

# THE KNOWLEDGE ECONOMY IN THE SOUTH WEST

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## SUMMARY

- The concept of the 'knowledge economy' highlights an ongoing shift from physical resources to knowledge and information as the fundamental basis for wealth creation in advanced economies.
- This bulletin analysis the South West's knowledge economy using a range of information related to knowledge intensive industries, knowledge-based occupations, R&D activity and the role of the region's higher education institutions. It presents projections for the future growth of the region's knowledge economy and considers alternative scenarios concerning future growth in knowledge intensive industries.
- Based on the Eurostat definition of knowledge-intensive industries, the knowledge economy accounts for around 44% of total employment in Great Britain and 46% of that in the South West during 2005. The South West has the 5<sup>th</sup> highest share of employment in knowledge industries among the British regions.
- By far the largest part of the region's knowledge economy, as in other parts of the country, is knowledge intensive services. The dominant group of knowledge intensive services is Education, Health, Social Work and Recreational & Cultural services.
- Around 360,000 additional knowledge-industry jobs were created in within the South West between 1998 and 2005. At 2.6% a year, the South West's growth rate of knowledge employment was the highest among the British regions over this period.
- We have also constructed estimates of Gross Value Added (GVA, a measure of total output) of knowledge intensive industries in the South West, by utilising information from our South West Regional Accounts. GVA from the South West's knowledge economy was estimated at around £44 billion in 2004, just over half of the region's total GVA.
- The South West has the 3<sup>rd</sup> largest share of employment in higher occupational groups among the UK regions. Around 43% of total South West employment was in the three highest occupation groups (managerial, professional, associate professional & technical), just above the rate for the UK as a whole (42%). The South West has a higher share of employment in Research & Development and Scientific occupations than is the case nationally. The region also has relatively high shares of employment in Healthcare and Construction & Engineering occupations.
- In 2006, around 167,000 people in the South West had NVQ level 5 qualifications (higher degrees), giving the region the 3<sup>rd</sup> highest share of workers with qualifications at this level among the UK regions. The South West also had the 4<sup>th</sup> highest share of workers with NVQ level 4 qualifications or above at this time (31.4% of all workers).
- The South West had the 3<sup>rd</sup> highest ratio of total R&D investment to GVA among the UK regions during 2004. As in most regions, the largest share of R&D activity within the regions came from the Higher Education sector. The South West has a strong university sector with a number of highly-rated research departments. Around 7% of

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the UK's highest rated academic research units and 5% of researchers are located within the region's higher education institutions.

- GVA from all knowledge intensive industries is projected to grow at an average rate of 7.3% a year (in current price terms) between 2006 and 2014. This reflects both strong employment growth and continuing productivity growth in these industries over this period.
- Our projections suggest that the knowledge intensive industries will grow to dominate the regional economy over the next decade. These industries are projected to make up around 62% of regional GVA and 56% of total regional employment by 2014. The projections also suggest that knowledge intensive services will play an increasingly dominant role within the region's economy over this period.
- There is, however, considerable uncertainty over growth prospects for the region's knowledge economy. Under a 'low growth' scenario, in which knowledge-industry productivity growth slows to that of the rest of the regional economy, the overall GVA growth rate for the regional economy slows from 5.9% a year in the baseline projections to around 5.4% a year, while under a 'high growth' scenario it rises to around 6.5% a year.

## INTRODUCTION

There is widespread agreement on the increasing importance of knowledge and information for economic activity and development within the advanced economies. Knowledge is a dominant input to a wide range of economic activities, and advances in knowledge are key drivers of innovation and economic growth. The concept of the 'knowledge economy' embraces the idea that the shift from physical resources to knowledge as the fundamental basis for wealth creation in advanced economies.

For countries in the vanguard of the world economy, the balance between knowledge and resources has shifted so far towards the former that knowledge has become perhaps the most important factor determining the standard of living – more than land, than tools, than labour. Today's most technologically advanced economies are truly knowledge based."

World Bank (1999: 17)

The knowledge economy idea has been central to economic policy within the UK at least since the DTI White Paper *Our Competitive Future: Building the Knowledge Driven Economy* was published in 1998. The knowledge economy is also a key theme running through the South West Regional Economic Strategy.

This bulletin provides an overview of the South West's knowledge economy based on a variety of information related to knowledge intensive industries, knowledge-based occupations, R&D activity and the role of the region's Higher Education institutions. It also examines trends in the region's knowledge economy and prospects for the future. Finally, this bulletin examines the implications of alternative scenarios for the knowledge economy for the future prosperity of the region. This analysis utilises models of the South West economy developed by the South West Observatory: Business & Economy.

## WHAT IS THE KNOWLEDGE ECONOMY?

Despite widespread agreement on the broad notion that economic activity in advanced economies is increasingly dependent on knowledge and information rather than physical resources, there is no universally-accepted definition of the term 'knowledge economy'.

One reason for the lack of agreement of specific definitions is that the shift to knowledge as a basis for production is believed to embrace all areas of economic activity to a greater or less extent: not just 'high-technology' manufacturing but also broad areas of services; not just leading-edge R&D, but continuous minor improvements to products and processes. Thus, the knowledge-based economy is seen as

... one in which the generation and exploitation of knowledge has come to play the predominant part in the creation of wealth. It is not simply about pushing back the frontiers of knowledge: it is also about the most effective use and exploitation of all types of knowledge in all manner of economic activity.

DTI (1998)

Similarly,

... economic success is increasingly based upon the effective utilisation of intangible assets such as knowledge, skills and innovative potential as the key resource for competitive advantage. The term 'knowledge economy' is used to describe this emerging economic structure.

ESRC (2005)

It has sometimes been argued that the shift to knowledge as the basis for economic activity is leading to a fundamentally 'new economy', which offers a step change in productivity growth and economic advance. The proposed link between an increasing role for knowledge and a permanently higher rate of productivity growth has not, however, been rigorously proven. Nevertheless, an ongoing expansion in knowledge-based economic activity offers huge potential for future prosperity.

Three types of definition of the knowledge economy have been widely used in practice. One set of definitions identifies groups of industries as knowledge-based according to such characteristics as the nature of the products produced, the extent of research and development (R&D) activity or the prevalence of certain higher occupation groups. The idea of knowledge-workers provides a second approach. The knowledge economy is then defined as the activity associated with a certain group of higher occupation groups or with workers possessing higher qualifications (degrees or equivalent), whatever industry they work in. A third, more comprehensive, approach attempts to combine indicators of various aspects of knowledge intensity in overall measures using a 'scoreboard' approach. Thus, the OECD scoreboard includes over 200 indicators including such aspects as research and development, human resources in science and technology, and the use of information and communications technologies.

None of these approaches is ideal. Industry-based definitions, whilst widespread for practical reasons, do not allow for knowledge-based activity throughout all sectors of the economy. Occupation-based approaches are also incomplete, as widespread post-compulsory education and increasing training investment is leading to increases in the knowledge-base across a broad range of jobs, making it difficult to identify specific occupation groups as being knowledge-based to the exclusion of all others. On the other hand, scoreboard approaches whilst undoubtedly comprehensive are rather difficult to interpret and any overall index of knowledge intensity based on them is inevitably dependent on arbitrary weightings applied to individual components. The remainder of this bulletin presents information on various aspects of the knowledge economy within the South West.

## THE SOUTH WEST'S KNOWLEDGE ECONOMY

### *Knowledge Intensive Industries*

The notion that the knowledge economy encompasses large parts of economic activity within advanced economies implies that any industry-based definition must have broad coverage. The OECD (2005) classification of technology and knowledge-intensive industries has been commonly used in applied research, but seems rather too narrow to encompass the full scope of the knowledge economy. Boddy (2005) presents a wider classification, which adds to the OECD version broad areas of knowledge intensive services including education and healthcare. An even broader definition has been developed by Eurostat (2006). This includes the following groups of industry sectors:

- **High Technology Manufacturing:** Pharmaceuticals (SIC 24.4), Manufacturing of Office Machinery & Computers (30); Manufacturing of Communications Equipment (32); Medical, precision and optical instruments (33); Aerospace (35.3).
- **Medium Technology Manufacturing:** Chemicals (24 excluding 24.4); Machinery (29); Motor Vehicles (31); Other Transport Equipment (except ships & boats) (35 excluding 35.1 & 35.3).
- **High Technology Knowledge Intensive Services:** Post & telecommunications (64); Computer & related activities (72); Research & Development (73).

- **Market Knowledge Intensive Services:** Water Transport (61); Air Transport (62); Real Estate Activities (70); Renting of Machinery & Equipment (71); Other Business Activities (74).
- **Financial Knowledge Intensive Services:** Financial Intermediation (65-67).
- **Other Knowledge Intensive Services:** Education (80); Health & Social Work (85); Recreational, cultural & Sporting Activities (92).

Table 1 shows employment (employee jobs) in the Eurostat knowledge intensive industries within the UK regions and countries during 1998 and 2005. On this broad basis, the knowledge industries are estimated to account for around 44% of total employment in Great Britain, and 46% of total South West employment in 2005. The South West has the 5<sup>th</sup> highest share of employment in knowledge economy industries among the British regions according to this classification. London has the highest share of knowledge industry employment – around 49% of its total employment during 2005.

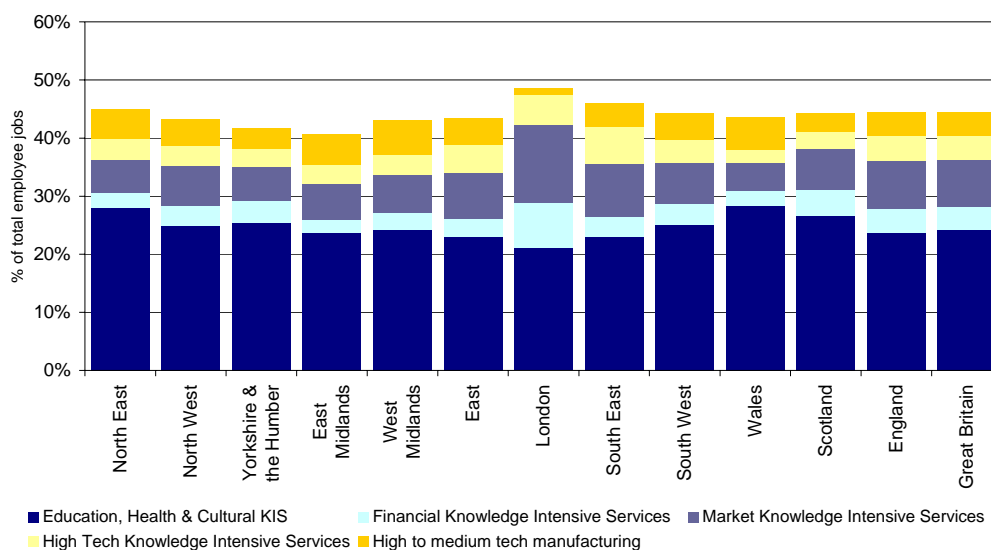
Around 360,000 additional knowledge industry jobs were created within the South West between 1998 and 2005, an average annual growth rate of 2.6%. This was the highest growth rate for knowledge industry employment among the British regions over this period, and substantially above the rate for Great Britain as a whole (2.0%).

**Table 1: Regional Employment in Knowledge Economy Industries**

	2005			1998			Change 1998-2005		
	Employee Jobs	Share of total (%)	Rank	Employee Jobs	Share of total (%)	Rank	Employee Jobs	Average annual growth (%)	Rank
North East	1,063,329	44.9%	3	909,041	41.7%	4	154,288	2.3%	4
North West	2,980,066	43.3%	8	2,665,796	40.7%	8	314,270	1.6%	9
Yorkshire & the Humber	2,262,398	41.8%	10	1,963,662	38.7%	10	298,736	2.0%	6
East Midlands	1,858,250	40.6%	11	1,682,293	38.2%	11	175,957	1.4%	10
West Midlands	2,376,375	43.0%	9	2,186,807	40.9%	5	189,568	1.2%	11
East	2,353,014	43.4%	7	2,079,565	40.8%	7	273,449	1.8%	8
London	4,058,070	48.6%	1	3,566,220	46.8%	1	491,850	1.9%	7
South East	3,762,418	46.0%	2	3,199,859	44.6%	2	562,559	2.3%	3
South West	2,207,748	44.2%	5	1,848,585	42.5%	3	359,163	2.6%	1
Wales	1,190,025	43.6%	6	998,018	40.8%	6	192,007	2.5%	2
Scotland	2,391,448	44.4%	4	2,046,625	39.4%	9	344,823	2.2%	5
England	22,921,668	44.4%		20,101,828	42.2%		2,819,840	1.9%	
Great Britain	26,503,141	44.4%		23,146,471	41.9%		3,356,670	2.0%	

Source: SWBEM based on ONS Annual Business Inquiry (NOMIS)

**Figure 1: Employment in Knowledge Intensive Industries, 2005**

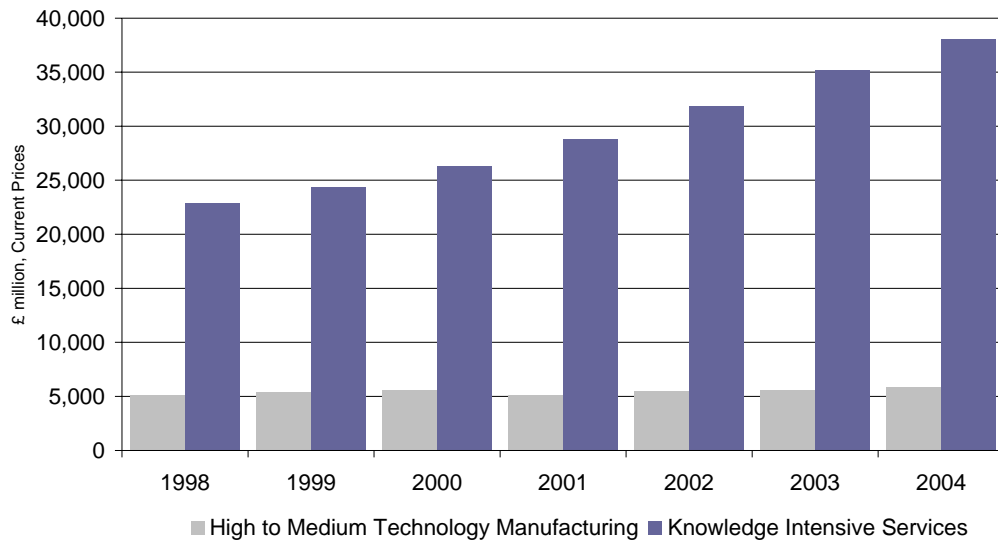


Source: SWBEM based on ONS Annual Business Inquiry (ABI)

Figure 1 gives a breakdown of Eurostat knowledge industry jobs in the British regions according to the broad industry groups defined above. By far the largest part of the knowledge economy, according to this definition, is made up of knowledge intensive services. High- and medium-technology manufacturing makes up only around 4.0% of total employment in Great Britain (no data are available for Northern Ireland) and 4.6% of employment in the South West. The South West has the 5<sup>th</sup> highest share of high and medium technology manufacturing employment among the British regions. The dominant group of knowledge intensive services is ‘Other Knowledge Intensive Services’, which includes Education, Health & Social Work, and Recreational, cultural & sporting activities. This group makes up around a quarter of total employment in the South West (25.1%), slightly higher than the figure for Great Britain as a whole (24.2%). Most of the regions are fairly similar in terms of shares of employment within the knowledge industry groups. The exception is London, which has far higher shares of employment in Financial Knowledge Intensive Services and Market Knowledge Intensive services than do any of the other regions. Around 7.7% of London’s total employment is in Financial KIS’s and 13.6% if Market KIS’s, compared to 4.0% and 8.0% in Great Britain as a whole.

We can also construct estimates of the output (Gross Value Added, GVA) of knowledge intensive industries within the South West by utilising information contained within our South West Regional Accounts. By aggregating the detailed industry sectors within the regional accounts to the Eurostat classification of knowledge intensive sectors, we can produce a good match to the Eurostat knowledge industries. The results of this analysis suggest that GVA from the South West’s knowledge economy was around £41 billion in 2003 and £44 billion in 2004, in current price terms (i.e. not allowing for the effects of inflation). This represented more than half of all output from the South West economy in both of these years (50.3% and 50.4% in 2003 and 2004, respectively). As with employment, knowledge intensive services account for the bulk of GVA from knowledge industries in the South West, and services have contributed essentially all of the growth in the knowledge economy over the period since 1998 (Figure 2). In GVA terms, at current prices, knowledge intensive services grew at an estimated average annual rate of 8.8% during 1998-2004 while high and medium technology manufacturing grew by around 2.5% a year over this same period.

**Figure 2: GVA from South West Knowledge Intensive Industries**

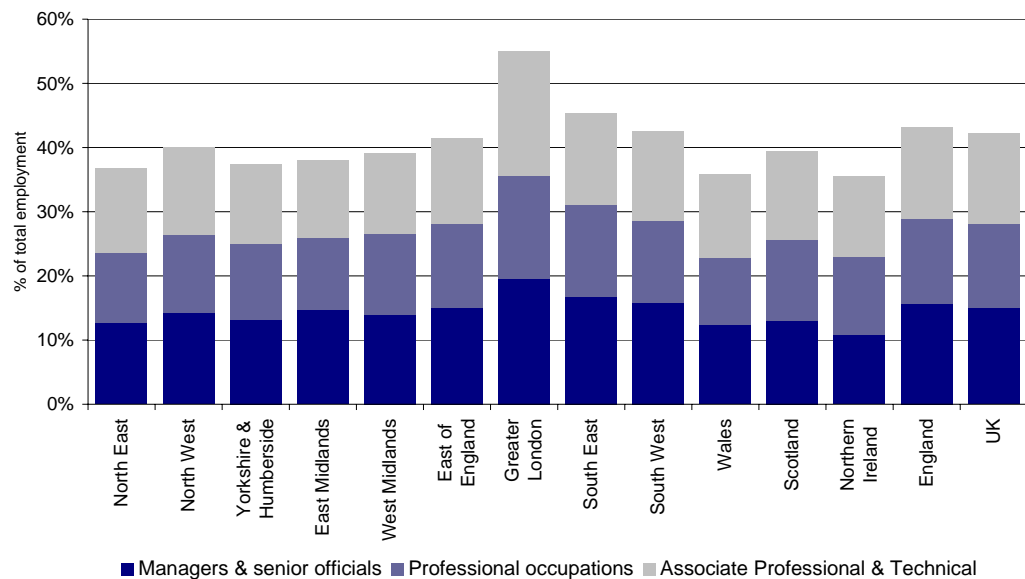


Source: SWBEM South West Regional Accounts

**Knowledge Intensive Occupations**

Another approach to defining the knowledge economy is to include all employment in knowledge intensive occupations, regardless of which industry they are employed in. The simplest, and most widely adopted, approach is to include all employment in the ‘top 3’ standard occupational groups: managers & senior officials; professionals; and associate professional and technical occupations. On this basis, the South West has the 3<sup>rd</sup> largest share of knowledge intensive employment in total employment among the UK regions. Around 43% of total South West employment during 2006 was in knowledge intensive occupations, just above the figure for the UK as a whole (42%). This amounted to almost 1.05 million workers in knowledge intensive occupations within the region at this time.

**Figure 3: Knowledge Intensive Employment by Occupation**



Source: SWBEM based on ONS Labour Force Survey

Figure 3 shows a breakdown of employment in knowledge intensive occupations within the UK regions between managerial, professional and associate professional & technical groups. The basic pattern of occupational employment is fairly similar across the regions, with broadly equal shares of knowledge intensive employment within the three occupational groups. In the South West, around 16% of all workers were employed as managers or senior officials; 13% as professionals; and 15% in associate professional or technical occupations. The occupation-based approach suggests, once again, that London has the largest knowledge economy within the UK. Knowledge intensive occupations accounted for the majority of employment within the capital during 2006.

Using more detailed data from the Labour Force Survey (for 4-digit Standard Occupational Classification groups) we can examine the importance of different types of higher occupations within the UK regions. The results of this analysis are presented in Table 2.

**Table 2: Regional Employment in Knowledge-Intensive Occupations**

	R&D and Scientific	Healthcare & Medical	Construction & Engineering	ICT	Legal, Business, Financial, etc.	Educational	Other	ALL
	<i>% of total employment</i>							
North East	1.2	5.3	5.0	1.9	7.2	4.4	9.3	34.3
North West	1.3	5.0	5.2	2.6	9.4	4.7	9.1	37.4
Yorkshire & Humberside	1.0	4.6	4.9	2.5	8.8	4.8	8.1	34.7
East Midlands	1.4	4.4	5.9	2.1	8.9	4.4	8.5	35.5
West Midlands	0.7	4.6	5.6	2.5	9.7	5.3	8.5	36.9
East of England	1.6	4.5	5.4	3.3	9.6	4.6	9.1	38.1
London	1.5	4.6	4.2	5.2	17.8	4.3	10.6	48.1
South East	1.3	4.7	5.5	4.9	11.7	4.8	9.1	41.9
South West	1.4	4.9	5.5	2.7	9.8	4.7	10.3	39.3
Wales	1.1	4.8	4.7	1.5	7.5	4.1	8.7	32.4
Scotland	1.4	5.0	5.8	2.5	8.4	4.5	9.1	36.7
Northern Ireland	0.9	5.5	4.3	1.3	6.9	5.0	8.7	32.7
England	1.3	4.7	5.2	3.4	11.1	4.6	9.3	39.6
UK	1.3	4.8	5.2	3.2	10.6	4.6	9.2	38.8
UK excluding London	1.3	4.8	5.4	2.9	9.4	4.7	9.0	37.3
SW/UK	1.07	1.04	1.07	0.84	0.93	1.01	1.12	1.01
SW/UK excl London	1.10	1.03	1.03	0.93	1.04	1.00	1.15	1.05
SW Rank	5	5	4	4	3	6	2	3

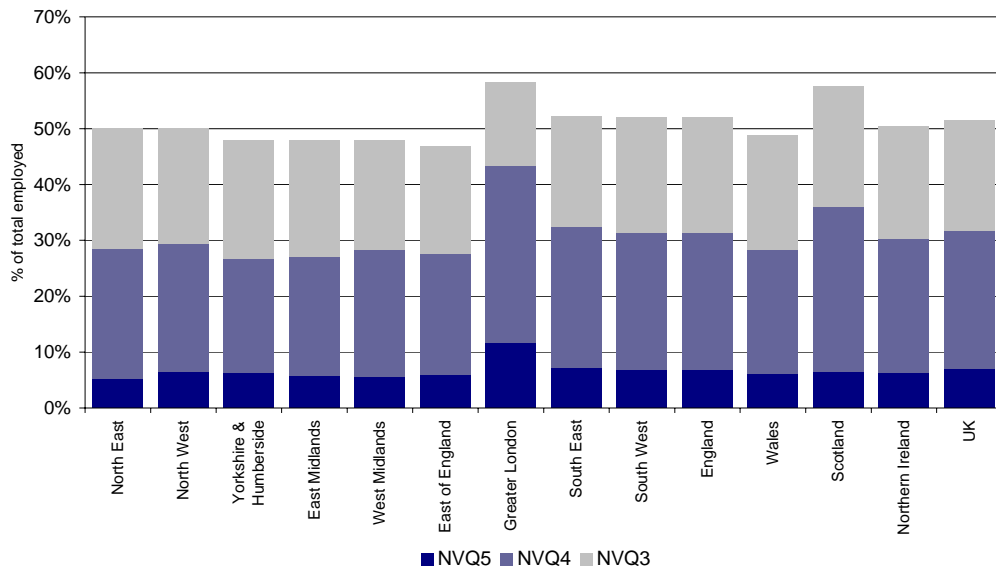
Source: ONS Labour Force Survey

The South West has a higher share of employment than the UK as a whole in Research & Development and Scientific occupations. The region also has relatively high shares of employment in Healthcare & Medical and Construction & Engineering occupations, an equal share to the UK in educational occupations, and relatively low shares in ICT and Legal, Financial and Business occupations. The 'Other' group includes non-specialist managerial occupations, police and other public services, and a variety of creative, transport & logistic and social care occupations. The South West also has a relatively high share of employment within this category.

### **Higher Qualifications**

Figure 4 shows the extent of higher level qualifications within the UK regions' workforces during 2006. Around 167,000 people working in the South West during 2006 had NVQ level 5 qualifications (higher degrees), 7% of the region's total employment. The South West had the 3<sup>rd</sup> highest share of workers with NVQ level 5 qualifications, behind London and the South East. London had by far the largest concentration of workers with higher degrees among the UK regions – 11.6% of all workers in London were qualified to this level. The South West also had the 4<sup>th</sup> highest share of workers with NVQ4 or above qualifications among the UK regions (behind London, Scotland and the South East). In 2006, almost 768,000 workers employed within the South West were qualified to NVQ level 4 or above, 31.4% of total regional employment.

**Figure 4: Employment of Highly-Qualified Workers**



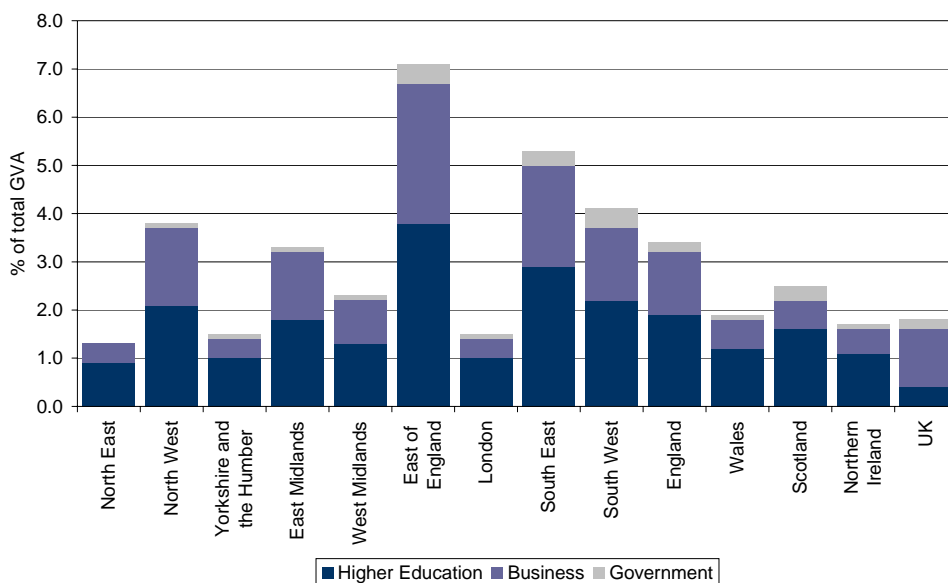
Source: SWBEM based on ONS Labour Force Survey

**Research & Development Activity and Higher Education**

While the concept of the knowledge economy is far wider than formal research & development, R&D investment plays a particularly important role in innovation and productivity growth, and it is therefore useful to examine regional performance in terms of research & development activity.

The main measure of R&D activity which is available for the UK regions is the level of R&D investment as a share of total Gross Value Added (GVA – a measure of total output), published within the DTI annual *Regional Competitiveness and State of the Regions* report. The most recent estimates are for 2004 and these are presented in Figure 5.

**Figure 5: Regional R&D Intensity**



The South West had the 3<sup>rd</sup> highest ratio of total R&D investment to GVA among the UK regions during 2004, behind the East of England and the South East. As in most regions, the largest share of R&D activity comes from the Higher Education sector. Research within the South West's Higher Education institutions contributed around 54% of the region's total R&D investment during 2004, with Business R&D contributing around 37% and Government R&D around 10%.

Recent research (Abramovsky *et al*, 2007) suggests that leading-edge University research departments can have an important influence on business R&D in surrounding areas. This study found that business R&D facilities within the UK tended to be located close to leading academic research departments, as indicated by ratings awarded to individual departments by the UK Universities' Research Assessment Exercise (RAE). The results were particularly strong for Pharmaceuticals and Chemicals research and among foreign-owned business R&D facilities, but were also significant across a broad range of other industry groups. The decision of businesses to locate R&D facilities near to leading university research departments may reflect the potential for increased knowledge spillovers through face-to-face contact and informal networks, together with more formal collaboration agreements, consultancy and university spin-outs.

The South West has a strong university sector with a number of highly-rated research departments. Table 3 shows the number of research units (departments), and of research-active academics working within such departments, within the region's major higher education institutions. RAE 5 and 5\* ratings are awarded to departments which produce published research of international standing. RAE 4 ratings reflect published research of national standing, with some internationally-important work. The latest rankings reflect the results of an exercise carried out during 2001 – results for the 2007 exercise are not yet available. In total, the region's universities include 118 units rated 4 or above within the 2001 Research Assessment Exercise, with 71 of these rated 5 or 5\*. In total, just over 2,000 academic researchers were employed in the region's top rated (4-5\*) research departments. The region, nevertheless has a relatively small share of the UK's top academic research departments and academics. Around 7% of the UK's 5 or 5\* rated research departments and 5% of researchers were in South West institutions during 2001.

**Table 3: Top University Research Departments in the South West**

	RAE 5 or 5*		RAE 4		RAE 4-5*	
	Units	Staff	Units	Staff	Units	Staff
Bath Spa University College	0	0	2	18	2	18
Bournemouth University	1	7	0	0	1	7
Dartington College of Arts	0	0	1	6	1	6
Falmouth College of Arts	0	0	1	3	1	3
University of Bath	11	301	6	116	17	417
University of Bristol	36	768	8	134	44	902
University of Exeter	19	262	16	186	35	448
University of Plymouth	3	28	7	85	10	113
University of West of England, Bristol	1	6	6	92	7	98
All South West Universities	71	1,371	47	640	118	2,012
All UK Universities	1,000	26,253	663	11,913	1,663	38,166
South West as % of UK	7.1%	5.2%	7.1%	5.4%	7.1%	5.3%

Source: RAE 2001

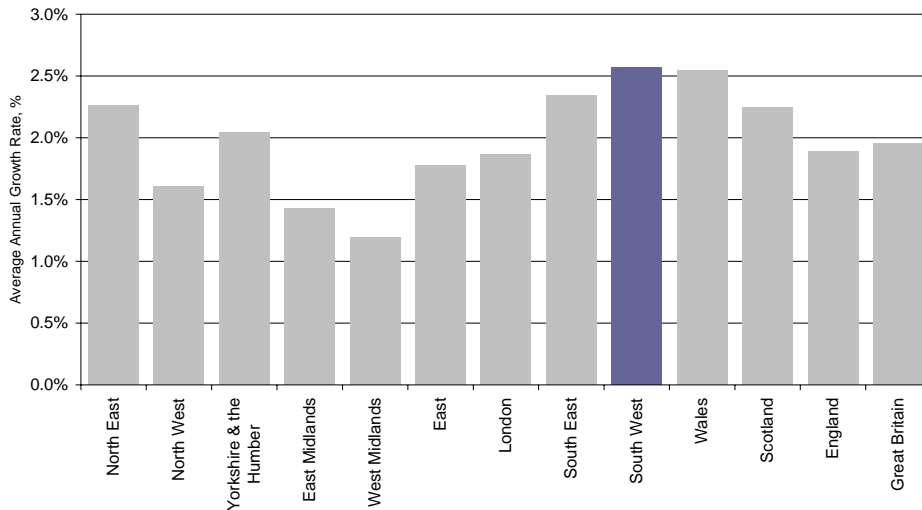
The South West's leading edge academic research is quite strongly concentrated in the north east of the region. The University of Bristol accounted for the majority of both departments and staff rated 5 or 5\*, while the 4 Bristol and Bath based institutions contained 68% of 5 or 5\* rated units and 78% of research-active academics within such units. Bristol University's 5\* rated units include Biological Science, Chemistry, Earth Sciences, Applied Maths, Statistics & Operational Research, and Civil Engineering.

## TRENDS & PROSPECTS

### Recent Trends

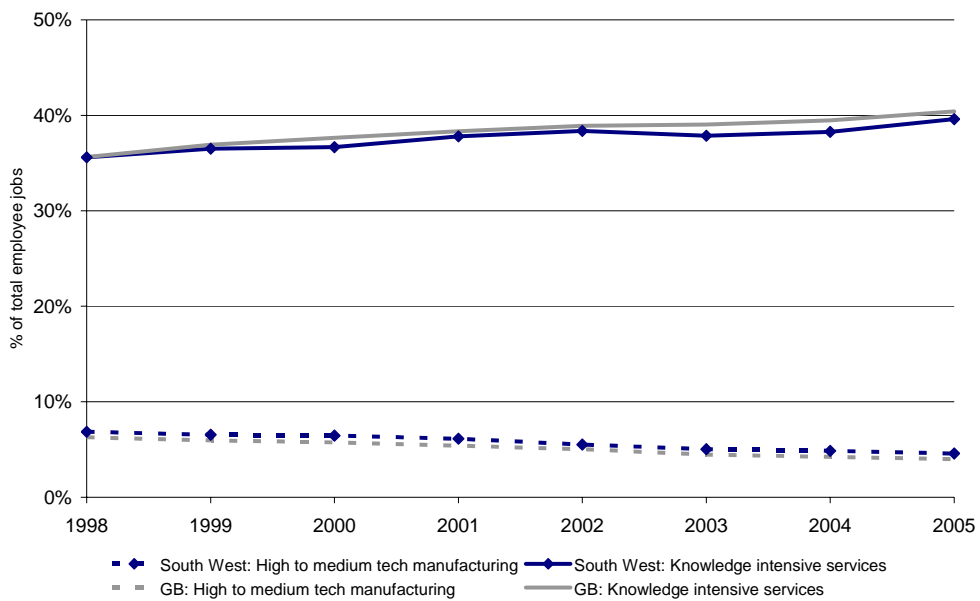
The South West had the strongest growth of employment in knowledge-intensive industries among the UK regions during the period 1998-2005. According to the broad Eurostat definition, employment in high to medium technology manufacturing and knowledge based services within the South West increased by almost 360,000 between 1998 and 2005, or by an average rate of around 2.6% a year (Figures 6 & 7).

**Figure 6: Growth of Knowledge Economy Employment 1998-2005**



Source: SWBEM based on ONS Annual Business Inquiry (NOMIS)

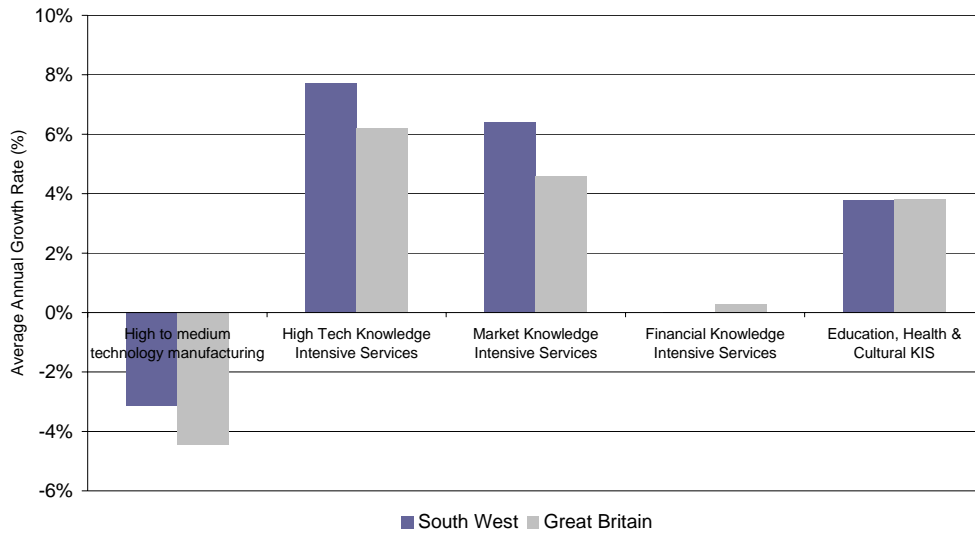
**Figure 7: Employment in Knowledge Economy Industries, 1998-2005**



The overall growth of employment in knowledge-intensive industries in recent years is more than fully accounted for by growth in knowledge-intensive services, which has been partially offset by declines in high and medium technology manufacturing employment within the region

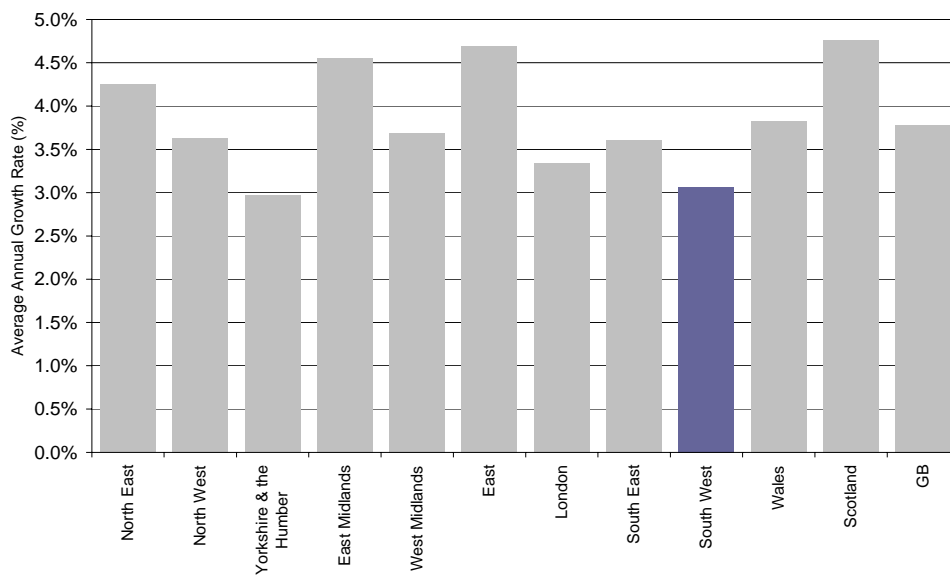
(Figure 6). This pattern is also seen in all other British regions over the period from 1998 to 2005.

**Figure 8: Employment Growth within Knowledge-Intensive Industry Groups, 1998-2005**



Source: SWBEM based on ONS Annual Business Inquiry

**Figure 9: Growth in employment of highly-qualified workers (NVQ4 or above), 1998-2005**



South West employment of workers qualified to degree level (NVQ level 4 or above) increased by around 131,000 between 1998 and 2005, rising from around 24.0% to 28.5 % of the region’s workforce over this period. The South West did, however, have the 2<sup>nd</sup> lowest growth rate of graduate level employment among the British regions.

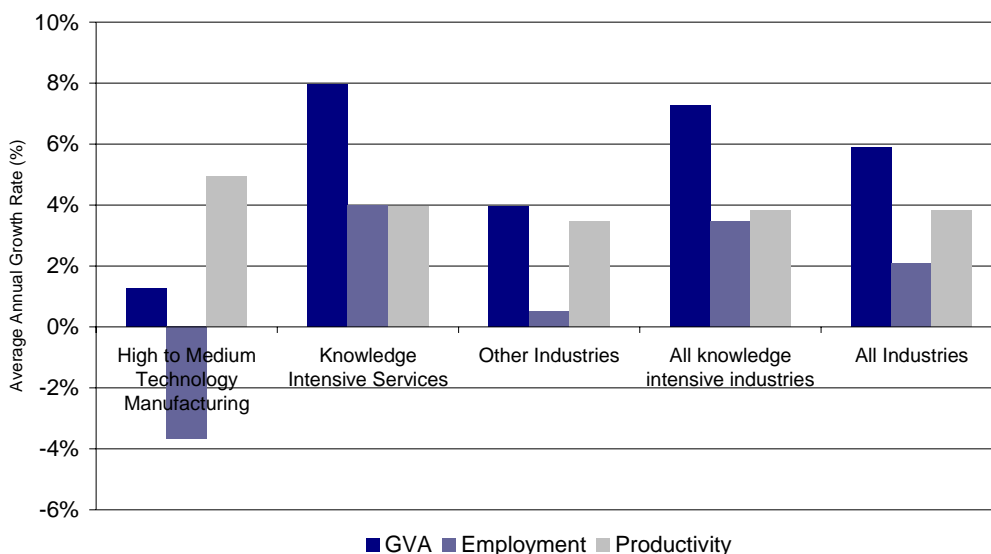
**Projection & scenarios**

SWBEM produce regular growth projections for the South West economy and its industry, based on our regional models and the information contained within the South West Regional Accounts. On the basis of these, we have constructed more detailed projections for growth of employment and GVA within the region’s knowledge economy. As above, these are based on the broad Eurostat definition of knowledge intensive industries.

Figure 10 presents projected growth rates for GVA (in current prices), employment (employee jobs) and productivity (GVA per job) for the South West’s knowledge intensive industries over the period 2006-2014. These show higher rates of projected growth of employment and GVA in the knowledge intensive industries as a whole than in the rest of the region’s economy over this period. GVA from all knowledge intensive industries is projected to grow at an average rate of 7.3% a year in current price terms, equivalent to ‘real’ (constant price – i.e. adjusted for inflation) growth of over 5% a year.

The rapid growth in knowledge industry GVA reflects both strong employment growth and continuing productivity growth. Employment in the knowledge intensive industries is projected to expand by around 3.5% a year, on average, over the period of the projections. Productivity growth (measured by current price GVA per job) is projected at 3.8% a year (or around 2% a year in constant price terms).

**Figure 10: Projected Growth of South West Knowledge Industries, 2006-2014**



Source: SWBEM

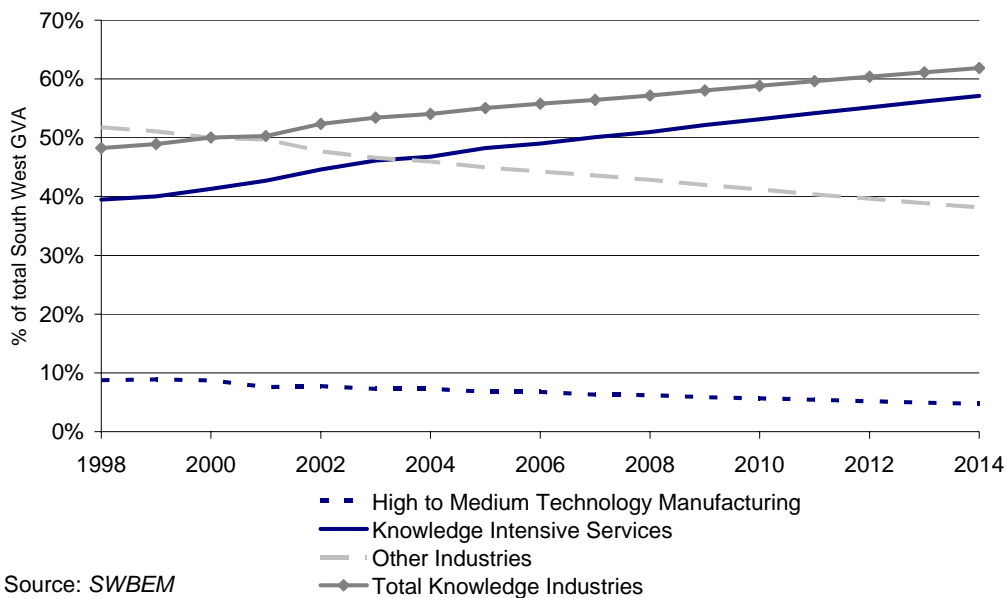
The knowledge-intensive industries are projected to have marginally stronger productivity growth, but much stronger employment growth, than the remainder of the South West economy during the period 2006-2014. Productivity growth in the knowledge industries is projected to exceed that in other industries by around 0.3 percentage points a year on average, while employment growth is projected to be 3.0 percentage points higher in the knowledge industries than in other parts of the regional economy. As a result, the knowledge-industry GVA growth rate is projected at 3.3 percentage points higher than that in other South West industries over this period, with projected average annual GVA growth rates of 7.3% and 4.0% respectively. The knowledge intensive industries are projected to contribute around 72% of the total growth in South West GVA between 2006 and 2014, and 89% of the total growth in regional employment over this period. Overall, employment in knowledge intensive industries is projected to increase by around 356,000 jobs.

All of the projected growth of employment within the South West’s knowledge intensive industries is within knowledge intensive services. Employment growth in the knowledge intensive services is projected to increase by around 382,000 between 2006 and 2014, while employment in high or medium technology manufacturing is projected to decline by around 26,000 over this period. These changes equate to an average annual employment growth rate of 4.0% in knowledge intensive services and a decline of around 3.7% a year in knowledge intensive manufacturing. The manufacturing industries are, however, expected to achieve higher productivity growth rates than do services: 4.9% a year for high and medium technology manufacturing as against 3.9% for knowledge intensive services. Taken together, the employment and productivity projections imply GVA growth at average annual rates of 1.3% in high and medium technology manufacturing and 7.9% in knowledge intensive services during 2006-2014. These are, however, current price projections, and imply strong growth in real (constant price) GVA from knowledge services but a marginal decline in GVA from knowledge intensive manufacturing over this period.

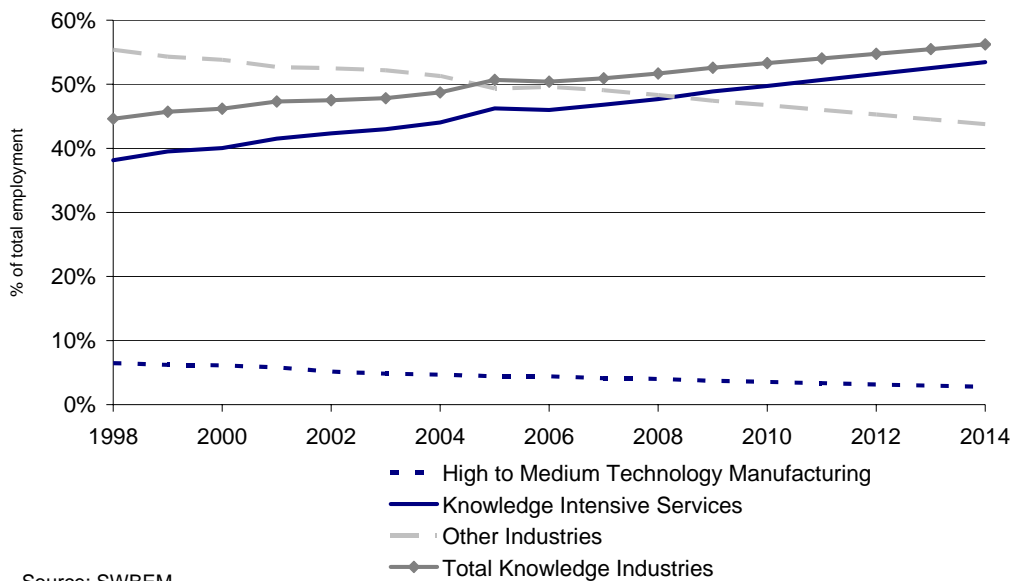
The growth patterns discussed above imply a significant restructuring of the South West economy towards knowledge intensive industries, continuing the trends established in recent years (Figures 11 and 12).

Our projections suggest that the knowledge intensive industries will grow to dominate the regional economy over the next decade, with these industries projected to make up around 62% of regional GVA and 56% of total regional employment (employee jobs) by 2014. The projections also suggest that knowledge intensive services will play an increasingly dominant role within the South West economy over this period.

**Figure 11: Projections: GVA from South West Knowledge Economy**



**Figure 12: Projections: Employment in the South West knowledge economy**



Source: SWBEM

There are, of course, a number of uncertainties concerning the future prospects for knowledge intensive industries within the South West. On the one hand, we cannot be certain whether recent strong growth of both employment and productivity in these industries can be sustained in the future. On the other, it is possible that future growth of the knowledge economy may be even stronger than that recorded during recent years. For one thing, the switch to a knowledge dominated economy involves significant structural changes to infrastructure (transport and communications, training systems, etc.), human capital (changes in the skills mix), business processes and other key aspects of the economy’s resource base. Given the rapid shift towards a knowledge-based economy, it is possible that the development of these resources has lagged behind the requirements of the knowledge industries themselves, and has therefore constrained productivity and output growth in those industries. Recent research into the effects of ICT improvements on productivity growth in the US, for example, suggests long lags between the initial development and primary adoption of new ICT technologies and the full benefits of those technologies to productivity levels and growth rates.

To take account of these uncertainties we have constructed two alternative scenarios, in addition to the ‘baseline’ projections presented above, for productivity and employment growth in the knowledge intensive industries. These scenarios were analysed using SWBEM’s computable general equilibrium (CGE) model of the South West, which was developed by SWBEM in collaboration with the University of Strathclyde. The ‘low growth’ scenario assumes that productivity growth in the knowledge-intensive industries matches that in other parts of the economy. This also dampens employment growth within the knowledge industries, and spills over into (marginally) lower employment growth in other industries due to the impact of weaker demand for knowledge intensive goods and services by other industries (as intermediate inputs) and households (due to weaker consumption demand). The ‘high’ growth scenario assumes that productivity growth in the knowledge industries is 1 percentage point higher than in the baseline. This strengthens employment growth in the knowledge industries and also stimulates additional activity in the rest of the regional economy (again through supply chain and consumption effects). These scenarios are, of course, highly speculative and the results are meant merely to indicate the potential scale of implications of alternative possible futures. The basic results for these scenarios are presented in Table 4.

**Table 4: Alternative Growth Scenarios for the South West Economy**

	GVA			Employment		
	Low	Baseline	High	Low	Baseline	High
High to Medium Technology Manufacturing	-0.6%	1.3%	2.2%	-3.9%	-3.7%	-3.2%
Knowledge Intensive Services	7.4%	7.9%	9.0%	3.8%	4.0%	4.5%
Other Industries	3.9%	4.0%	4.0%	0.4%	0.5%	0.6%
All Knowledge Intensive Industries	6.6%	7.3%	8.3%	3.3%	3.5%	4.0%
<b>ALL INDUSTRIES</b>	<b>5.4%</b>	<b>5.9%</b>	<b>6.5%</b>	<b>1.9%</b>	<b>2.1%</b>	<b>2.4%</b>

Source: SWBEM

Under the 'low growth' scenario overall GVA in the South West increases at an average annual rate of 5.4% during 2006-2014, 0.5 percentage points below that in the baseline projections. Weaker growth in the knowledge intensive industries also results in (marginally) weaker growth in other parts of the regional economy. Employment growth is also weaker, at an average rate of 1.9% a year compared to 2.1% in the baseline. Under the 'high growth' scenario, both employment and output growth are stronger than in the baseline, with total South West employment rising by around 2.4% a year and GVA by 6.5% a year, compared to 2.1% and 5.9%, respectively, in the baseline projections.

One factor not fully captured by these trends and projections is the continually growing knowledge intensity of all areas of economic activity within the advanced economies. As a result of this, the projections probably understate the likely growth of the region's knowledge economy in years to come.

## CONCLUSIONS

This bulletin presents an analysis of the South West's knowledge economy using a range of information related to knowledge intensive industries, knowledge-based occupations, R&D activity and the role of the region's higher education institutions. It presents projections for the future growth of the region's knowledge economy and considers alternative scenarios concerning future growth in knowledge intensive industries.

Based on the Eurostat definition of knowledge-intensive industries, the knowledge economy accounts for around 44% of total employment in Great Britain and 46% of that in the South West during 2005. The South West has the 5<sup>th</sup> highest share of employment in knowledge industries among the British regions. By far the largest part of the region's knowledge economy, as in other parts of the country, is knowledge intensive services. The dominant group of knowledge intensive services is Education, Health, Social Work and Recreational & Cultural services. GVA from the South West's knowledge economy was estimated at around £44 billion in 2004, just over half of the region's total GVA.

The South West's knowledge economy has expanded rapidly in recent years. Around 360,000 additional knowledge-industry jobs were created in within the South West between 1998 and 2005. At 2.6% a year, the South West's growth rate of knowledge employment was the highest among the British regions over this period.

Around 43% of total South West employment was in the three highest occupation groups (managerial, professional, associate professional & technical), just above the rate for the UK as a whole (42%) and the 3<sup>rd</sup> highest share among the UK regions. In 2006, around 167,000 people in the South West had NVQ level 5 qualifications (higher degrees), giving the region the 3<sup>rd</sup> highest share of workers with qualifications at this level among the UK regions. The South West also had the 4<sup>th</sup> highest share of workers with NVQ level 4 qualifications or above at this time (31.4% of all workers).

GVA from all knowledge intensive industries is projected to grow at an average rate of 7.3% a year (in current price terms) between 2006 and 2014. This reflects both strong employment growth and continuing productivity growth in these industries over this period.

Our projections suggest that the knowledge intensive industries will grow to dominate the regional economy over the next decade. These industries are projected to make up around 62% of regional GVA and 56% of total regional employment by 2014. The projections also suggest that knowledge intensive services will play an increasingly dominant role within the region's economy over this period.

There is, however, considerable uncertainty over growth prospects for the region's knowledge economy. Under a 'low growth' scenario, in which knowledge-industry productivity growth slows to that of the rest of the regional economy, the overall GVA growth rate for the regional economy slows from 5.9% a year in the baseline projections to around 5.4% a year, while under a 'high growth' scenario it rises to around 6.5% a year.

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## APPENDIX 1: TABLES

Table A1: South West Sub-Regional Employment in Knowledge Economy Industries

	2005			1998			Change 1998-2005		
	Employee Jobs	Share of total (%)	Rank	Employee Jobs	Share of total (%)	Rank	Employee Jobs	Average annual growth (%)	Rank
Bath & North East Somerset	82,062	48%	8	66,535	45%	8	15,527	3.0%	38
Bournemouth	81,748	51%	1	61,910	48%	2	19,838	4.1%	40
Bristol	229,945	50%	2	210,153	49%	1	19,792	1.3%	45
Caradon	22,651	36%	39	19,696	39%	41	2,955	2.0%	6
Carrick	46,047	47%	13	35,137	46%	11	10,910	3.9%	32
Cheltenham	55,767	48%	9	55,054	41%	15	713	0.2%	37
Christchurch	17,673	46%	16	15,328	48%	12	2,345	2.1%	36
Costwold	36,091	43%	22	28,935	43%	21	7,156	3.2%	22
East Devon	40,753	40%	38	32,540	40%	23	8,213	3.3%	19
East Dorset	29,960	37%	28	24,034	45%	19	5,926	3.2%	25
Exeter	84,921	46%	4	59,933	45%	4	24,988	5.1%	35
Forest of Dean	21,841	40%	31	22,907	38%	22	-1,066	-0.7%	30
Gloucester	63,294	49%	10	56,083	46%	3	7,211	1.7%	44
Isles of Scilly	1,044	26%	45	746	20%	45	298	4.9%	1
Kennet	26,454	41%	35	23,921	39%	25	2,533	1.4%	23
Kerrier	30,953	43%	25	24,326	43%	36	6,627	3.5%	8
Mendip	40,937	39%	30	34,233	40%	27	6,704	2.6%	17
Mid Devon	24,169	38%	42	20,468	33%	42	3,701	2.4%	4
North Cornwall	30,865	36%	33	26,172	33%	40	4,693	2.4%	7
North Devon	38,402	40%	23	33,040	34%	34	5,362	2.2%	15
North Dorset	23,217	39%	37	18,615	38%	43	4,602	3.2%	3
North Somerset	72,337	40%	19	59,738	36%	18	12,599	2.8%	28
North Wiltshire	47,603	43%	24	40,913	44%	26	6,690	2.2%	20
Penwith	19,792	40%	20	15,787	38%	30	4,005	3.3%	14
Plymouth	104,722	44%	11	90,682	42%	9	14,040	2.1%	39
Poole	68,011	46%	6	57,961	47%	7	10,050	2.3%	41
Purbeck	15,395	46%	32	13,491	42%	24	1,904	1.9%	24
Restormel	35,700	34%	34	29,151	35%	33	6,549	2.9%	12
Salisbury	51,808	48%	5	41,369	44%	13	10,439	3.3%	33
Sedgemoor	41,286	33%	41	31,573	36%	39	9,713	3.9%	5
South Gloucestershire	137,994	45%	3	90,903	44%	6	47,091	6.1%	31
South Hams	33,689	40%	26	24,845	35%	32	8,844	4.4%	11
South Somerset	65,249	45%	15	54,820	44%	14	10,429	2.5%	34
Stroud	41,749	47%	21	35,928	46%	20	5,821	2.2%	26
Swindon	110,647	45%	12	106,152	45%	10	4,495	0.6%	42
Taunton Deane	55,683	45%	14	44,571	40%	17	11,112	3.2%	29
Teignbridge	40,569	36%	36	33,996	36%	38	6,573	2.6%	9
Tewkesbury	34,636	47%	7	25,530	44%	16	9,106	4.5%	27
Torbay	47,266	43%	18	40,211	48%	5	7,055	2.3%	43
Torrige	17,389	41%	43	16,029	36%	37	1,360	1.2%	10
West Devon	16,088	37%	44	13,531	36%	28	2,557	2.5%	16
West Dorset	40,764	46%	17	35,590	40%	29	5,174	2.0%	18
West Somerset	11,399	35%	40	9,530	32%	44	1,869	2.6%	2
West Wiltshire	50,884	41%	29	49,435	32%	35	1,449	0.4%	13
Weymouth & Portland	18,259	42%	27	17,069	38%	31	1,190	1.0%	21

Source: SWBEM based on ONS Annual Business Inquiry (NOMIS)

## SW BEM

The Business and Economy Module of the South West Observatory provides a dynamic source of economic and business research and intelligence, with comprehensive data and analysis to support regional development and evidence based decision making. To improve the availability of regional data the Business and Economy Module has developed a set of Regional Accounts which are freely available to all. For further information please visit the Business and Economy Module website ([www.swo.org.uk/bem](http://www.swo.org.uk/bem)).

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