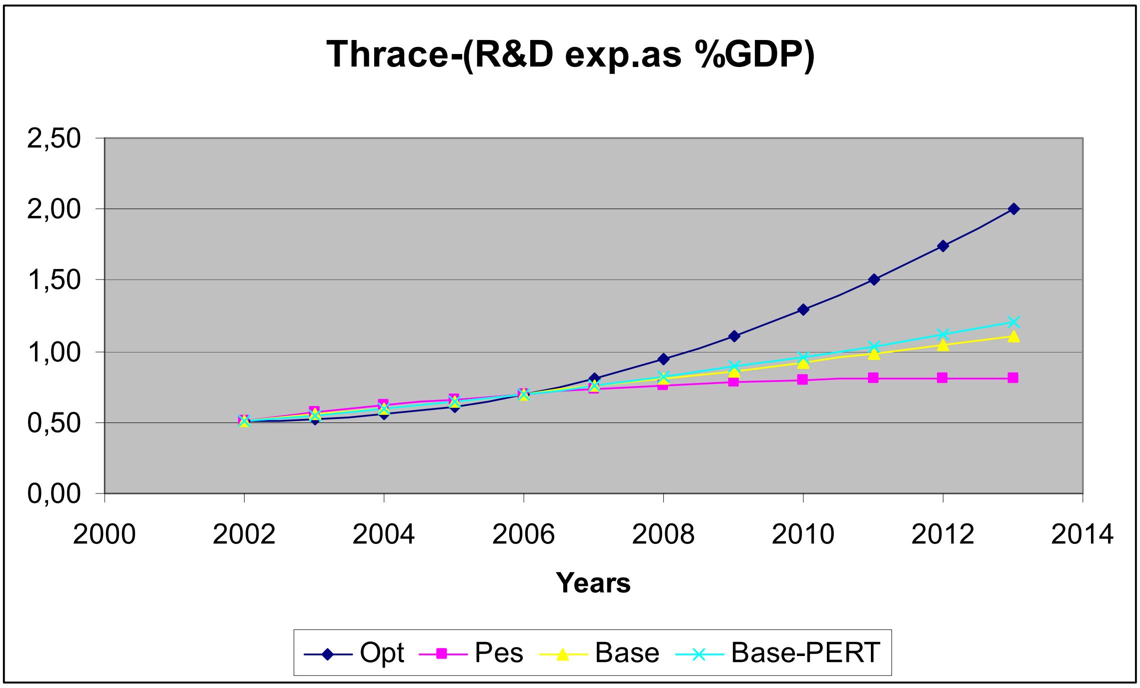


Figure 4.10. Comparison of the three scenarios in the Thrace Region

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4.5 Powerpoint Presentation

SIXTH FRAMEWORK PROGRAMME
REGIONS OF KNOWLEDGE 2

MIRIAD:
Managing and Infusing Research Investment and Development

Project Participants ;

- **University of Sheffield (UK)**.
- **South-East European Research Centre (SEERC)-Thessaloniki.**
- **Istanbul Commerce University- Istanbul**
- **University of National and World Economy- Sofia**.

The Rationale for Miriad

- In the past, R&D investment policies and strategies have focused either on stimulating transfers/spillovers or facilitating knowledge absorption.
- Successful strategy building must take account of both simultaneously.
- It is the aim of this project to integrate both these aspects, so as to remove both the supply and demand-side barriers associated with R&D transfer, absorption, and investment.
- R&D investment is a function of a region's ability to transfer, spillover and absorb knowledge.
- This project will focus on the inter-connectivity of these three factors as a catalyst and stimulator of enhanced R&D investment.

MIRIAD: Aims & Objectives

The objective of this project is to stimulate policy intervention focused on raising levels of R&D investment in four regions across Europe. *Yorkshire in the UK, Thrace in Turkey, Central Macedonia and East Macedonia & Thrace in Greece, and South & East Bulgaria.*

The key aims are:

•To formalise policies with regional and national government aimed at improving levels of R&D investment by businesses, government and higher education.
•To establish tools by which SMEs are able to identify and measure their knowledge assets through developing a range of benchmarking and scorecard instruments.
•To establish a regional mutual learning platform for promoting the trans-national exchange of practices towards enhancing regional R&D investment.
•To facilitate the transfer of good practices in terms of participation to EU funded research, links and co-operation between SMEs and research performers.
•To establish an R&D Investment Strategy for each of the regions that is complementary to the existing policy initiatives and activities already being undertaken.

Miriad Project Aims

- The key aim of the project is to stimulate policy intervention focused on raising levels of R&D investment in four regions across Europe.
- These four regions consist of Yorkshire and the Humber in the UK, the Western Turkish region from Istanbul (inclusive) to the Greece and Bulgarian borders of Turkey, East Macedonia and Thrace (including Thessaloniki) in Greece, and the South Eastern Bulgarian region from Sofia (inclusive) to the border with Greece and Turkey, including also the Bulgarian Black Sea region.
- To formalise policies with regional and national government aimed at improving levels of R&D investment by businesses, government and higher education.

Miriad Project Aims (Continued)

- To establish tools by which SMEs are able to identify and measure their knowledge assets through developing a range of benchmarking and scorecard instruments.
- To establish a regional mutual learning platform for promoting the trans-national exchange of practices for enhancing regional R&D investment.
- Facilitate the transfer of good practices in terms of participation to EU funded research, links and co-operation between SMEs and research performers.
- Establish and launch a R&D Investment Strategy for each of the regions that is complementary to the existing policy initiatives and activities already being undertaken.

Key Tasks: Scoping and Analysis of R&D Performance

- **Identification and Analysis of Key Regional R&D Indicators and Initial Consultation Process -** initial scoping and analysis of the R&D performance of the regions, and an initial consultation process primarily consisting of the stakeholders relating to R&D investment and knowledge transfer. Total of 20 interviews per region consisting of 10 universities and research centres, 5 innovation and technology transfer intermediaries and 5 policymakers.

- **Development of Regional Knowledge-Based Models -** based around a conceptual framework focused on: Knowledge transfer/spillover; Knowledge absorption; and Knowledge investment.

- **Preparation of Regional Knowledge Scorecards -** Develop an underlying framework for the establishment of regional knowledge scorecards. This will consist of the operationalisation of the regional knowledge models in order to produce a regional benchmarking instrument for use by policymakers and policy providers.

Foresight and Scenario Worskshops

- **Preparation of Workshop Materials -** The scorecard and benchmarking tools will provide a focus for engaging regional stakeholders in a series (one per region) of foresight and scenario workshops. The materials gathered will be synthesised in order to establish a number of scenarios (three per region) for the future development of each respective region from the perspective of R&D investment strategies.

- **Facilitation of the Workshops -** The focus of the workshops will be to identify key demand and supply-side priorities for future knowledge-based and R&D-focused policies.

- **Workshop Proceedings -** The results and findings of each workshop will be compiled in individual reports.

Benchmarking Regional Knowledge Demand and Transfer

- **Development of Business Scorecards -** the task will involve the production of a ‘business scorecard’ methodology that seeks to measure the knowledge and intellectual assets SMEs already have and those that they should be demanding.

- **Data Gathering Through SME Interaction -** this task will consist of a range of interactions with SMEs in their respective regions through interviews, consultations and focus group events (with a minimum of 50 SMEs from a range of sectors being surveyed per region).

- **Reporting on Regional Knowledge Demand and Absorption -** A report for each region that identifies the research and knowledge SMEs require, as well as effectively absorbing the research and knowledge they know already exists.

Benchmarking Regional Knowledge Supply and Transfer

- **Data Gathering on Knowledge Supply -** Through a series of structured interviews (the actual number of interviews will depend on, and vary by region according to, the number and range relevant of knowledge supply actors identified by the earlier workpackages, but will consist of a minimum of eight interviews per region) and focus groups/workshops (one per region).
- **Data Gathering on Knowledge Transfer -** Data regarding existing knowledge transfer and barriers to such transfer will also be gathered through these interviews and workshops.
- **Reporting on Regional Knowledge Supply and Transfer -** A report for each region that identifies the knowledge they create and the R&D they currently undertake, as well as existing modes of transfer and barriers hindering such transfer.

Regional Policy Roundtables

- **Facilitation of Regional Policy Roundtables -** The focus of these roundtables will be on how increased knowledge spillovers can be generated through more robust transfer and absorption processes.

- **Key Strategic Regional Intervention Reports -** The reports will produce a framework for the thematic strategic intervention that will provide a bespoke template for each of the respective Regional R&D Investment Strategies.

Trans-National Regional Learning Platform

- **Exchange Visits -** Meeting and exchange visits to each of the participating regions This will consist of one study visit to each of the regions, which will be organised by the partners and the coordinators.

- **Synthesised Documentation -** The development of synthesised documentation, reporting, and scorecard/benchmarking materials.

- **Trans-National Network -** The establishment of a trans-national network of relevant policy actors, which will be catalysed by allowing stakeholders access to an intranet system acting as a clearing house for R&D information and data.

- **Website -** An initial website outlining the scope, objectives, and proposed actions of the project will be established at the outset of the project, but it is at that this point that the materials developed will allow the website to become fully functional, acting as a focal point for exchange and external visibility.

Regional R&D Investment Strategies

- **Establishing the Regional R&D Investment Strategies -** the production of the draft regional R&D investment strategies will consist of a collaboration between the partners and the coordinators, ensuring that the strategies are complementary to the existing activities being undertaken in the region.
- **Ensuring Regional Buy-In: Final Consultation -**The draft investment strategies will be subject to a final round of consultation not only with policy actors, but government research bodies, higher education institutions, indigenous SMEs and foreign investors. This consultation will consist of those relevant actors being sent by post or email a copy of the draft investment plan during month 18 and being given approximately one month to respond with their comments.
- **Launch of the Regional R&D Investment Strategies -** the final stage of the project, along with project reporting, will consist of the official launch of the strategies. Specifically, the official launch will consist of the publication of the strategy, its presentation at a regional workshop (one per region) to an audience of relevant stakeholders, as further dissemination of the report to interested parties via the website.

MIRIAD

Preliminary Issues on R&D

MIRIAD: "Knowledge Infusion in SEE"

Supply of Knowledge: Stock of R&D, Higher Education System, R&D Infrastructure, institutional framework for R&D.

Demand for Knowledge: The corporate sector, comparative advantage and sectoral allocation of economy, Foreign Investment.

Knowledge Diffusion: The Triple-Helix interaction between Research Performers-Corporate Sector-Policy Makers.

Policies for R&D: Creating the critical-mass for R&D, developing domestic skills and competencies, accessing global networks.

Regional Synergies: Cooperation for upgrading the regional R&D potential.

The goal: Accession into the European Knowledge Economy

Thrace-Turkey, the SEE Region and the UK

Thrace-Turkey:
- In terms of socio-economical development Istanbul is the most developed city in Turkey and the Thrace region including Edirne, Kırklareli and Tekirdağ is the fifth in development.
- The region is rich in GDP hence, it is more inclined for innovation
- Advantage: High percentage of university educated people
- Disadvantage: Limited regional data.

The SEE region (Balcans):
- Synthesis for the future (moving towards EU Integration and rising economic interaction)
- SEE synergies: In R&D infrastructure, networks, collaboration, corporate sector M&A
- SEE projects for the region

The UK:
- Transfer of Know-How for policy makers and researchers
- Relevance of UK experience (Institutional structure, Industrial renovation, Education system, R&D Collaboration).

The Thrace Region

The stabilisation of the Economies of SEE since 2001 has been sustainable with growth averaging around 4% and inflation stabilising at single digit figures. The process of economic liberalisation and the transposition of EU law (Aquis Communitaire) is keeping the regional effort towards *European integration* alive.

However, permanent reliance on privatisation and the offer of low wages to attract FDI is neither possible nor desirable. *Domestic capacity needs to be built in order to fully benefit from absorbing the transfer of know-how from abroad and adding further value.*

Hence, macro-economic stability, transposition of European institutions and attraction of FDI are only the *prerequisites for sustained growth…*and enabling economies to face the new challenge: Integration into the new Global Knowledge Economy

The new challenge:
Integrating into the knowledge Economy

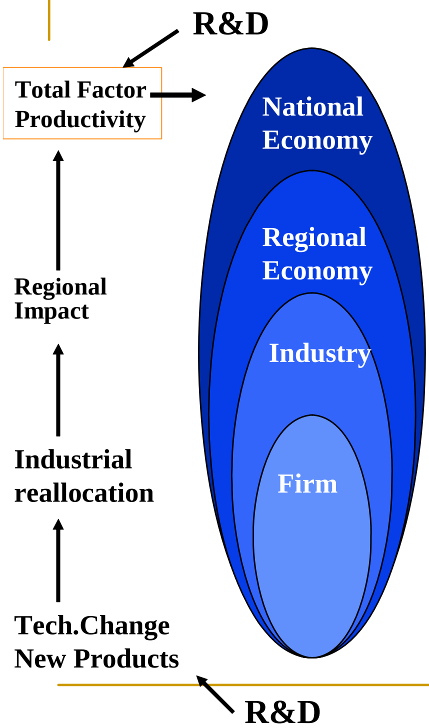
•Knowledge policies are the key for agility, competence and flexibility for the economic competition.

•The new aspect is the creation of networks of excellence amongst institutions-corporations-research performers within a global knowledge economy that relies on continuous product innovation and technological change.

•Competitiveness through co-operative outcomes between business, nations/regions and institutions is the EU innovation policy.

•Sustainable growth not simply an issue of sufficient financial resources but being able to offer the competence and technological infrastructure to gain membership into such networks .

The Economic Impact of R&D



- ❑Holonic effect national economy on the firm.
- ❑In the long-run, causality reverses. Technological innovation at firm level affects the industry and the overall economy.
- ❑The role of R&D in this process is vital as it affects economy-wide productivity.
- ❑R&D can impact economic performance at different levels.
- ❑The ability to diffuse the gains from R&D through-out the economy is the key policy issue.

The Economy and R&D

<u>Variables affecting R&D activity</u>

Economy/National level:
•Macroeconomic & Institutional outlook ⟶ Business Environment
•R&D Stock (Scientists, R&D organisations, R&D Investment, R&D institutional structure/organisation)

Regional Level
•Comparative position of region in economic, institutional and R&D characteristics
•Locational issues, Clustering, regional knowledge systems

Industry Level
•Type of Sector: Knowledge Intensive, traditional
•Cross-sectoral links and international exposure

Firm Level
•Market type: Firm type/size, FDI-MNCs, unofficial economy
•R&D Capabilities: In-house, network co-op., R&D capacity utilisation

R&D is an economic function that has strong multiplier effects on the economy through its effect on all other economic sectors by raising the combined productivity of labour and capital. The intensity and speed of the process depends on the ability to diffuse knowledge.

<u>Diffusion: Flow of knowledge within and across levels</u>

The R&D Function

R&D Performers/HEIs
Govt.R&D Orgs
Policy Makers
National Level

Innovation can occur at any level but needs to be diffused through-out the R&D chain

R&D Performers
Chambers, Reg.R&D orgs
Regional Level

Industrial Assocs
Specialised Research
Industry Level

Institutional
Collaboration
Market type
Infrastructure
Resources

R&D
Corporate Level

Supply R&D (Transfer)

Resources/Institutions (HEIs, Research Centres, R&D orgs.) collaboration, R&D stock, policy

Demand R&D (Absorption)

R&D capabilities, R&D stock, sector type, market type, business Environment, policy

Flow of Know-How

Reputation, trust, time, R&D activity, R&D stock, costs, socio-cultural, policy, collaboration-networks, access/info, mobility of scientists and capital

R&D Policy Objectives

Innovative Policies: Vision, networks, understanding (drivers-forces), use of Policy Instruments and Public R&D agents---MIRIAD contribution

Innovative Environment: Public Procurement, admin./trans. costs, infrastructure (spending in ICT-R&D), institutions/policies

Innovative Enterprises: infrastructure for technology, entry&VC-incentives, finance, capabilities (in-house, co-op, utilisation)

Innovative Sectors: Hi-tech (computer-instruments, aerospace, electronics, chemicals, pharmaceuticals, biotech etc) (national goals)

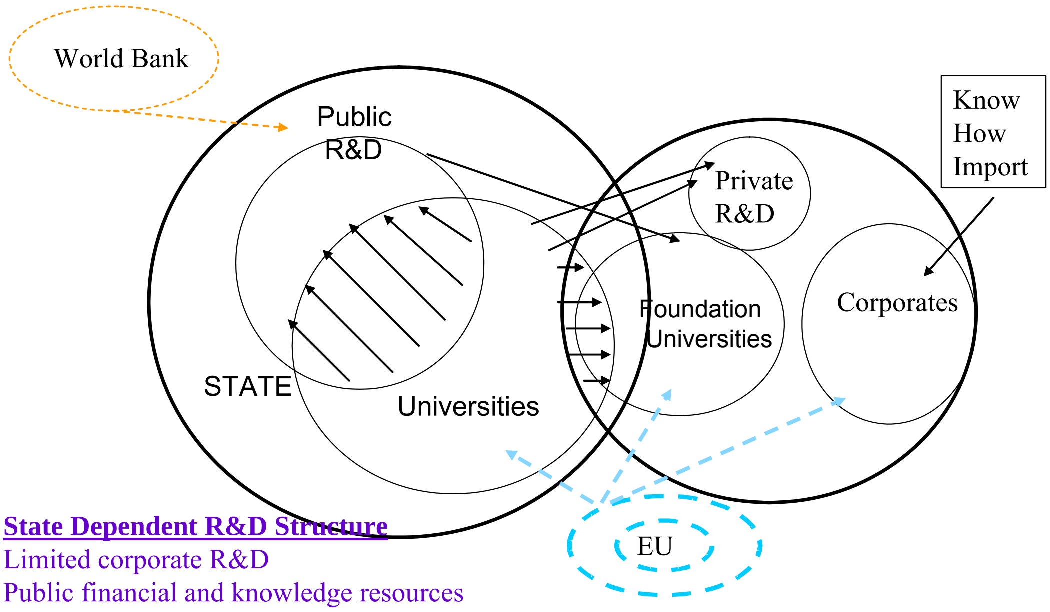
Transfer of Know-How: infrastructure (HC, ICTspending, Web), incentives (tax/Subs, synergy), clustering, collaboration (firms-R&D actors)

Entry to innovation: Diffusion, Commercialisation (IPR,Patents)

Measuring the impact of R&D strategies: Diffusion, synergies

Assessing the Barriers: Collaboration & Incentives(Synergies v Crowding-out), structural, institutional.

R&D Typology in Turkey



State Dependent R&D Structure
Limited corporate R&D
Public financial and knowledge resources
Small transfer-diffusion activity
Missing institutional links & coordination

Barriers to R&D Diffusion

•Globally there appears to be an abundant supply of R&D personnel. Recent studies have shown that in developing economies only 13% of available young professional are suitable for employment at multinational company level compared to 75% for the advanced economies. Hence the *reform of the higher education system* is the priority issue.

Other key barriers include:
•The *structure of the economy* concentrated in low technology sectors dominated by small firms and overwhelming reliance on imported technology
•Fragmented *institutional framework* for R&D
•State dependendent and risk averse business culture
•Very Difficult access to *finance*

Policy Issues for R&D

•Developing the ***Critical-Mass for R&D*** with the efficient use of financial resources, infrastructure, human capital, external links.
•Cooperation between ***Research/HEIs-Businesses-Policy Makers*** to develop the suitable human skills and core competencies
•Blending domestic ***comparative advantage with the right sectoral focus*** e.g. New technologies like nano and bio-sciences or full ***reliance on market forces.***

The international experience: Many small open economies have attempted this forward leap successfully:
•Ireland: from high unemployment and immigration to record FDI attraction and export-led growth.
•Asian Tigers: fast recovery from the 1990s crisis utilising their small size next to the large Chinese market.
•Chile: becoming an R&D hub in Latin America through public-private cooperation.
•Finland: developing domestic R&D capacity geared to exports.

Overall Economy in Turkey

Impressive progress after 2001:
Average growth at 7.4%, 2.5 % over EU25
GDPpc is back to 3,044 $ level
Inflation is 8.83%
Business investment grew by 60.3% and capacity utilisation found 81.3 %
Booming foreign direct investment up to 8.4 billion $
Negative aspects:
•High Unemployment (11.9%)
•low employment rate (46.75% work-age pop.)
•High interest debts and bad foreign trade balance of 63.2%
•Limited spending on R&D by both public&private sectors 0.66 % of GDP
•Total exportation is even below Romania

Global rankings: competitiveness 14 th in 25 and innovation 33 in 33.

Performance Benchmark: Romania and EU25

	2002			2003			2004		
	TR	RO	EU25	TR	RO	EU25	TR	RO	EU25
INPUT									
Innovation Drivers									
New S&E Graduates (‰ of 20-29 age		5.80	11.37	5.20	9.40	12.21			
Population w ith tertiary ed	9.10	9.80	20.42	9.70	9.60	21.33		10.60	22.08
Broadband penetration rate (% of population) (MT)							0.30	3.50	6.50
Participation in life-long le	0.90	1.10	7.86	1.20	1.30	9.29	1.30	1.60	10.00
Youth education attainme	42.80	75.30	76.84	44.90	73.80	76.88	41.80	74.80	76.33
Know ledge Creation									
Public R&D Expenditure (%	0.47	0.15	0.68		0.17	0.68			
Business R&D Expenditur	0.19	0.23	1.28		0.23	1.28			
Business Financed Unive	22.00	5.60	6.59		8.50				
Innovation & Entrepreneurship									
ICT expenditures (% GDP	4.10			3.20				1.50	6.25
OUTPUT									
Application									
Employment in High-Tech	1.05	1.57	3.27	1.04	1.45	3.22			
Exports of High-Tech pro	1.60	3.10	18.24	1.80	3.30	17.37			
Med-hi/high-tech manufac	9.10	5.50	6.88	9.15	5.32	6.57			
OUTCOME									
Human Capital									
Shareholder Education Level (primary)		0.62	0.43		0.61	0.41		0.55	0.41

Turkey: R&D Outlook

R&D/Innovation outlook

Scores negatively in 13 out of 15 international indicators.
Strongest in: Public R&D
Weakest in: Hi-Tech employment and production, lifelong learning, new products, patents.

According to EU Innovation reports:
- There is a technology averse culture
- University business collaboration is not established
- R&D not yet a national policy priority

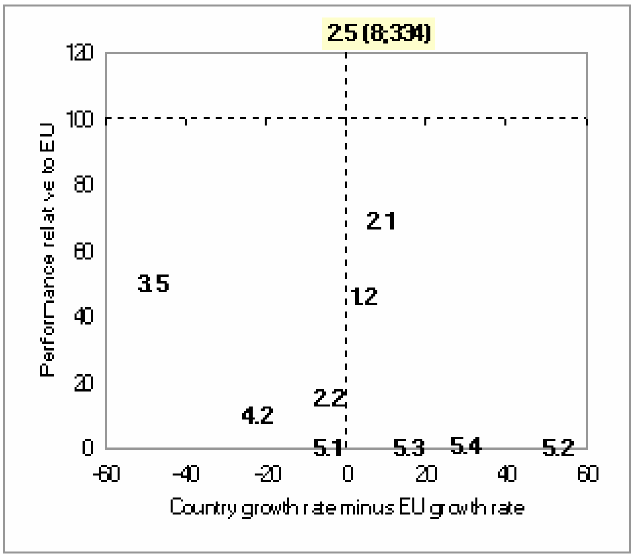
Targets:
R&D spending at 0,66% of GDP and targeted to reach 2% of GDP by 2013. The private sector accounts for 30.6% of spending and targeted to reach 59.97% by 2013, Research funds by Tubitak are increased by 30 % in 2006.
Although catching-up in some areas, the overall rate of improvement is below the speed of competitors.

R&D Indicators for Turkey

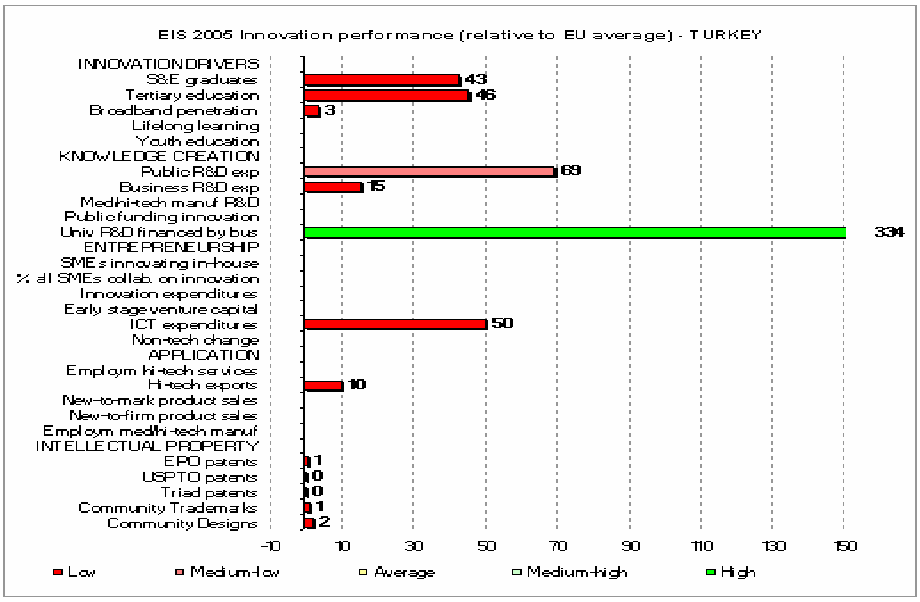
1.1 S&E graduates
1.2 Tertiary education
1.3 Lifelong learning
1.4 Employment medium/high-tech manufacturing
1.5 Employment high-tech services

2.1 Public R&D
2.2 Business R&D
2.3.1 EPO hi-tech patents
2.3.2 USPTO hi-tech patents
2.4.1 EPO patents
2.4.2 USPTO patents

4.5 ICT expenditures
4.6 Value-added high-tech manufacturing



R&D Indicators for Turkey



Turkey: R&D Policy Priorities

Major actors: Supreme Council for Science and Technology, chaired by the Prime Minister; HEC; KOSGEB
Policy Pillars: 1.Research policy and 2. incentives for private investment.

The Objectives:
•Raise demand for new knowledge (modernise traditional sectors, develop new knowledge intensive sectors)
•Reorganise research framework and integrate with intl. networks
•Develop R&D infrastructure (emphasis on ICT)
•Sector priorities and clusters to be determined e*learning, e*business.

Impact of policies:
•Limited and slow moving
•R&D diffusion is considered still slow.
•NII is expected to be fusing the business sector.

Barriers to R&D

•**Education system**: Driven towards the international scientific activities, away from the national economic activities with finance problems in state universities and education resource problems in the foundation universities.

•**Training**: Weak in Entrepreneurship, Lifelong, Technological

•**Cultural/behavioural**: technology averse, risk averse, limited understanding of knowledge based trends

•**Institutional**: (a) Poor policy coordination (between Ministries of Education and Development). (b) Lack of innovative policies at sectoral and regional levels.

Other factors to consider: Corporate characteristics, economic structure, R&D incentives system, R&D networks.

MIRIAD

Regional R&D Performance
Thrace (TURKEY)

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

Competitiveness SWOT

Strengths	Growth in GDP is developed faster than the country average. Reducing increase of population and fast increase in education level are ahead of the country averages.
Weaknesses	Slow on restructuring 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 in textile industry.

R&D Expenditure 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

R&D Investment SWOT

Strengths	Strong higher education sector, with a core of world-class research establishments. The number and strength of Foundation Universities in the region triggers the business.
Weaknesses	A clear lack of R&D investment by the business sector, which has just started.
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.

R&D Supply

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

R&D Supply: Outlook and Policies

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.

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 the education.
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 coorperation with the large industry and big foundation universities

R&D Demand

Indicator	THRACE	TURKEY	EU-25 Average
Proportion of Innovative SME (2004, %)	11.4	30.24	25
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 % o 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

R&D Demand Outlook

Strengths	Although, knowledge absorption capacity is higher than the national average.There are high numbers of innovation centers 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 Organizations 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.

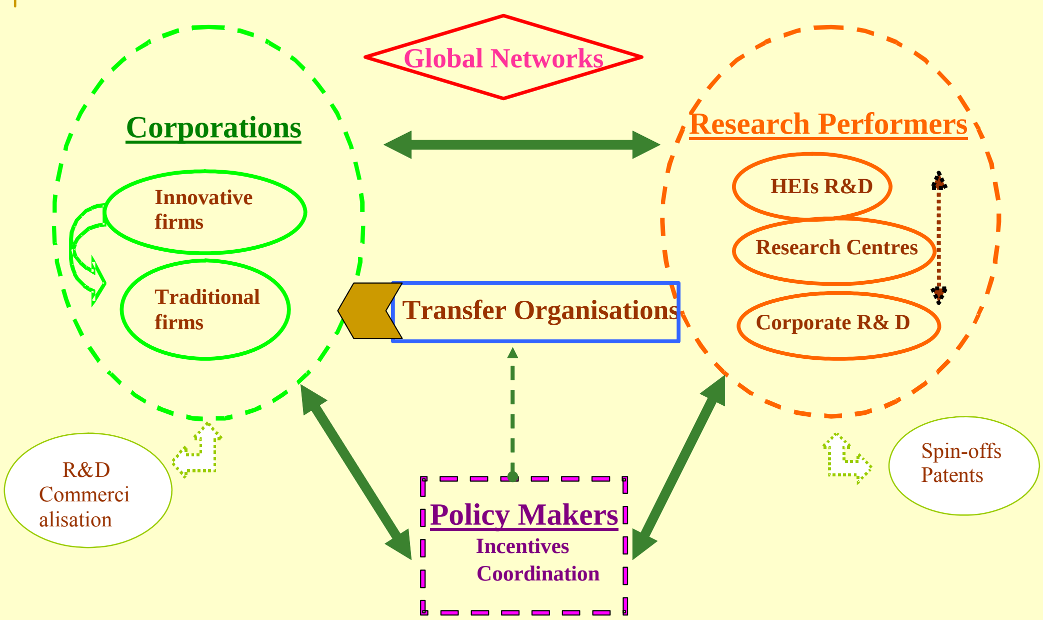
R&D Demand Policies

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.

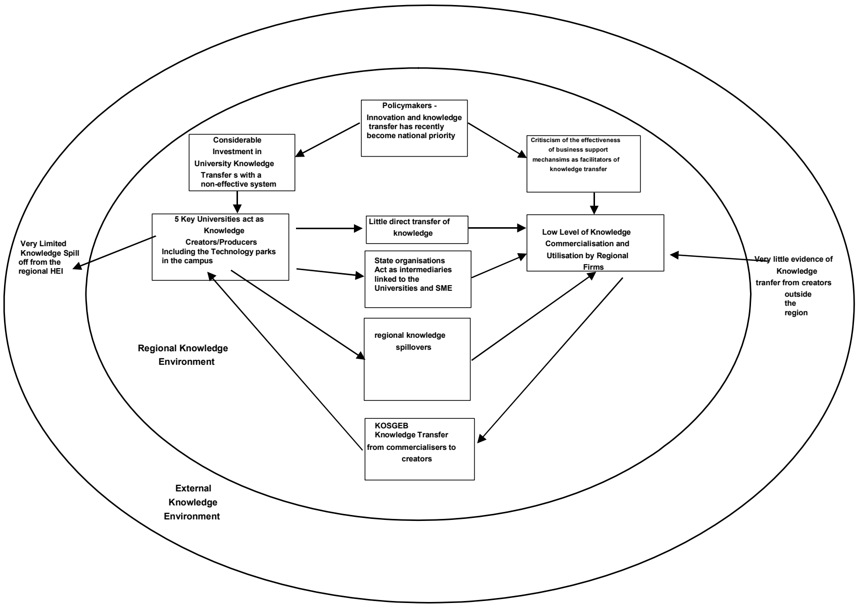
Research Grants Utilised

	Realised by August 2005 (1,000,000 €)	Expected realisation by December 2005 (1,000,000 €)
Academic research projects	20.6	52.3
Industrial research projects	19.1	68.3
TUBITAK projects	28.6	41.17
Public organisations	6.69	29.4
Defence and space programs	0.87	29.4
Scientist training and development programs	2.35	14.7
Science dissemination programs	0.197	8.82
SPO based mining and environment projects	17.65	17.65
TOTAL	**96.057**	**261.74**

A Knowledge-Flow R&D Model



Thrace Knowledge Flow Model



Regional Knowledge Model

•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.

Regional Knowledge Model

•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.

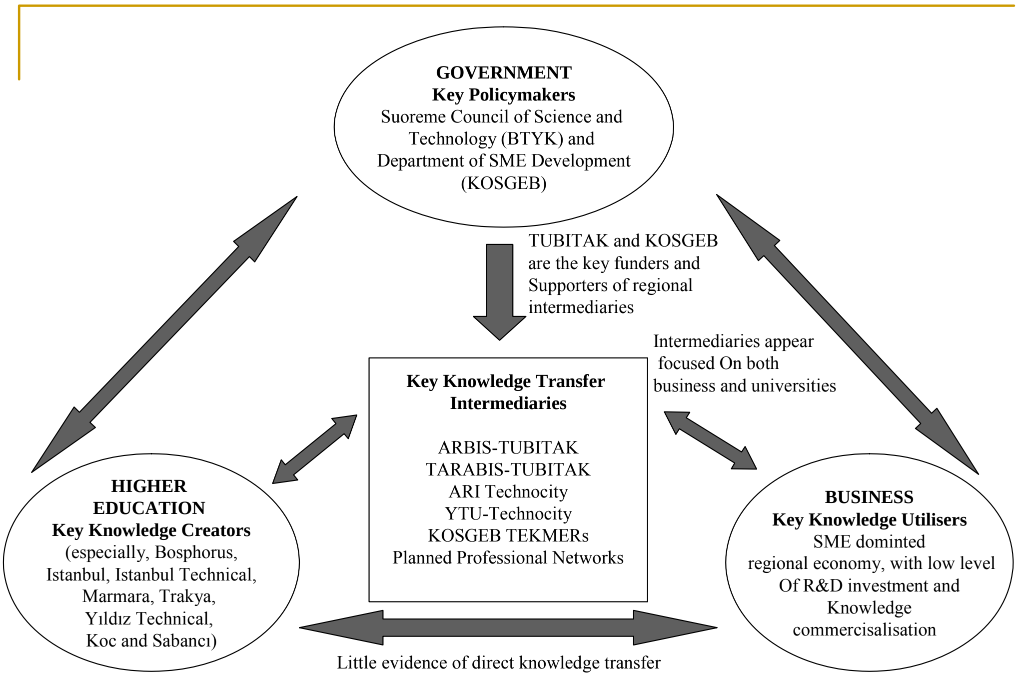
•The effectiveness of knowledge transfer from the universities is criticised mainly because of the gaps in HE system.

•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.

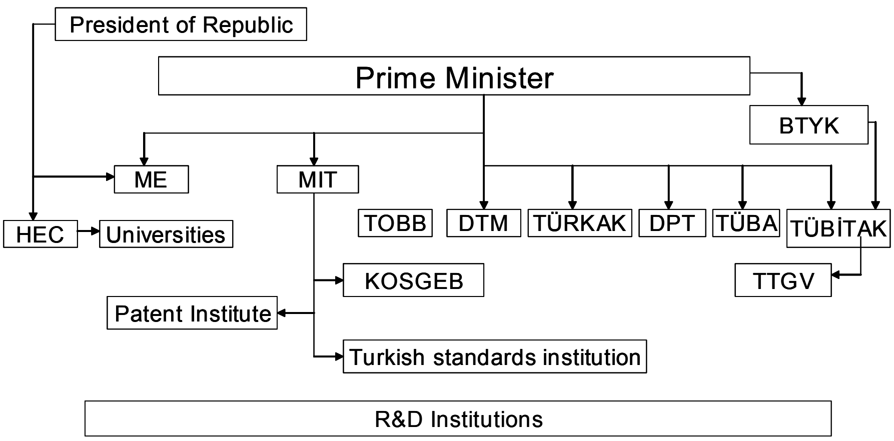
•KOSGEB seems to be the only facilitator for knowledge transfer from potential beneficiaries to knowledge creators in the region.

•There is little evidence of regional knowledge spillovers



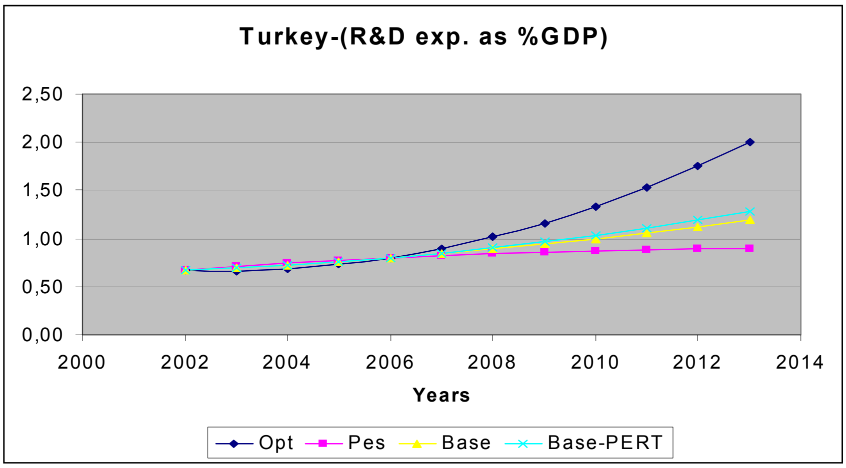
Triple Helix Interaction

➢<u>Government</u> – 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.
➢<u>Business</u> – SME dominated regional economy with low levels of R&D investment and knowledge commercialisation.
➢<u>Higher Education</u> – The largest-scale knowledge creation in Turkey is actually realised by a number of regional universities.
➢<u>Government-Higher Education Interface</u> – The key liaison between higher education and government are through HEC and TUBITAK. There exists no regional authority.
➢<u>Higher Education-Business Interaction</u> – 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.
➢<u>Government-Business Interaction</u> – The business community had good connections with the Government, influencing the economic policies until recently. The SMEs have always had good relations with KOSGEB.

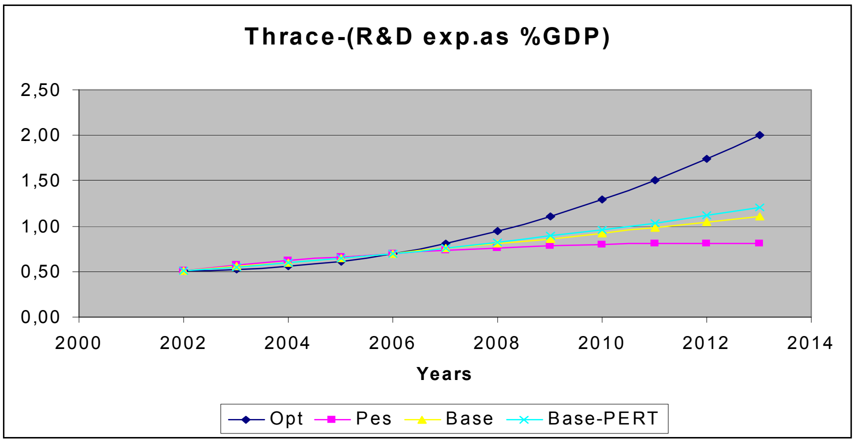


BTYK- Supreme Council of Science Technology
MIT- Minister of Industry and Trade
ME- Ministry of Education
TÜBİTAK- The Scientific and Technical Research Council of Turkey
HEC- Higher Education Council (YÖK)
TÜBA- The Turkish Academy of Sciences
DTP- State Planning Organization
KOSGEB- Small and Medium Sized Industry and Development Organizations
TTGV- Technology Development Foundaditon of Turkey
DTM- Foreign Trade and the Treasury
TOBB- Union of Chambers and Commodity Exchange of Turkey
TÜRKAK- Accreditation Board

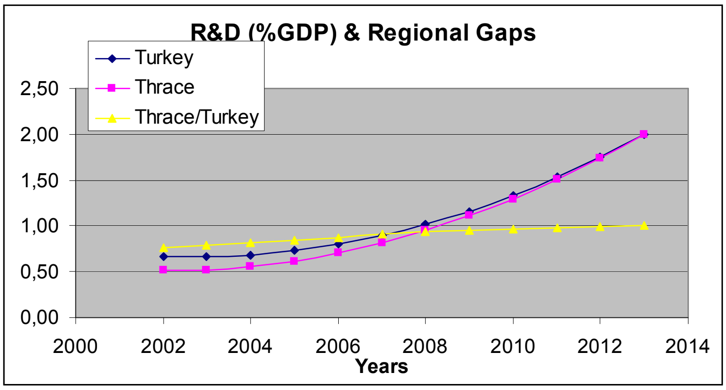
Scenarios for R&D Strategy Planning



Scenarios for R&D Strategy Planning

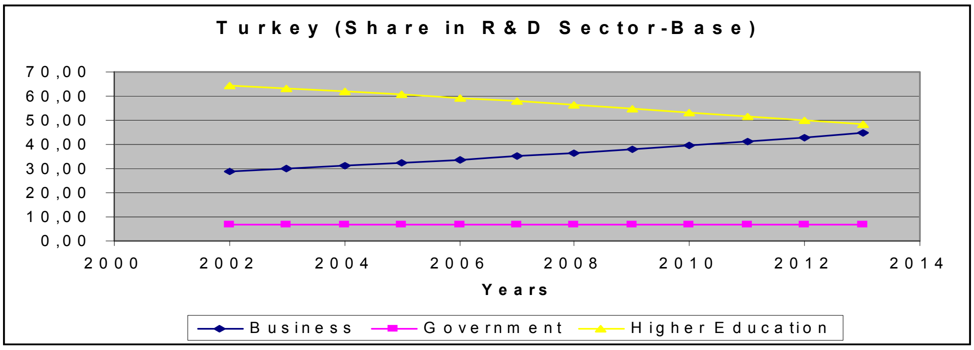


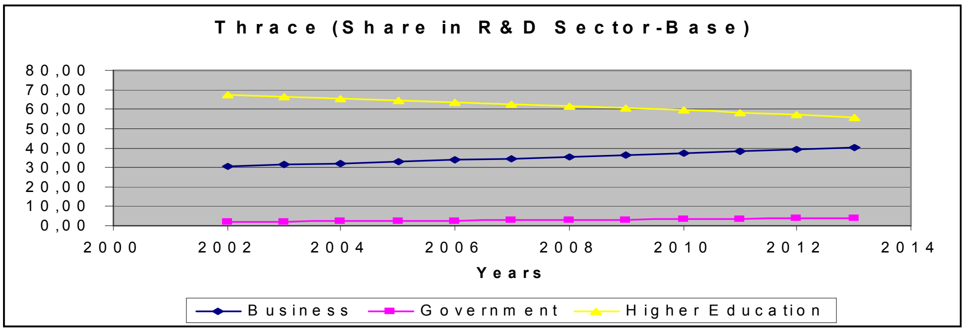
Optimistic Scenario



Optimistic Scenario: Reaching the 2013 targets

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
RTD(% GDP)												
Turkey	0.67	0.66	0.68	0.73	0.80	0.90	1.02	1.16	1.33	1.53	1.75	2.00
Thrace	0.51	0.52	0.55	0.62	0.70	0.81	0.95	1.11	1.29	1.51	1.74	2.00
Thrace/ Turkey	0.76	0.78	0.81	0.84	0.88	0.91	0.93	0.95	0.97	0.98	1.00	1.00
RTD shares by sector												
Turkey												
Corp. Sector	28.70	30.69	32.82	35.09	37.52	40.12	42.90	45.87	49.05	52.45	56.09	59.97
Govt. Sector	7.00	6.79	6.58	6.39	6.19	6.01	5.83	5.65	5.48	5.31	5.15	5.00
Higher Educ.	64.30	62.52	60.60	58.52	56.29	53.87	51.27	48.48	45.47	42.23	38.76	35.03
Thrace												
Corp. Sector	30.60	32.43	34.37	36.43	38.61	40.92	43.36	45.96	48.71	51.62	54.71	57.98
Govt. Sector	2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02
Higher Educ.	67.38	65.55	63.61	61.55	59.37	57.06	54.62	52.02	49.27	46.36	43.27	40.00





Scenario Strategy Planning Implications

•Turkey requires an exponential increase in RTD investment rates, in order to reach its 2013 targets even then, it is behind EU25.
•Reforms in the higher education system and the government fund utilisation are absolute needs to activate the triple Helix.
•The role of the corporate sector is extremely critical, where SME play an important role. Collaboration of business and universities to change the SME culture.
• Region's role in the national development should be determined and diffused in the region. Accordingly, the strengths of the region will be used and fund allocation can be realised accordingly.
•The need to achieve agglomeration and critical-mass for RTD will likely play a crucial role.
•The Thrace region is capable of playing a leading role in whole Thrace, this can be clarified and used for creating synergy.
• There is more need for EU support for increasing the R&D investments and not using the limited government budget for the military expenses.

Policy Issues To be Clarified

- Regional viability for RTD.
- Industrial priorities for the fund allocation might call for a more focused RTD strategy.
- The role of supply-chains in driving RTD strategy
- Policy makers, taking the initiative and developing networks
- Targeted allocation of financial resources.
- Building synergies between knowledge creators and knowledge beneficiaries.
- Reforming the Higher Education System.
- Upgrading the level of entrepreneurship.
- Cultivating the knowledge based culture amongst economic actors.

CHAPTER 5
FUTURE SCENARIOS FOR SOUTH EAST BULGARIA

5.1 Introduction

This report presents three possible scenarios for the future R&D and knowledge creation and transfer developments in South-East Bulgaria. In addition it provides some comments about the influence these specific developments may have on the local economy. The three scenarios include: a) a "base case" whereby the region follows the current trends in GDP and R&D activities; b) a moderate optimistic scenarios, whereby the region goes on with slightly higher trends and c) an optimistic scenario, where the region experiences a large improvement of the current developments.

The report is organized as follows: section 2 provides a brief review of the present economic situation in the region as a whole and in each of the four planning regions it consists of.[1] The analysis here is based on several key indicators such as GDP per capita, labour productivity, R&D expenditures, employment in medium- and high-tech manufactories and labour force qualifications. This section summarizes also core policy documents and actions aimed at promoting R&D investments and innovations and it describes in brief the key actors in knowledge creation and transfer. Section 3 sets out three scenarios for the future R&D and knowledge creation and transfer developments in South-East Bulgaria and their impact on the economic performance of the region.

5.2 Setting the Scene. Outline of the South-East Bulgaria

South-East Bulgaria, 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% (two-thirds) of Bulgarian territory and is home of 88% of the population. Currently, most of the statistical information in Bulgaria is provided at the level of six planning regions. Therefore, in the present report analysis draws on regional data at the level of six planning regions and further aggregation has been made to draw a picture of the MIRIAD region (South-East Bulgaria) as a whole.

In 2003 the South-East Bulgaria accounts for 81.5% of the country's GDP level. Within the region significant inter-regional disparities in economic development are still observed. South Western planning region occupies produces 46.7% of the region's GDP and 38.1% of the country's GDP. On the opposite site within the region is the South Eastern planning region, giving only 11.2% and 9.1% of the region's and the country's GDP respectively. 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. In 2004 in South - Western region GDP per capita is 1.4 times higher than the national level while in South Central region it amounts to 81% of the national level. The economic restructuring in the regions is still going on and the structure of gross value added by planning regions is characterised by controversial trends. The service sector has a dominant share in the gross value added in the all four planning regions but industry in the Northeastern planning region lags far behind the rest of the regions.

[1] As has been noted in the reports of the previous working packages, the most of the statistical information in Bulgaria is provided at the level of planning regions. Therefore, analysis in the presented reports draws on regional data at the level of four planning regions.

As regards to the competitiveness South-East Bulgaria lags far behind that of the EU. Bulgarian GDP per capita in PPP is almost 3.4 times lower than for the EU as a whole. A key issue for the future competitiveness of the region is to address the relatively low levels of labour productivity, reaching in 2004 only 31.9% of the EU-25 level. The labour productivity does not vary considerably by planning regions – still South Eastern and South Western region report the highest and South Central region the lowest levels of productivity in 2003. Labour productivity is largely determined by industrial structure, especially its knowledge intensity, and the effectiveness of human capital deployment.

The above results indicate that improvement of regions' competitiveness becomes the main challenge for both national and local policymakers. Incapability of a large part of enterprises (especially SMEs) to meet the European standards and external competition in the 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 absorbing EU funds, insufficient level of co-financing, other negative external economic shocks are among the most important obstacles to the improvement of labour productivity and economic competitiveness.

Nowadays knowledge is well recognized as a key ingredient underlying the competitiveness of regions, states, sectors and individual firms. Innovation performance, the development of new markets, expansion of existing markets and increasing levels of productivity are central to the development of Europe's economy. Being EU accession country and joining the EU at the beginning of 2007 Bulgaria is facing the main challenge to ensure sustainable economic growth through discovering new sources of competitive advantages based on investment in new technologies, enhancement of innovation capacity and increase in total factor productivity.

Table 5.1: Regional R&D and Innovation Performance in Bulgaria in 2003

Region	R&D expenditure by regions in%	Share of R&D in local GDP in %	Number of R&D personnel and researchers
North-West	0.2	0.02	91
North Central	4.4	0.17	1101
North-East	6.6	0.23	1578
South-East	2.0	0.11	504
South Central	7.1	0.18	1718
South-West	79.7	1.05	12408
National level	100.0	0.5	17400

Notes: 1. The shaded regions are those included in the MIRIAD region (South-East Bulgaria).
Source: National Statistical Institute

Table 5.1 summarises the key *R&D investment* indicators for Bulgaria by planning regions. South-East Bulgaria covers 95.4% of the total R&D expenditure in the country and 93% of R&D personnel. South West sub-region that includes Sofia alone accounts for almost 80% of the total R&D expenditure in the country. In concentrates more than 80% of the R&D personnel and researchers. Statistical data clearly display the main characteristic of the

Bulgarian innovation system - its high centralisation and concentration of resources and activities in the capital. In such a situation development of successful regional policy without taking into account the national one is not effective. In terms of share of *R&D investment* in GDP South-East Bulgaria and the country as a whole lags behind the EU averages - 0.5% compared to 1.92% in EU-25 in 2003.

Figure 5.1

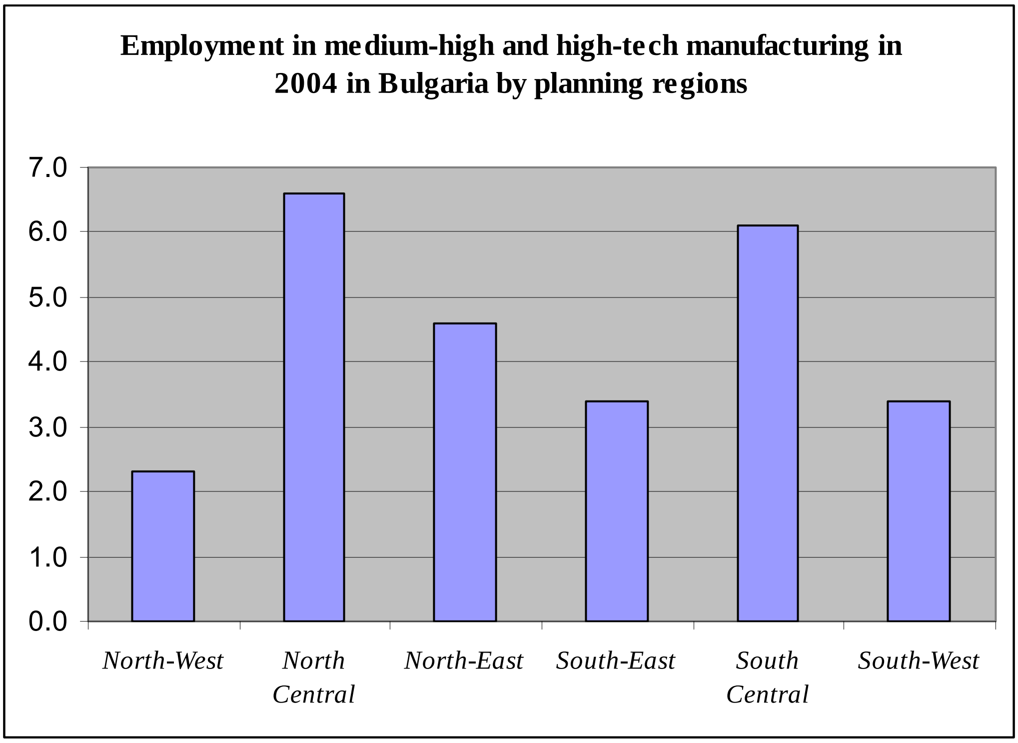
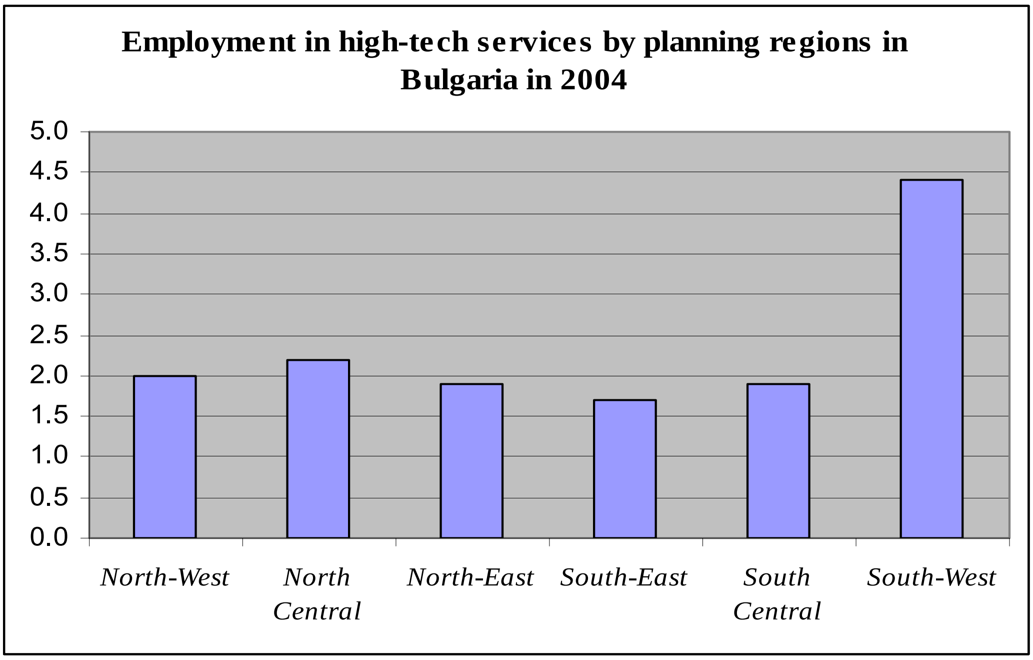


Figure 5.2



At a regional level, the best available indicators for *knowledge demand and absorption* refer to industrial structure and the human capital capacity of the existing workforce. As shown by

Figure 5.1 and Figure 5.2, the major part of the medium and high tech manufacturing in the country is located in South-Eastern Bulgaria although with significant variation across sub-regions.

The share of persons with tertiary education ranges from 16.5% in South Central region to 31.1% in South Western region whereas the average national level is 21.7% (see Table 5.2). The leading position in the live-long learning is again for the South Western region, where the indicator's level of 25.3% is far above other regions and country as a whole. On the opposite site out of all Bulgarian planning regions and out of MIRIAD covered four planning regions are the North West region and South Central region, where live-long learning reaches only 16.5% and 17.3% correspondingly. In sum, South-East Bulgaria has a high human capital potential for investment in ICT technologies and innovation businesses.

Table 5.2: Population with tertiary education and live-long learning

Region	Population with tertiary education	Live-long learning
North-West	17.5	16.5
North Central	21.0	18.5
North East	18.2	18.2
South East	17.8	18.9
South Central	16.5	17.3
South West	31.1	25.3
National level	21.7	19.9

Notes: 1. The shaded regions are those included in the MIRIAD region.
Source: National Statistical Institute

There are special *policies* both at the regional and the national level, aiming to improve R&D and innovation performance of the region. The base policy documents are:

- **National Innovation Strategy** (2004) - The essential objectives of the innovation strategy 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) - Its 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 favorable climate for keep Bulgarian graduates in science and technology in Bulgaria.

- **Regional Innovation Strategies –** They are elaborated at the level of 6 planning regions. This means that within South-Eastern Bulgaria there are will be 4 such strategies. Currently only one of them – for South Central Region is developed. The otherse in process of elaboration. The South Central Regional Innovation Strategy

(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.

Within South-Eastern Bulgaria there is also a plethora of intermediaries with some form of responsibility for *knowledge transfer and flow*. 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. The *key intermediaries* in the knowledge transfer process within the region are:

- **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.

- **Bulgarian Chamber of Commerce and Industry (BCCI) -** 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)** - It 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) -** It 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).

Except for the above organizations, there are also other important intermediries, acting mainly at national level. These are:

- **Innovation Relay Centre IRC – Bulgaria -** IRC was established in January 1997 as a focal point of the brokerage with regard to the demand and supply of new technologies and know-how. It offers a wide range of consultancy services to the industrial companies and research organizations and serves in all industrial sectors in Bulgaria. IRC customizes the European polices, best practices and standards in the field of innovation and technology development in conformity with the Bulgarian environment.

- **Applied Research and Communication Fund (ARC Fund) -** ARC fund, established in 1991, is a non-government organization (NGO) whose activities are aimed at advancing the development of the modern knowledge-based society. It takes active part in the shaping policies and developments towards information society and knowledge economy in the national and international contexts.

- **Bulgarian International Business Association (BIBA) –** It was founded in 1992 by the most prominent companies in Bulgaria. The main mission is to promote BIBA member's common interests and relevant principles in an effort to achieve international standards and business practices. In this way BIBA influences the business climate in Bulgaria and leads to an improvement of member company's competitiveness and national competitiveness.

- **Employers Association of Bulgaria (EABG) -** EABG is the umbrella organization of the major Bulgarian private companies. The members of the EABG are more than 90 branch organizations, holding groups and individual companies. The Association represents the interests of its members, provides services for the member companies and acts as a speaker for them in their external relations.

- **Euro Info Centre Bulgaria (EIC BG) -** EIC BG offers a wide range of business services to SME's such as information, advisory and assistance for: starting up new companies, improving the business of an existing company; identifying the right partners for establishing joint venture and cooperative productions; identifying the finance resources, supporting potential investors; providing consultations and organizing seminars and trainings for SME's with own, national and foreign consultants and etc.

5.3 Scenarios

Scenario 1 – Continuing the current trend

This scenario is based on R&D levels and GDP in South-East Bulgaria continuing at the current levels of annual growth between 1998 and 2003. We calculated the average growth in real terms first deflating GDP and R&D expenditure[2]. It turned out that during the period 1998 -2003 real R&D expenditures in South-East Bulgaria declined by 4.4% per annum while real GDP increased by 4.8%. The scenario obtained assuming that both trends will remain in the next 10 years appears to be very pessimistic. R&D as a percentage of GDP in real terms in South-East Bulgaria will decrease from 0.5% to 0.17% of GDP over the next 10 years[3]. Dynamics of the R&D expenditure as share of GDP for the period 2004-2014 is illustrated by Figure 5.3. Following this scenario the level of R&D expenditure as share of GDP in Bulgaria will result in further lagging far behind the EU-25 average and the Lisbon target of 3% till 2010. Such developments will clearly have disastrous effect on the regional competitiveness.
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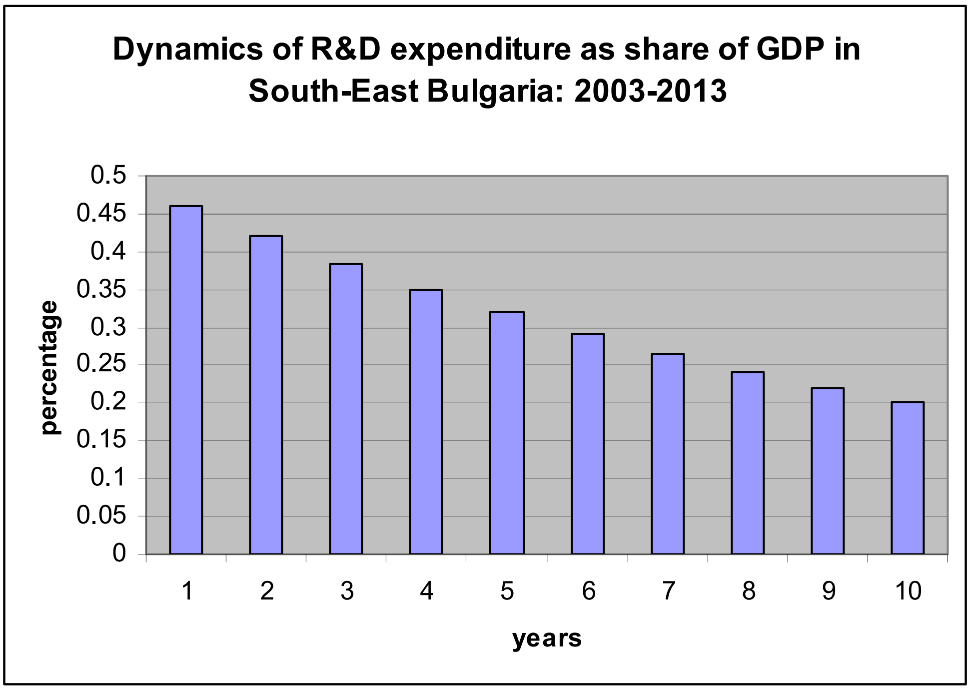
[2] We use a common deflator for all 6 planning regions since currently regional deflators are not calculated by official statistics in Bulgaria.
[3] The forecasts based on nominal variables were also computed. In this case the share of R&D expenditure in GDP would decline from 0.5% in 2003 to 0.3% in 2013.

This scenario assumes that there is very little in the way of incentives for firms within the region to undertake R&D and no change in the budget spending on R&D activities. In addition it is highly unlikely that under such circumstances the region will be able to maintain the assumed annual GDP growth of 6.6%. Dominance of low technology sectors would deter potential FDI, especially from new technology high added value sectors which demand highly skilled labour. It has to be noted however that the observed trend is due to a great extent on the high disparities among the sub-regions that South-East Bulgaria consists of.

Figure 5.3: Scenario 1 – Continuing the current trend



The wider implications of this scenario are summarised as follows:

- South-East Bulgaria will find itself stuck in a low skill equilibrium dominated by low skilled, low paid jobs and low value added, and low technology industries. As a result, there will be further restrictions on the growth of long-term economic potential of the region and on the future improvement of population living standards.
- Increased divergence from the more prosperous core regions of Europe and continuation of the economic decline initiated by the close-down of large enterprises – off-springs of socialism during transition to a market economy.
- The lack of incentives for SMEs to invest in ICT technologies and adopting new technologies;
- The deterioration of the currently highly-qualified research staff and further restriction of innovation activities within the bounds of development stage without clear connections with the real business.

- The lack of opportunity for highly skilled jobs in high technology sectors and lack of perspective for career development in state-owned scientific institutes and universities will result in further brain-drain of the region and country as a whole.

- The lack of skills and dominance of low technology sectors would deter potential FDI, especially from new technology high added value sectors which demand highly skilled labour, as well as a supply chain to provide the necessary inputs.

- Insufficient R&D funding may mismatch the activities and interrelations between key R&D actors and may hamper the new forms of economic co-operation (for example regional clusters);

- Continuing the current trends would not ensure the remarkable improvement of innovation culture among national and regional administration and would not to get over the lack of co-ordination among institutions and policies on R&D;

- Retaining the more intensive development for South West sub-region (that is currently in line with the most of the EU-countries) will result in further increase in the intra-regional disparities. The scenario implies that the capital will continue attracting highly-qualified labour force from the other regions and thus, the concentration of R&D resources will increase.

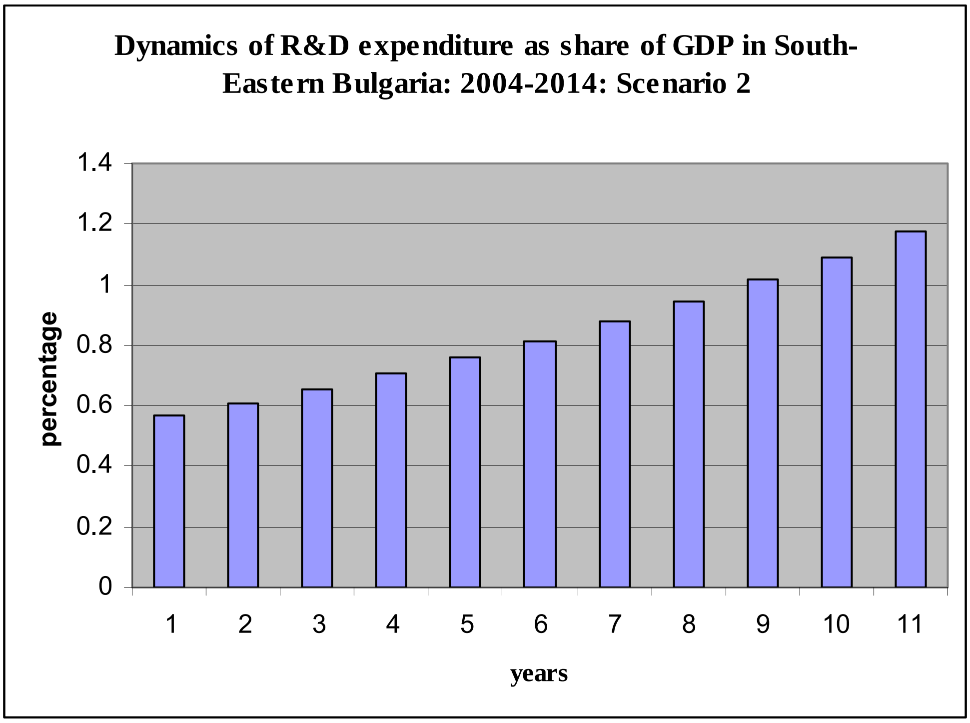
Scenario 2 – moderate increase in R&D expenditure

This scenario is based on the targets set out in the National Innovation Strategy: 2003-2013. The forecast of R&D expenditure in the Strategy refers to the nominal values of the variables. According to it till 2013 the share of R&D expenditure in GDP should reach 1.15% based on the assumption of 6% growth per annum of nominal GDP. Assuming the same scenario for South-Eastern region the nominal R&D expenditure have to increase by 14% on average annually in order to reach the target set by National Innovation strategy. Figure 5.4 shows dynamics of the R&D expenditure as share of GDP for the period 2004-2014 following the scenario set out by National Innovation Strategy. Following scenario 2 would lead to an improvement in the relative position of the region with expenditure on R&D rising to 1.15% of GDP till 2014. This scenario can be considered as positive one that requires a substantial annual increase in R&D investment.

The conditions required for this scenario to occur include:

- EU accession, steady increasing the trade with EU, high capacity for EU funds absorption; facilitating the construction of the European cross-border, trans-national and trans-regional cooperation, integration of the cross-border areas;

Figure 5.4: Scenario 2 – based on targets set out by National Innovation Strategy



- Effective implementation of the National Innovation Strategy and speeding up the process of developing Regional Innovation Strategies especially assisting firms to develop new and better products and promoting knowledge and technology transfer within the region.

- High and steady increase in domestic and foreign direct investment and developing mechanisms for foreign investment in industrial research and technology;

- Commercialisation of research activities, keeping Bulgarian graduates in science and technology and increasing the number of students in the innovations-related subjects;

- Improving knowledge and skills of SMEs to develop and implement innovations; developing co-operation among enterprises; promoting technology transfer.

- High-speed development of new forms of economic co-operation and increasing the role of regional clusters, a wide network of regional branches with good local connections and reputation, good level of using information technologies;

- Building up innovation culture among national and regional administration, and good co-ordination among institutions and policies on R&D and implementation of national and regional innovation strategies;

- High level of engagement in international knowledge transfer practices and developed skills in the legal protection of intellectual rights for local SMEs

- Strengthening the link science - education - economy – society and further integration of the higher education sector into the regional economy and the removal of barriers between this sector and the business sector which may prevent effective R&D collaboration.

- A special attention should be given to the increase of the share of R&D expenditure spend by business in the total R&D expenditure with an emphasis on the SME sector.

- Provision of loans/grants to aid the purchase of the capital equipment required in the innovation process.

- Encouraging the creation of new knowledge-generating firms into the region through provision of appropriate accommodation and infrastructure. Embedding these firms into the regional supply chain may lead to flows of knowledge across the firms within these chains.

The wider implications of this scenario are:

- South-Eastern Bulgaria will be a more competitive region in an increasingly globalising economy and under higher competition that it will face after Bulgarian accession to EU in 2007;

- The increased level of R&D will create a higher number of skilled jobs which will act as an incentive for skilled workers to stay in the region as well as attracting others from the outside, preventing the region from sinking into a low skill equilibrium.

- Attraction of FDI from high added value firms further boosting the regional economy.

Scenario 5.3 – moderate increase in R&D expenditure

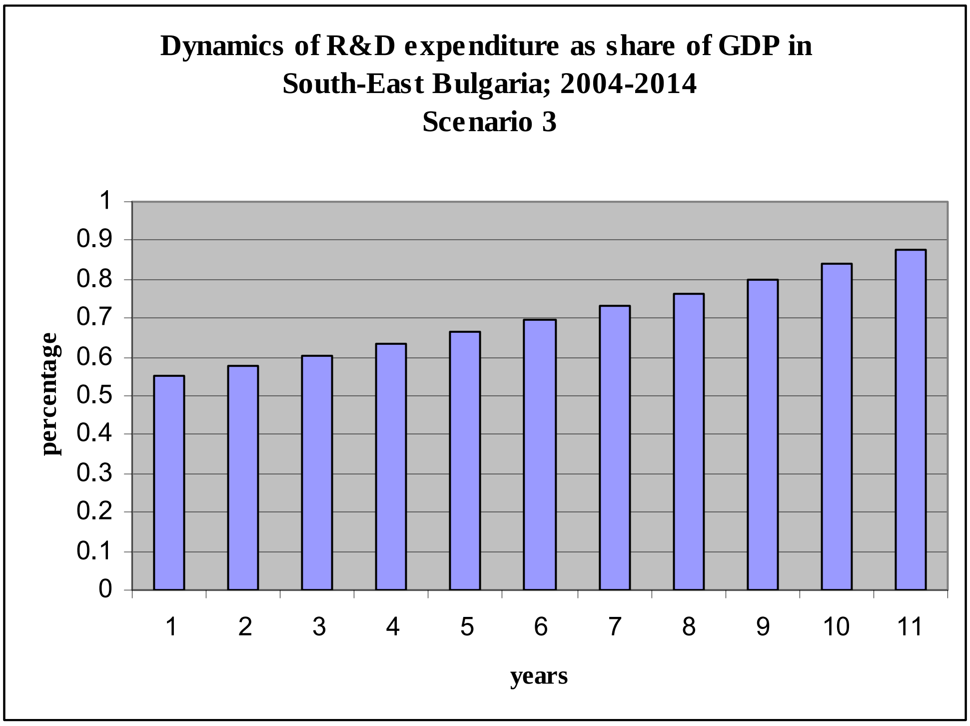
This scenario is based on a moderate rate of growth of nominal R&D expenditure compared to the previous version - to 10% per annum. It assumes also a slightly lower annual growth in nominal GDP equal to 5%. Figure 5.5 shows that this would lead to an improvement in the relative position of the region with expenditure on R&D rising to 0.9% of GDP in 2014. However, this improvement is very slight and is still far behind the EU-25 level of 1.92% in 2003. Under this scenario it would still take a considerably long time period to converge with the EU, even assuming no increase in the proportion of EU average GDP spent on R&D.

The conditions required for this scenario to occur are:

- EU accession, macroeconomic stabilisation and sustainable economic growth, stable and well developed banking system, relatively high investment dynamics, positive changes in the business environment;

- High quantity and quality of R&D supply and the innovation activities of researchers covering all development stages;

Figure 5.5: Scenario 3 – moderate increase in R&D expenditure



- Increasing firms awareness of the need for knowledge to stimulate their innovation capability and overall competitiveness, improving the financing of innovations and setting up mechanisms for attraction of private investment;
- Promoting innovative activities and technology transfer and stimulating creation of clusters of innovative companies;
- Assisting innovative start-ups and spin-offs and strengthen the innovative potential of SMEs;
- Understanding of the specific role of intermediary organisations in the field of innovations;
- Encouraging the industrial research and cooperation between the research organizations, universities and business;
- Good awareness of EU Structural Funds and the Cohesion Fund and enough administrative capacity for EU funds utilization;
- Offering grants and/or loans for firms to undertake R&D activities;
- Outsourcing government R&D to firms within the region with the requisite ability, in order to give a boost to regional business R&D;

- Formation of effective intermediaries in order to match knowledge demand with knowledge generated.

The wider implications of the second scenario for four planning regions are as follows:

- The beginnings of the transition to a modern knowledge based economy would be observed. This may enable South-East Bulgaria to start catching up with EU in terms of spending on R&D and innovations;

- While there is only a low level of growth observed this scenario stops the decline and offers a base to build on for the future.

- Arresting the decline may prevent the higher skilled jobs from leaving the region, ensuring there is demand for skilled workers and ending the brain-drain from the country.

- Pressure is eased on the state-owned scientific institutions and universities to extend their connections with business and to make the research more-market and practically oriented;

- There is greater scope for the cluster strategy to succeed as the higher levels of R&D allow greater amounts of innovation to be undertaken and a higher level of knowledge spill-over to occur.

5.4 Summary

In summary, the three scenarios elaborated suggest:

- **Scenario 1** – if the region continues its current trends then the regional economy will continue to diverge from the EU average levels and will find itself stuck in a low skill equilibrium dominated by low skilled, low paid jobs and low value added, and low technology industries. As a result, there will be further restrictions on the growth of long-term economic potential of the region and on the future improvement of population living standards.

- **Scenario 2** – based on the quantitative targets set out by National Innovation Strategy. This is an optimistic scenario that will result in large improvements in R&D expenditure. The main outcome will be not only preventing from further divergence from EU but also starting up a process of catch up with the EU countries.

- **Scenario 3** – it assumes more moderate annual increase in nominal R&D expenditure and GDP that will result in small improvements in local economic development and competitiveness. According to this scenario it would still take a considerably long time period to converge with the EU, even assuming no increase in the proportion of EU average GDP spent on R&D.

5.5 Powerpoint Presentation

RATIONALE

- In the past, R&D investment policies and strategies have focused either on stimulating transfers/spillovers or facilitating knowledge absorption.
- Successful strategy building must take account of both simultaneously.
- It is the aim of this project to integrate both these aspects, so as to remove both the supply and demand-side barriers associated with R&D transfer, absorption, and investment.
- R&D investment is a function of a region's ability to transfer, spillover and absorb knowledge.
- This project will focus on the inter-connectivity of these three factors as a catalyst and stimulator of enhanced R&D investment.

MIRIAD: AIMS AND OBJECTIVES

- <u>**The objective of this project**</u> is to stimulate policy intervention focused on raising levels of R&D investment in four regions across Europe. *Yorkshire in the UK,*
- *Thrace in Turkey, Central Macedonia and East Macedonia & Thrace in Greece,*
- *and South & East Bulgaria.*
- **The key aims are:**
- To formalise policies with regional and national government aimed at improving levels of R&D investment by businesses, government and higher education.
- To establish tools by which SMEs are able to identify and measure their knowledge assets through developing a range of benchmarking and scorecard instruments.
- To establish a regional mutual learning platform for promoting the trans-national exchange of practices towards enhancing regional R&D investment.
- To facilitate the transfer of good practices in terms of participation to EU funded research, links and co-operation between SMEs and research performers.
- To establish an R&D Investment Strategy for each of the regions that is complementary to the existing policy initiatives and activities already being undertaken.

Goals of the presentation

- to present three possible scenarios for the future R&D and knowledge creation and transfer developments in South-East Bulgaria;
- **to** provide some comments about the influence these specific developments may have on the local economy;

Setting the Scene. Outline of the South-East Bulgaria

- It includes four of the six planning regions in Bulgaria – South-West, South-Central, South-East and North-East region.
- This area covers approximately 74% (two-thirds) of Bulgarian territory and is home of 88% of the population.
- In 2003 the South-East Bulgaria accounts for 81.5% of the country's GDP level. Within the region significant inter-regional disparities in economic development are still observed.

Competitiveness of the region

- **The South Central region** with Food, beverages and tobacco being the most prominent industries.
- **The South East Region and North East of Bulgaria** with tourism as the most rapidly developing sector of the regional economy, with activities mainly on the Black sea coast;
- With such broad spatial scope it is difficult to discover regional specifics and to explore the relation between competitiveness and innovation.

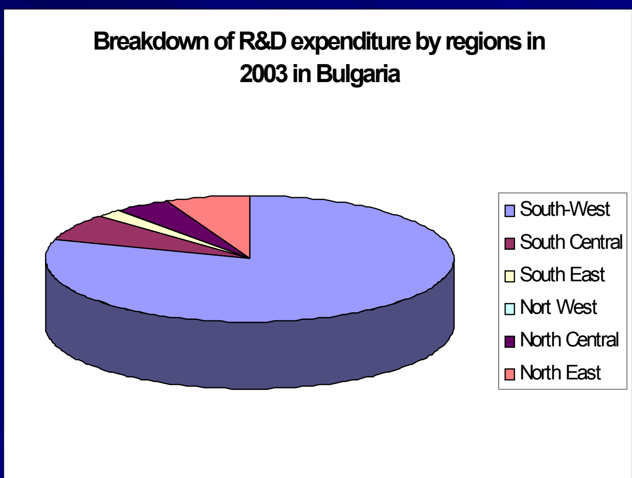
Innovation and R&D Data issues

- Scope: 20 indicators that are currently used by Eurostat for computing Summary Innovation Index (SII).
- Non-availability of about half of them for Bulgaria at national level;
- No regional breakdown for most of the indicators due to the small sizes of sample surveys;
- Methodological problems with regional breakdown of R&D activities;

Setting the Scene.
Outline of the South-East Bulgaria

- As regards to the competitiveness South-East Bulgaria lags far behind that of the EU. Bulgarian GDP per capita in PPP is almost 3.4 times lower than for the EU as a whole.
- South-East Bulgaria covers 95.4% of the total R&D expenditure in the country and 93% of R&D personnel.
- South West sub-region that includes Sofia alone accounts for almost 80% of the total R&D expenditure in the country. In concentrates more than 80% of the R&D personnel and researchers.
- In terms of share of R&D investment in GDP South-East Bulgaria and the country as a whole lags behind the EU averages - 0.5% compared to 1.92% in EU-25 in 2003.

Breakdown of R&D expenditure by regions in Bulgaria in 2003



Setting the Scene.
Outline of the South-East Bulgaria

- the major part of the medium and high tech manufacturing in the country is located in South-Eastern Bulgaria although with significant variation across sub-regions.
- The share of persons with tertiary education ranges from 16.5% in South Central region to 31.1% in South Western region whereas the average national level is 21.7%.
- The leading position in the live-long learning is again for the South Western region, where the indicator’s level of 25.3% is far above other regions and country as a whole.

Conclusions stemming from the current state of the region

- All indicators show that R&D system is highly concentrated and centralized in the South-West region and especially in the capital;
- Not surprisingly South West Bulgaria is considered to be the most developed region in the country
- One should not simplify the correlation between the R&D performance and general level of economic development.
- Further data and analyses are needed to explore this relationship.

Main Policy Documents

- **National Innovation Strategy** (2004);
- **National Strategy for Science, Research and Development** (2005);
- **Regional Innovation Strategies**

Key intermediaries in the knowledge transfer process within the region

- Bulgarian Association of Regional Development Agencies (BARDA)
- Bulgarian Chamber of Commerce and Industry (BCCI);
- Bulgarian Industrial Association (BIA);
- Association of SMEs (ASME);
- Innovation Relay Centre IRC – Bulgaria;
- Applied Research and Communication Fund (ARC Fund);
- Bulgarian International Business Association (BIBA) ;
- Employers Association of Bulgaria (EABG);

Main Goal of the analyzing knowledge model

- to map and identify the key actors of the R&D and investment and knowledge transfer and their interaction in South-East Bulgaria and thus, to gain a deeper understanding of the issues related to those activities

Methodological Remarks

The analysis focuses on the supply of the R&D and innovation support rather on the demand side of the process.

It covers both actors based in the region and actors based outside the region and/or operating at national level.

The regional actors are divided into three main groups: i) knowledge creators/producers; knowledge intermediaries that assist knowledge transfer/spillover and knowledge absorption in the region and iii) policymakers.

Research tools

- Primarily tool are in-depth face to face interviews with a cross section of relevant key actors and stakeholders in the region – 10 knowledge producers, 5 intermediaries and 5 policymakers.
- The analysis draws also on findings from previous studies on R&D and innovation in Bulgaria and worldwide.
- It makes use of data from official statistics, empirical surveys and experts' estimates.

Institutional and Legal Framework of Knowledge Creation and Transfer

- Legal framework;
- Policy framework
  - National Innovation Strategy (2004)
  - National Strategy for Science, Research and Development (2005)
  - Other policy documents
- Institutional framework
  - Ministry of Economy
  - Ministry of Education and Science

Socialist (Triple Helix I) knowledge model

- 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. In this configuration the nation state encompasses academia and industry and directs the relations among them. The role of regional actors was limited
- Under central planning the national research and innovation system includes research institutes, universities, R&D units located at large production conglomerates and the state sponsored scientific and technical intelligence agency;
- The system ensured country's specialization in specific areas of fundamental science and in reverse engineering in certain industries, e.g. electronics
- It concentrated significant human and financial R&D resources and produced a fairly large volume of scientific and technology production although part of it with limited market value.

Transition from socialist to "laissez-faire" knowledge model

- During economic transition from central to a market oriented economy Bulgarian R&D and innovation system has been left to its own development
- Many activities were disrupted and certain divisions closed or depleted from human resources.
- Gradually the key knowledge producers have lost contact with market reality and business and have closed themselves in the rein of basic research.
- Most of the research institutions and R&D have lived on edge of surviving and covered only operational costs.
- In the last 10 years the share of capital investment in total R&D expenditure did not exceed 4% in Bulgaria.

Current structure

- Bulgarian R&D system has a public sector dominated structure. In 2003 44% of the Bulgarian R&D sector operate in the public sector, 27,6 in the higher education sector, 26,5% in the business sector and 1,9% are non-profit organizations.
- Private sector research and innovation infrastructure is rudimentary. The most prominent private R&D organizations are either privatized structures of the former state infrastructure or were established within the EU-funded projects

Current structure of knowledge creation and transfer

- *Knowledge producers/creators*

  - Universities and other high schools

  - Bulgarian Academy of Sciences

  - National Center for Agrarian Sciences (NCAS)

  - Innovation centers

  - Non-governmental organisations

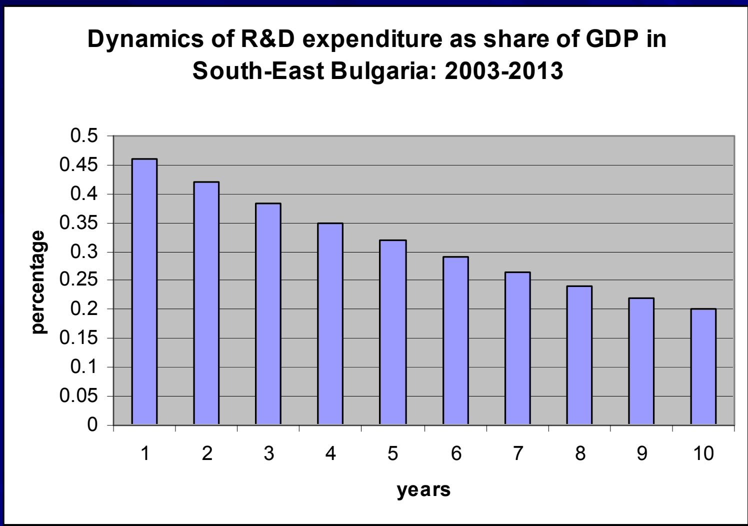
Results from the interviews

- Universities in Bulgaria have been traditionally viewed as a source of human capital, future employees and, secondarily, as a source of knowledge useful to the firm
- Almost all of the interviewed public institutions that produce knowledge rely fully on the state financial support. Income from other sources, mainly international projects despite their increasing share in the total budget still play complementary role
- There was a common opinion that most of the research projects are supply rather than demand driven. Demand from private firms was described as rudimentary and scarce.
- Almost 2/3 of them mentioned also participation in the conferences and internet pages as the most frequently used and in their opinion, the most efficient ways of finding clients of their production and services.

Results from the interviews

- at present are failing to fulfill their potential due to both Most respondents state that senior management within their organizations are generally positive towards commercialization of research but internal and external reasons.
- At the same time it has to be mentioned that the universities and state research institutes of Bulgarian Academy of Sciences have no clear strategies of research commercialization and are lacking significant and relevant expertise in the field
- Interviews with the intermediary organizations reveal weak relationship between them and knowledge producer organizations. The protection of intellectual property rights of SMEs has been identified by all respondents as one of the most underdeveloped areas in the field of research and innovations.

Scenario 1 – Continuing the current trend



This scenario is based on R&D levels and GDP in South-East Bulgaria continuing at the current levels of annual growth between 1998 and 2003

- We calculated the average growth in real terms first deflating GDP and R&D expenditure. It turned out that during the period 1998 - 2003 real R&D expenditures in South-East Bulgaria declined by 4.4% per annum while real GDP increased by 4.8%.
- The scenario obtained assuming that both trends will remain in the next 10 years appears to be very pessimistic. R&D as a percentage of GDP in real terms in South-East Bulgaria will decrease from 0.5% to 0.17% of GDP over the next 10 years.
- Following this scenario the level of R&D expenditure as share of GDP in Bulgaria will result in further lagging far behind the EU-25 average and the Lisbon target of 3% till 2010. Such developments will clearly have disastrous effect on the regional competitiveness

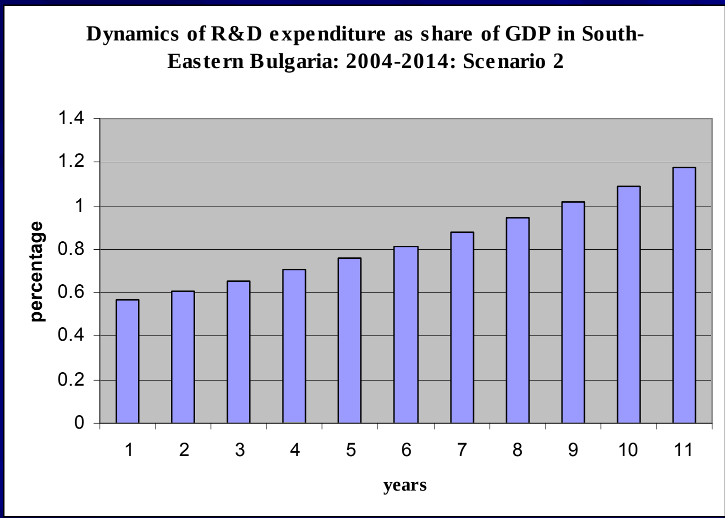
Assumptions

- there is very little in the way of incentives for firms within the region to undertake R&D and no change in the budget spending on R&D activities.
- In addition it is highly unlikely that under such circumstances the region will be able to maintain the assumed annual GDP growth of 6.6%.

Implications in a nutshell
Scenario 1

if the region continues its current trends then the regional economy will continue to diverge from the EU average levels and will find itself stuck in a low skill equilibrium dominated by low skilled, low paid jobs and low value added, and low technology industries. As a result, there will be further restrictions on the growth of long-term economic potential of the region and on the future improvement of population living standards.

Scenario 2 – high increase in R&D expenditure



This scenario is based on the targets set out in the National Innovation Strategy: 2003-2013.

- The forecast of R&D expenditure in the Strategy refers to the nominal values of the variables. According to it till 2013 the share of R&D expenditure in GDP should reach 1.15% based on the assumption of 6% growth per annum of nominal GDP. Assuming the same scenario for South-Eastern region the nominal R&D expenditure have to increase by 14% on average annually in order to reach the target set by National Innovation strategy.
- Following scenario 2 would lead to an improvement in the relative position of the region with expenditure on R&D rising to 1.15% of GDP till 2014. This scenario can be considered as positive one that requires a substantial annual increase in R&D investment.

The conditions required for this scenario to occur include:

- EU accession, steady increasing the trade with EU, high capacity for EU funds absorption; facilitating the construction of the European cross-border, trans-national and trans-regional cooperation, integration of the cross-border areas;
- Effective implementation of the National Innovation Strategy and speeding up the process of developing Regional Innovation Strategies especially assisting firms to develop new and better products and promoting knowledge and technology transfer within the region.
- High and steady increase in domestic and foreign direct investment and developing mechanisms for foreign investment in industrial research and technology;
- Commercialisation of research activities, keeping Bulgarian graduates in science and technology and increasing the number of students in the innovations-related subjects;
- Improving knowledge and skills of SMEs to develop and implement innovations; developing co-operation among enterprises; promoting technology transfer.
- High-speed development of new forms of economic co-operation and increasing the role of regional clusters, a wide network of regional branches with good local connections and reputation, good level of using information technologies;

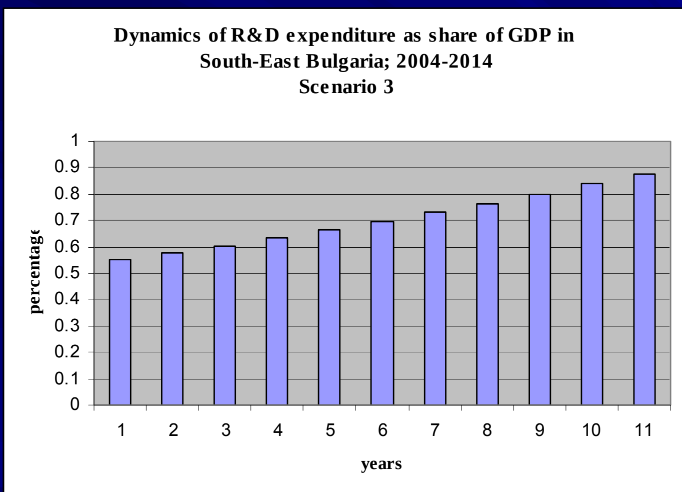
The conditions required for this scenario to occur include:

- Building up innovation culture among national and regional administration, and good co-ordination among institutions and policies on R&D and implementation of national and regional innovation strategies;
- High level of engagement in international knowledge transfer practices and developed skills in the legal protection of intellectual rights for local SMEs
- Strengthening the link science - education - economy – society and further integration of the higher education sector into the regional economy and the removal of barriers between this sector and the business sector which may prevent effective R&D collaboration.
- A special attention should be given to the increase of the share of R&D expenditure spend by business in the total R&D expenditure with an emphasis on the SME sector.
- Provision of loans/grants to aid the purchase of the capital equipment required in the innovation process.
- Encouraging the creation of new knowledge-generating firms into the region through provision of appropriate accommodation and infrastructure. Embedding these firms into the regional supply chain may lead to flows of knowledge across the firms within these chains..

Implications in a nutshell
Scenario 2

based on the quantitative targets set out by National Innovation Strategy. This is an optimistic scenario that will result in large improvements in R&D expenditure. The main outcome will be not only preventing from further divergence from EU but also starting up a process of catch up with the EU countries.

Scenario 3 – moderate increase in R&D expenditure



This scenario is based on a moderate rate of growth of nominal R&D expenditure compared to the previous version - to 10% per annum.

- It assumes also a slightly lower annual growth in nominal GDP equal to 5%.
- Figure 5 shows that this would lead to an improvement in the relative position of the region with expenditure on R&D rising to 0.9% of GDP in 2014. However, this improvement is very slight and is still far behind the EU-25 level of 1.92% in 2003.
- Under this scenario it would still take a considerably long time period to converge with the EU, even assuming no increase in the proportion of EU average GDP spent on R&D.

The conditions required for this scenario to occur include:

- EU accession, macroeconomic stabilisation and sustainable economic growth, stable and well developed banking system, relatively high investment dynamics, positive changes in the business environment;
- High quantity and quality of R&D supply and the innovation activities of researchers covering all development stages;
- Increasing firms awareness of the need for knowledge to stimulate their innovation capability and overall competitiveness, improving the financing of innovations and setting up mechanisms for attraction of private investment;
- Promoting innovative activities and technology transfer and stimulating creation of clusters of innovative companies;
- Assisting innovative start-ups and spin-offs and strengthen the innovative potential of SMEs;
- Understanding of the specific role of intermediary organisations in the field of innovations;

Implications in a nutshell
Scenario 3

it assumes more moderate annual increase in nominal R&D expenditure and GDP that will result in small improvements in local economic development and competitiveness. According to this scenario it would still take a considerably long time period to converge with the EU, even assuming no increase in the proportion of EU average GDP spent on R&D.