Connect

Bank of Ireland UK
Northern Ireland's Enterprise Bank



# 2016 KNOWLEDGE ECONOMY REPORT.
# TRACKING PROGRESS.
# POWERING PROSPERITY.

#KnowledgeEconomy

Catalyst Inc

Ulster University
Economic Policy Centre

# So, how's our future looking?

"...the potential to deliver a greater prize than Northern Ireland has ever experienced before"

Knowledge economies use information and intelligence to unlock opportunity and power prosperity. Academic institutions, investors and business R&D are important foundations for all knowledge economies, but so too are the people developing and applying the innovations commercially. If we can align all their efforts they have the potential to deliver a greater prize than Northern Ireland has ever experienced before – its evolution into one of Europe's most entrepreneurial knowledge economies by 2030.

It's a future where ideas are the new linen; software development, the new ship building and brainpower our new muscle.

Steve Orr







# The beating heart of our ambition

The development of Northern Ireland's knowledge economy is a fundamental building block for sustainable success. It's also at the heart of Connect's ambition, so to ensure this sector is growing and moving in the right direction we commission an annual state of the nation field study.

The NI Knowledge Economy indicator framework is based on the renowned San Diego CONNECT model, which is entrepreneurial and private sector focused.

**A total of twenty-one indicators make up the framework under these subheadings:**

**– Core indicators**
**– Investment**
**– R&D**
**– Innovation & patent activity**

While measuring Northern Ireland's progress against past performance is important, tracking how we perform compared to other regions in the UK lets us gauge how we are doing in context. There's no point taking satisfaction in beating our personal best if it isn't competitive in the actual race.

**We measure our indicators against the same criteria in 11 other UK regions.**

We commission the Ulster University Economic Policy Centre to measure and produce the Knowledge Economy Report and assess the relative health of the knowledge economy in NI. We've been doing this annually since 2013.



# What is a knowledge economy?

Knowledge economies are powered by individuals, companies and sectors that create and commercialise new ideas, technologies, processes and products to export around the world. To maintain their competitive advantage, these companies constantly strive to remain at the forefront of their industry by recruiting highly skilled individuals, investing in R&D, encouraging creativity and seeking out new markets.

# Why it matters to everyone in NI

The knowledge economy is a vital element of every developed economy around the world as it contributes to and enhances their global competitiveness. This in turn increases their level of economic growth and through a downstream effect increases the wealth and prosperity of people living there – and not just those directly involved with the knowledge-based businesses. Retail, hospitality and construction are just three sectors that benefit from the knowledge economy's growth.

"The knowledge economy is a vital element of every developed economy around the world as it contributes to and enhances their global competitiveness."

# What sectors does it include?

Defining the business types that come under the umbrella phrase 'knowledge economy' is much-debated. To give our study rigour and integrity we use the sectors identified by the CONNECT organisation in San Diego with some customisation for the Northern Irish context. Our overall strategic model is based on San Diego's, so adopting their definition of a knowledge economy seemed a logical, natural choice. That means the sectors we include are both knowledge intensive and export oriented – those with the greatest potential to sell high value goods and services across the globe, generating additional income for the companies and employees in NI.

## THE SECTORS

- Pharmaceuticals and biotechnology
- Medical devices
- Software & digital content
- IT Services
- Creative content & digital media
- High-tech financial services
- Other technical services
- Aerospace and other transport equipment
- Telecommunications
- Computing & advanced electronics

# 2016 Headlines

If you only have time to read one page of this report, this is the one.

## HIGH SCORES

JOBS CREATED
**39,499**

BUSINESS STOCKS
**2,950**

R&D JOBS
**6,000**

M&A ACTIVITY
**130**

BUSINESS STARTS
**435**

RESEARCH GRANTS AND CONTRACTS
**£99m**

INNOVATION ACTIVE FIRMS 45%

This latest study recorded our highest knowledge economy numbers ever.

ALMOST
**10%**

OF THE NI ECONOMY DEPENDS ON THE KNOWLEDGE ECONOMY

**1 IN 11**

PEOPLE ARE EMPLOYED DIRECTLY OR INDIRECTLY BY THE KNOWLEDGE ECONOMY

ALMOST
**1.5X**

KNOWLEDGE ECONOMY WORKERS EARN ONE AND A HALF TIMES THE AVERAGE WAGE

**82%**

OF KNOWLEDGE ECONOMY SALES ARE DONE OUTSIDE NI

KE SALES
**£5BN**

£2.9BN EXPORTS
£1.2BN TO GB
£0.9BN IN NI

**2ND**

NORTHERN IRELAND'S KNOWLEDGE ECONOMY IS THE 2ND FASTEST GROWING OUT OF 12 UK REGIONS

**70%**

OF EXPORTS ARE OUTSIDE THE EU: A POSITIVE POST-BREXIT

**11/21**

RECORD HIGHS FOR 11 OF THE 21 INDICATORS

**11TH**

NORTHERN IRELAND'S KNOWLEDGE ECONOMY IS RANKED 11TH OUT OF 12 UK REGIONS

# Tracking out progress against aspirational targets.

We set 21 yearly targets across our four indicator areas (Core; investment; R&D; innovation), and if the targets were achieved an additional 40,000 direct jobs and £5bn of GVA would be created plus 40,000 downstream jobs and an additional £3bn of GVA.

-IF THE TARGETS WERE ACHIEVED -

**40,000** direct jobs
**£5bn** of GVA

**40,000** downstream jobs
**£3bn** of GVA





## We're doing good

ahead of target on 9 indicators

- Number of knowledge economy start up businesses
- Number of VC investment deals
- M&A and ECM deals
- Proportion of innovation active firms
- Number of R&D personnel
- Number of patent applications per head of population
- Number of high tech patent applications per head of population
- Total expenditure on business R&D
- Total expenditure on R&D



## We're doing okay

on target with 5 indicators

- Knowledge economy employees
- HEI research grants and contracts
- Private equity investment
- Knowledge economy business
- Knowledge economy exports (£M)



## We could do better

behind target on 7 indicators

- VC investment: total £ amount
- Number of publicly listed companies
- Number of science and tech graduates
- Knowledge economy wage premium
- Number of PhDs per annum
- Knowledge economy productivity (nominal £)
- Knowledge economy GVA (nominal £)

# Our knowledge economy is vital. Here's why.




- Employs one in eleven people directly or indirectly
- Responsible for 85% of all sales outside NI
- Productivity levels are more than one third higher than the economy-wide average, helping to drive international competitiveness
- Wages are almost one and a half times above the NI average
- The downstream effects of the knowledge economy are seen in how companies and employees spend their earnings. Higher wages equals more disposable income
- For every person employed in the knowledge economy nearly one more full time job will be created elsewhere in different sectors. And for every pound generated, an additional 61 pence will be created elsewhere

The knowledge economy creates highly paid, sustainable jobs that require intelligence, insight and flexibility.

It's export intensive and generates income from outside NI. With 70% of it coming from outside the EU, it's less exposed to Brexit fallout.

International evidence demonstrates that countries who invest heavily in R&D have better than average standards of living. NI has been successful in catching up to UK average levels of R&D in recent years.



# The knowledge economy helps NI meet its challenges head-on.




1 **Inspires a generation**
It inspires the kids of today by giving them ambition for tomorrow.

2 **Happiness and wellbeing**
New ideas and knowledge unlock amazing opportunities, resulting in improved economic wellbeing and increased quality of life.

3 **More competitive. More attractive.**
A healthy knowledge economy boosts the competitiveness of NI, making it more attractive to inward investors.

4 **Values a wider range of skills**
The knowledge economy values creativity and design, not just ingenuity and technical savvy.

5 **Downstream spending**
The wider impact of the knowledge economy is felt through the supply chain purchases made by these companies (the indirect effects) and through the expenditure of employees' wages earned from knowledge economy companies.

6 **Rebalance public/private sector employment levels**
The knowledge economy can contribute to regionally balanced economic growth throughout NI towards higher value added sectors.

It can also provide additional core public service funding as Increased levels of economic activity will result in a broader tax base.

# NI Knowledge Economy Index: 2016 findings / Positives

Northern Ireland's knowledge economy is the second fastest growing region (Fig. 1), bettered only by Scotland.

Scotland's more rapid growth is driven by:
– Business stocks
– Business starts
– Investment indicators
– R&D activity
– PhDs awarded

**In contrast, NI's growth is powered by:**
– A flurry of investment activity
– Patent applications
– Business stocks and starts

KNOWLEDGE ECONOMY WAGES ARE

**45%**

HIGHER THAN THE NI AVERAGE

**80%**

KNOWLEDGE ECONOMY SALES ARE OUTSIDE NI

**40,000**

PEOPLE ARE EMPLOYED IN THE KNOWLEDGE ECONOMY



Fig. 1

Knowledge Economy growth by UK region
2009 - 2016

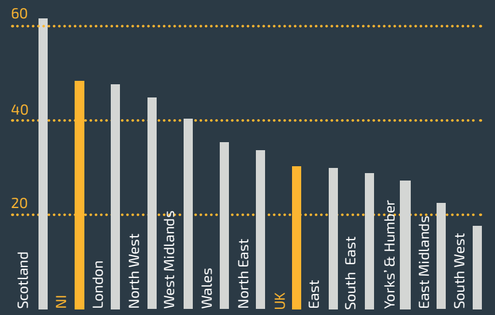



Fig. 2

Knowledge Economy Sales
Pie Chart



- Exports £2.9Bn
- GB sales £1.2Bn
- NI £0.9Bn

**Employment**
Almost 40,000 people are employed in knowledge economy companies. That's 4.6% of the entire NI employment population.

**Income**
Wages in NI's knowledge economy are almost 1.5 times the NI average wage. The NI average is £22K, while our knowledge economy average is £28K.

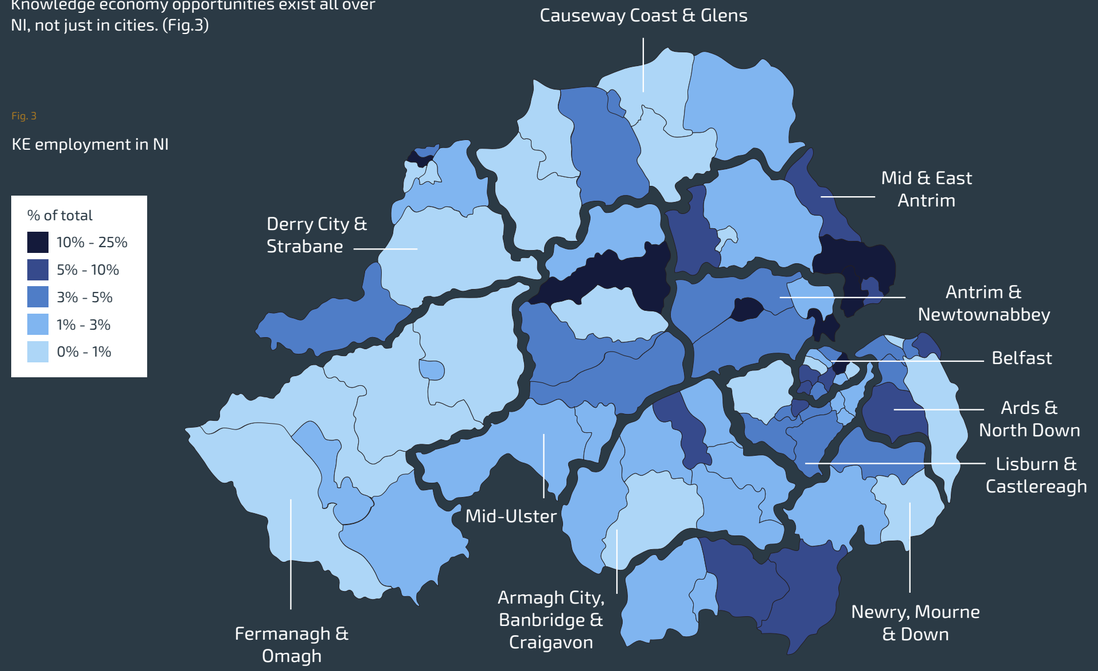
**Exports**
80% of knowledge economy sales come from outside NI, bringing money into the economy, not just recirculating within it. (Fig.2)

## Accessibility

Knowledge economy opportunities exist all over NI, not just in cities. (Fig.3)

Fig. 3

KE employment in NI






## The Downstream Effect

The downstream effect creates one indirect job for every knowledge economy job. Here's a breakdown of where they occur. (Fig.4)

## Biggest players

Aerospace & Transport and Computing & Advanced Electronics are the most externally focussed knowledge economy sectors. Together they represent 2/3 of all KE exports - 43% in Aerospace & Transport and 26% in Computing & Advanced Electronics. Aerospace & Transport exports have grown consistently since 2011, while all computing and related sectors have witnessed a slowdown.

## Investment

Investment activity is strong with NI ranked first in two indicators and third in another.



Fig. 4

Trickle-down wealth breakdown

| Sector | Proportion of downstream jobs |
|---|---|
| Professional scientific & technical | 27% |
| Admin' & support services | 13% |
| Wholesale & retail | 12% |
| Restaurants and hotels | 10% |
| Transport & storage | 9% |
| Information & communication | 5% |
| People employed by households | 4% |
| Construction | 3% |
| Finance & insurance | 3% |
| Agriculture | 2% |
| Manufacturing | 2% |

# NI Knowledge Economy Index: 2016 findings / Negatives

In general, the data for outcome indicators is more subdued for the latest year available, pointing to a relative "levelling out" in the knowledge economy.

**Deterioration in some indictors including;**

- £400m (-2%) reduction in direct GVA between 2013 & 14
- Our knowledge economy drives 9.7% of total GVA
- Productivity declined by almost £6k per employee to £50,583, lower than in 2009.
- PhD numbers continue to fall
- Investment values are relatively small and have fallen from 2012/13 peak

THE AVERAGE WAGE REDUCED FROM £29,391 TO

**£28,217**

PRODUCTIVITY (PER EMPLOYEE) DECLINED TO

**£50,583**

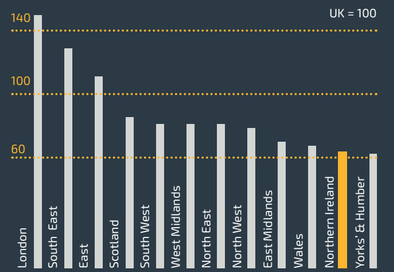
OUR KNOWLEDGE ECONOMY DRIVES

**9.7%**

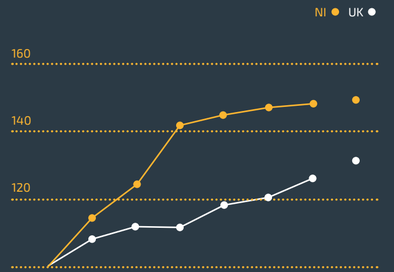
OF TOTAL GVA DOWN FROM 10.3%



NI's knowledge economy is 11th in size, down from 10th in 2015.




NI & UK Knowledge Economy growth
2009 = 100




# Challenges

Northern Ireland has continuously sought to increase sustainable employment, create well- paid jobs and boost competitiveness.

The knowledge economy will be important in helping to reposition the overall NI economy towards the private sector. However, growing a highly productive and externally oriented private sector should be the ultimate goal, generating wealth from outside, creating sustainable jobs with high wages and disposable income that can be spent locally. Increased economic activity will result in a deeper and broader tax base, which can then be used to fund public services.

**More PhDs**
PhDs fuel the knowledge economy, which is why measures were put in place in 2015 to address the declining number undertaken. It will be several years before we see the benefit of this strategy impacting positively on the index.

**Higher value deals**
And while the number of deals done looks impressive at first glance, but dig a bit deeper and you'll discover the relatively low levels of financial investment. The focus therefore should be on the value of deals, not the number.

**R&D momentum**
R&D performance is encouraging but it hasn't gone unnoticed that a small number of large companies can impact significantly on investment values. It is imperative to broaden the base of enterprises that are involved in R&D to lessen the risk to NI.

# Summary

### Export income
The knowledge economy generates significant income from sales outside NI, helping to grow the economy and create highly skilled, well paid and highly productive employment opportunities.

### Widespread wealth
The majority of knowledge economy firms are located in and around the cities and along motorway corridors, but there is also a spread across rural areas, providing employment opportunities and helping to promote regional growth.  The spill-over effect also generates an additional job in the wider economy for every knowledge economy job – in shops, trades, logistics and restaurants.

The Knowledge Economy Index demonstrates that NI has one of the fastest growing in the UK and is ranked 11th of the UK regions. The most recent data shows that NI moved down the regional rankings in seven of the indicators and improved in seven others.

The challenges will be to boost knowledge economy activity at a pace that exceeds other regions and then to translate this activity into economic outcomes in terms of employment and wage growth.



> “...growing a highly productive and externally oriented private sector should be the ultimate goal, generating wealth from outside, creating sustainable jobs with high wages and disposable income that can be spent locally”

### Educating for the knowledge economy of the future
NI’s education system must be aligned to the requirements of the knowledge intensive economy. The curriculum must focus on technological skills, problem solving and learning activities to help develop a flexible and adaptable workforce.

Funding for subject areas that are in demand from the knowledge economy should be protected by Government and supplemented by support from the private sector in terms of bursaries, scholarships or philanthropic funding.

### Rebalancing the economy
The Knowledge Economy will be important in helping to rebalance the NI economy. Growing a larger private sector is important, however, growing a highly productive and externally oriented private sector should be the ultimate goal, generating wealth from outside, creating sustainable jobs with high wages and disposable income that can be spent locally. Increased economic activity will result in a deeper and broader tax base, which can then be used to fund public services.

### Insulating NI against a ‘hard Brexit’
With more than two thirds of knowledge economy exports going outside the EU, the sector is particularly important in generating income from markets that will be less impacted by the Brexit negotiations.  Indeed, a more competitive exchange rate in the short term will provide a boost to many knowledge economy companies – especially those in the service sector that have a lower propensity to import.

### Setting records
In nine of the 21 indicators that make up the index, NI achieved record highs over the last year.

### The R&D challenge
With a small number of large firms carrying out the lion’s share of R&D, NI is particularly exposed to the investment decisions of these rms. The challenge is to continue to broaden the R&D base.



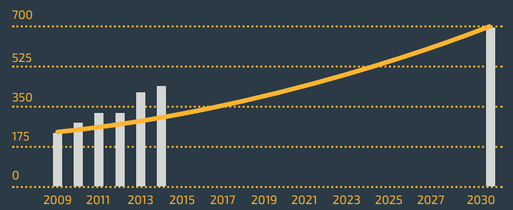
# Appendix



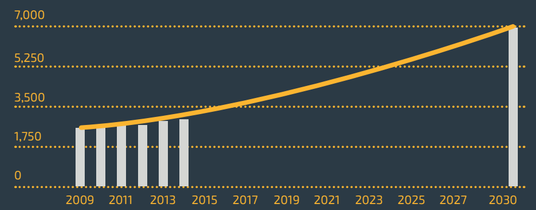
## Summary of core indicators

| Knowledge Economy Core characteristics (CONNECT definition) | Regional ranking | Position since last year | Previous data | Latest data | Latest year | Source |
|---|---|---|---|---|---|---|
| KE employment, as % of total employment | 9 | ^ | 4.5% | 4.6% | 2015 | COE (NI), BRES (GB) |
| KE businesses, as of total business stock | 12 | = | 5.1% | 5.3% | 2014 | IDBR |
| KE businesses start ups per 100,000 population | 12 | = | 22.4 | 23.6 | 2014 | IDBR / NOMIS |
| Knowledge Economy median wage level | 11 | v | £29,391 | £28,217 | 2015 | ASHE |

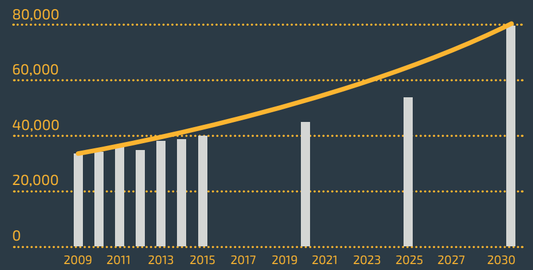
## No. Knowledge Economy business start-ups



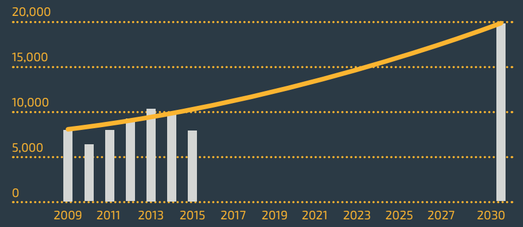

## No. Knowledge Economy businesses



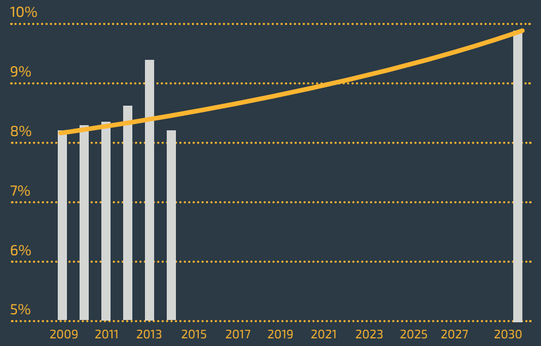

## No. Knowledge Economy employees



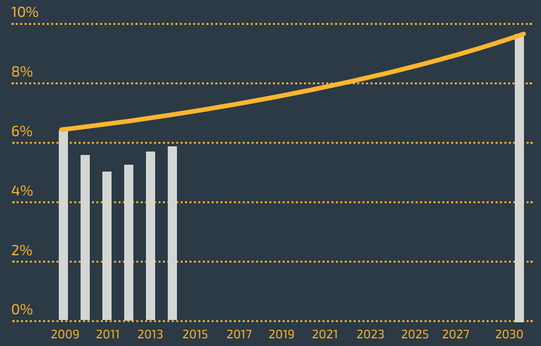

## Knowledge Economy average wage premium



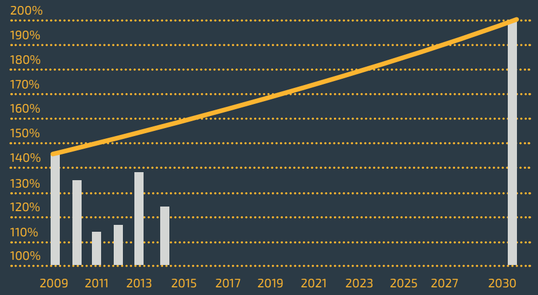

## Knowledge Economy exports as a % of GVA




## Knowledge Economy GVA as a % of total (nominal £M)




## Knowledge Economy productivity premium relative to NI average

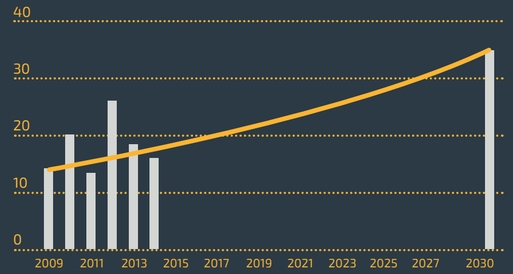


It should be noted that the venture capital investing data for NI is fairly poor. And it's not just our opinion. Government research has also found the data lacking. Investments made by funds located outside NI may not be recorded in the available statistics, so they should be treated with caution at best, scepticism at worst.

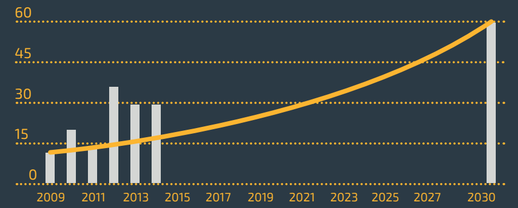
## Summary of investment activity

| Investment Activity | Regional ranking | Position since last year | Previous data | Latest data | Latest year |
|---|---|---|---|---|---|
| No. of private equity and VC investments (no. of companies) | 9 | ^ | 34 | 31 | 2014 |
| No. of private equity inv' per 100,000 VAT registered businesses | 1 | ^ | 61 | 56 | 2014 |
| No. of venture capital inv' per 100,000 VAT registered businesses | 1 | ^ | 52 | 52 | 2014 |
| Amount of VC investment, £m | 11 | v | £5.1 | £5.0 | 2014 |
| No. of M&A and ECM deals per 100,000 VAT registered businesses | 3 | ^^ | 159 | 234 | 2015 |
| Public listed companies: Market capitalisation per head | 12 | = | £294.5 | £461.8 | 2016 |

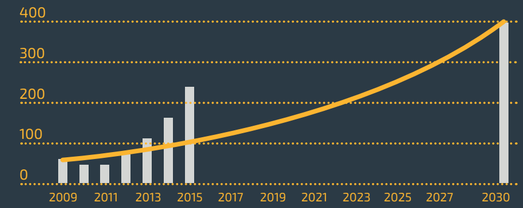
No. private equity investments (companies)



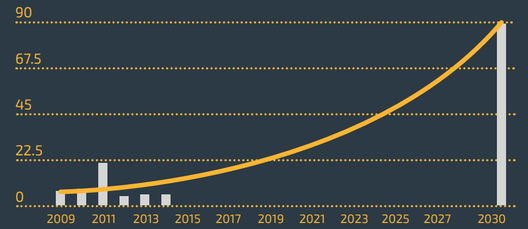

No. venture capital investments (companies)



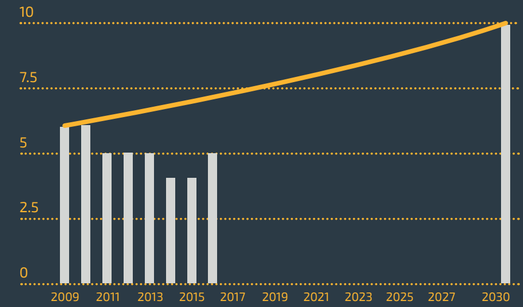

M&A and ECM activity (deals)



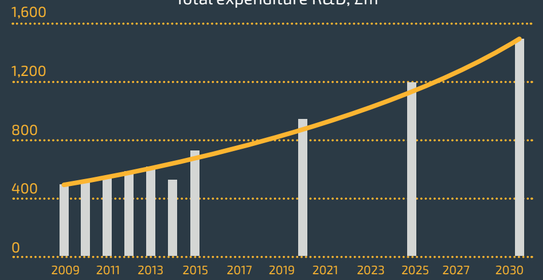

Venture capital investment (£m)



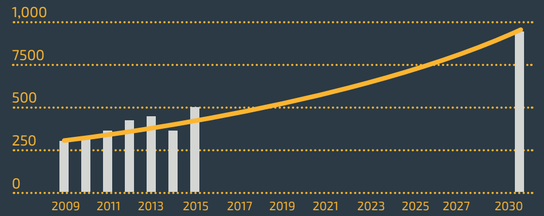

No. Public Listed Companies



Total expenditure R&D, £m




Total expenditure on business R&D, £m



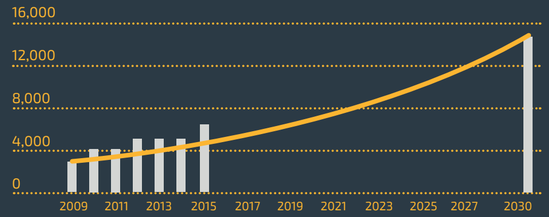

## Summary of R&D activity

| R&D Activity | Regional ranking | Position since last year | Previous data | Latest data | Latest year | Source |
|---|---|---|---|---|---|---|
| R&D as % of workplace based GVA | 8* | ⌄⌄ | 1.8% | 2.1% | 2015 | NI R&D survey |
| Business Expenditure on R&D as % of workplace GVA | 5 | ⌃⌃ | 1.0% | 1.4% | 2015 | NI R&D survey |
| Business R&D personnel as % of total employment | 3 | ⌃⌃ | 0.6% | 0.7% | 2015 | NI R&D survey |
| No. of PhDs per million inhabitants | 11 | ⌄ | 269 | 232 | 14/15 | HEIDI |
| HEI Research grants and contracts per 1,000 population | 10 | ⌄ | £48.0 | £53.5 | 14/15 | HEIDI |
| No. of science and tech graduates (NVQ Level 4+) as % of workforce | 12 | – | 22% | 18% | 2016 | LFS |

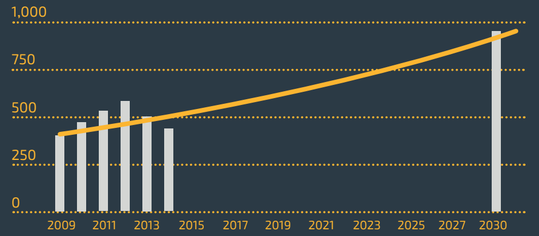
*The ranking relates to 2014 data as total expenditure on R&D for 2015 for the UK regions has not yet been published



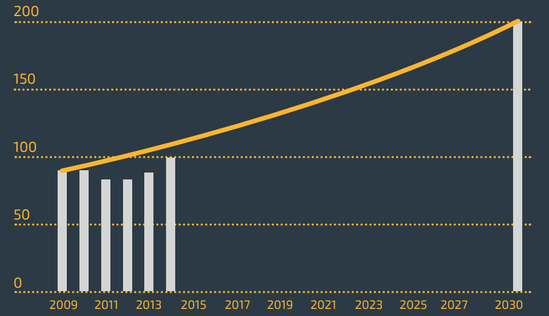
No. R&D personnel



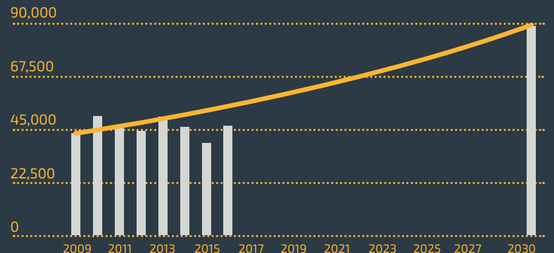

No. PHDs awarded per annum




HEI research grants & contracts, £m




No. Science and Tech' graduates (NVQ Level 4+)

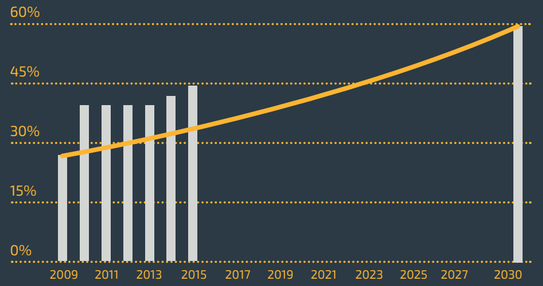


## Summary of innovation and patent activity

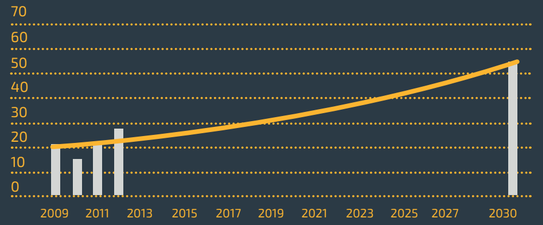
| Innovation and Patent Activity | Regional ranking | Position since last year | Previous data | Latest data | Latest year | Source |
|---|---|---|---|---|---|---|
| % of firms stating that they are innovation active | 11 | ^ | 40% | 45% | 2015 | UK Innovation Survey |
| No. of patent applications per million inhabitants (to EPO) | 9 | ^ ^ ^ | 44 | 54 | 2012 | OECD |
| No. of high technology patents per million inhabitants (to EPO) | 6 | ^ ^ ^ ^ ^ | 23 | 28 | 2012 | OECD |
| No. of patent applications filed per million inhabitants (to UK IPO) | 12 | – | 122 | 111 | 2015 | UK IPO |
| No. of patent granted per million inhabitants (to UK IPO) | 12 | – | 15 | 17 | 2015 | UK IPO |



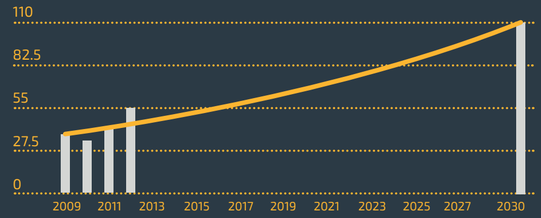
Proportion of firms innovation active




No. high tech patent applications, per million inhabitants




No. patent applications, per million inhabitants



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