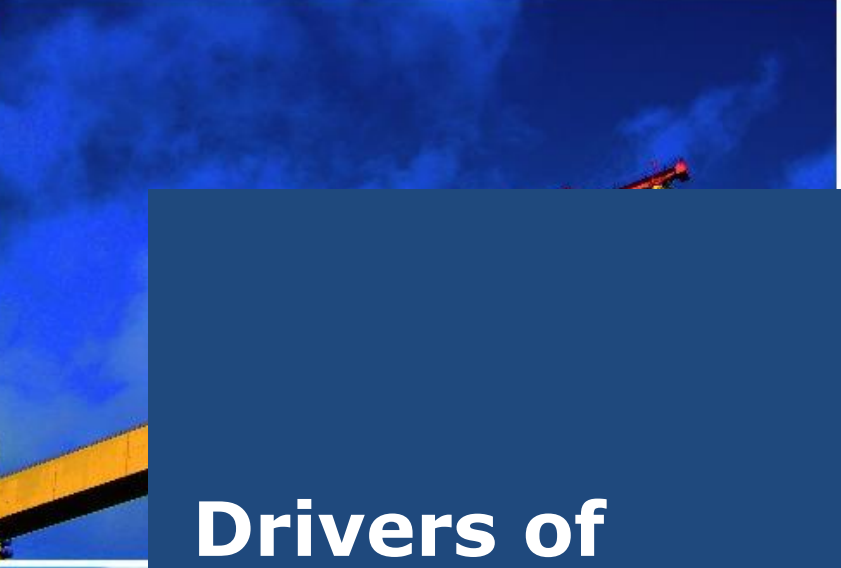




Drivers of Competitiveness in Northern Ireland

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Table of Contents

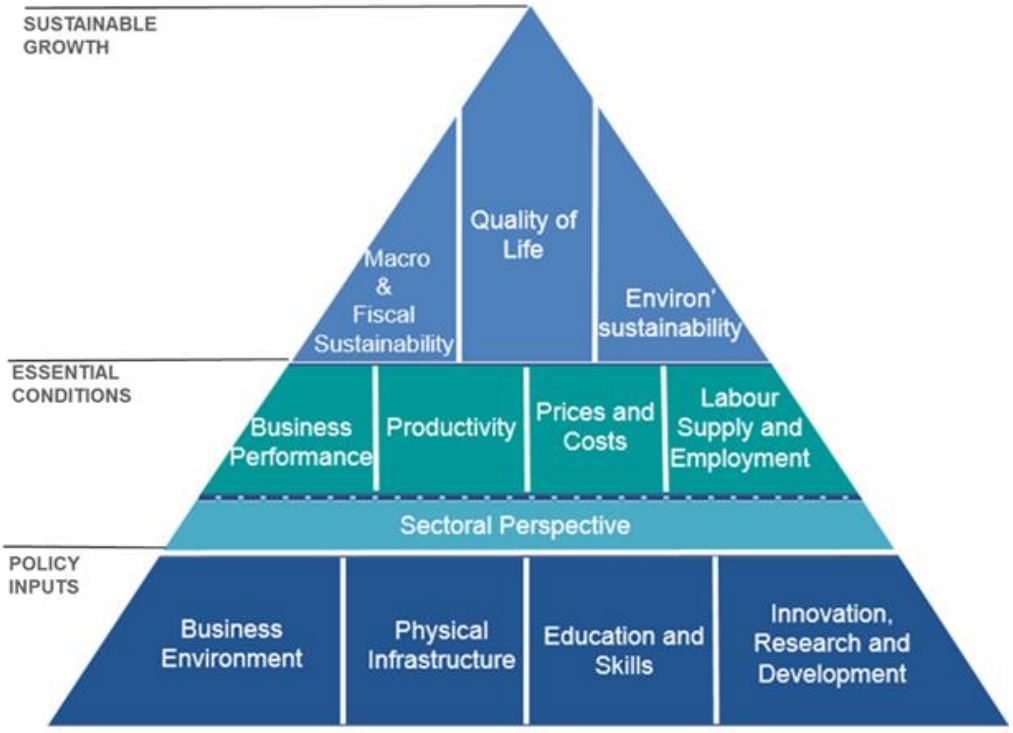
1 Executive summary

1.1.1 In 2016, the Ulster University Economic Policy Centre (UUEPC) created and published a Competitiveness Scorecard report for NI[1]. This Scorecard benchmarked NI's competitiveness relative to a range of European and OECD countries over a five-year period across more than 150 indicators.

1.1.2 The UUEPC has updated the Policy Inputs tier (Figure 1) of the Competitiveness Scorecard, as these are the main drivers of competitiveness in NI. The Policy Inputs tier is made up of four pillars which are;

- Business Environment;
- Physical Infrastructure;
- Education and Skills; and
- Innovation, Research and Development.

Figure 1: UUEPC Competitiveness Scorecard



Source: UUEPC

1.1.3 This research identifies several positive findings for NI. These include the improvement in relative competitiveness in the business environment and infrastructure pillars, driven by UK reserved policy matters such as regulation in the main for business environment and the technological improvements in the case of the infrastructure pillar.

[1] Competitiveness Scorecard for NI (2016) available at: www.ulster.ac.uk

1.1.4 The erosion of competitiveness in the skills & education pillar is of most concern, as it is now the weakest of the four pillars and on a downward trajectory as competitor nations are improving much more rapidly that outputs in NI, with the result that competitiveness has slipped over the last decade. If not dealt with in the immediate period these issues have longer-term implications for employment opportunities, wage levels and potential continued and further disengagement from the labour market for some.

1.1.5 R&D&I is a mixed picture, with recent improvements in R&D evident. However, these improvements have not yet translated into more innovative activity or patents being granted. NI needs to ensure it provides a competitive and well skilled and educated workforce along with attractive infrastructure to maintain domestic companies that are engaging in R&D&I and attract FDI companies.

1.1.6 When all the evidence is considered, over the last decade and across all four pillars, the key finding is that NI's relative competitiveness has increased marginally as improvements in the technological infrastructure and business environment have outweighed the decline in skills and education. Despite this improvement, more than half of the competitor nations are still more competitive than NI, outlining the scale of the challenge if it is to deliver upon the economic aspirations in the Programme for Government and the Economic Strategy.

1.1.7 As NI faces the challenges that Brexit and the fourth industrial revolution are likely to bring, and politicians and policy makers begin to implement the New Decade, New Approach[2] in the recently restored NI Executive, it is essential that NI focusses on the areas of greatest need in order to boost future competitiveness and sustainability.

1.1.8 This research outlines a number of areas where policy attention is required in the immediate term. Most specifically in education and skills, focussing on the outputs and attainment levels in the education system and addressing lifelong learning and low qualifications within the workforce as NI prepares for a more automated and constantly evolving future of work. Innovation, seed capital, and physical infrastructure are all areas in which NI could boost competitiveness with carefully considered investments. The Competitiveness Fund that was launched in the New Deal, New approach document should consider the findings of this and other competitiveness research in order to identify priorities for the future and areas for further research.

1.1.9 These findings highlight a modest improvement in the drivers of competitiveness over the last decade, but there is much to do order to build sustainability and resilience into the NI economy.

[2] https://static.rasset.ie/documents/news/2020/01/new-decade-new-approach.pdf

2 Introduction

2.1 Background

2.1.1 UUEPC have updated the Policy Inputs tier of the 2016 Northern Ireland Competitiveness Scorecard. The policy inputs tier is made up of four pillars which are each made up of several indicators. The four pillars of the Policy Inputs tier are:

- Business Environment;
- Physical Infrastructure;
- Education and Skills; and
- Innovation, Research and Development.

2.1.2 These pillars are the drivers of competitiveness and the areas in which policy interventions can have the most direct and immediate impact. From this perspective, these are the areas in which NI has, in most instances, devolved policy control and therefore influence to create positive change.

2.1.3 In their response to the 2016 Scorecard, the members of the NI Economic Advisory Group (EAG) expressed the view that the issue of competitiveness should be the central focus of the EAG's research agenda going forward. They asked for further analysis and reporting to provide greater transparency into the competitiveness of the various factors that contribute to the NI economy.

2.2 What is competitiveness and why is it important?

2.2.1 There is no internationally agreed definition of economic competitiveness, however the World Economic Forum (WEF) defines competitiveness as ***"the set of institutions, policies, and factors that determine the level of productivity of a country"***.[3] The level of productivity in turn determines the level of prosperity and rates of return to investments (capital and labour), which are the fundamental drivers of growth rates. In conclusion, the WEF states that ***"a more competitive economy is one that is likely to grow faster over time."***

2.2.2 The IMD Competitiveness yearbook uses a similar approach, measuring ***"how well countries manage all their resources and competencies to facilitate long-term value creation."***[4] Overall competitiveness can mean how well a country is doing relative to another country or groups of countries, or it relates specifically to a country's performance in terms of international

[3] http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2014-15.pdf
[4] http://www.imd.org/news/IMD-releases-its-2015-World-Competitiveness-Ranking.cfm

trade, or it can relate to whether a country is performing at its maximum economic potential.

2.2.3 Competitiveness matters a great deal for the growth trajectory of an economy and the wealth of its citizens, whichever definition is used. Indeed, in response to recent fiscal crises European leaders have suggested ***"Setting up common standards in the field of "labour markets, competitiveness, business environment and public administrations, as well as certain aspects of tax policy"***. These common standards would also require ***"setting up independent competitiveness authorities within each [of the EU countries], and would co-ordinate at EU level to ensure, for instance, consistent wage developments."***[5]

2.3 Economic context in NI

2.3.1 The NI economy has performed strongly over the last number of years, creating almost 113,000 net additional jobs since Q3 2012. The recent labour market indicators have shown continued improvement, despite the ongoing uncertainty surrounding Brexit. Employment levels and rates reached a record high of 848,000 and 72.6% for those aged 16-64 in September-November 2019. ILO unemployment levels of 20,000 and a rate of 2.3% in September-November 2019 also marked a new record - the joint lowest since record began.

2.3.2 The strong performance in the NI labour market has also led to record breaking levels of economic output, with £40.5bn of GVA in 2017. However, GVA has dipped since this record high in 2017 to the current level of £40.1bn a likely follow on from the uncertainty around 'Brexit'. Since the end of the recession in 2010, the economy has grown at a modest rate of 1.7% per annum.

2.3.3 Despite the recent strong growth in the NI economy there is still a great level of uncertainty overhanging the UK and NI economy in the form of 'Brexit'. The UUEPC Summer 2019 Outlook forecast that growth will continue, albeit at a much-reduced rate (1.2%), between 2019-22. This growth is based upon the UK agreeing on a deal and achieving a 'smooth transition' out of the EU.

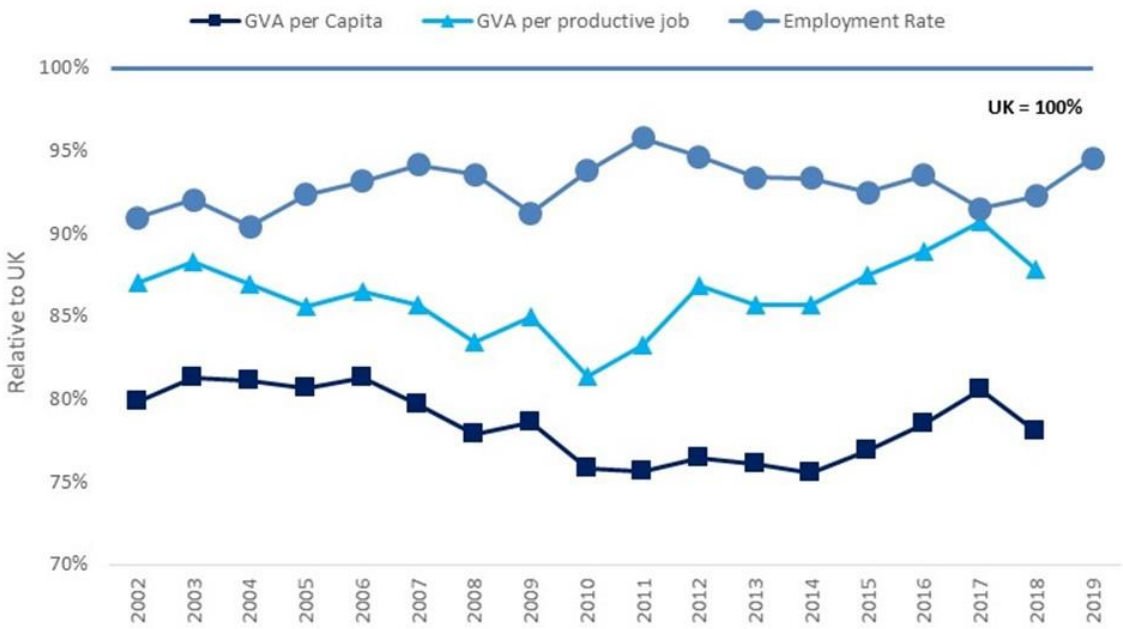
2.3.4 The potential impact of Brexit, historical competitiveness challenges and relatively lower standards of living mean that competitiveness must remain high on the policy agenda, as NI strives to improve in a challenging global environment.

[5] http://www.policy-network.net/pno_detail.aspx?ID=4922&title=The-eurozones-changing-philosophy-and-what-it-means-for-Britain

2.4 Existing and future economic challenges

2.4.1 Over the last decade, NI's key economic aspiration has been to achieve UK average levels of wealth. This ambition is indicated within the draft Programme for Government[6] to rebalance the NI economy towards more and higher value-added employment. Figure 2 shows the scale of the challenge. Lower average levels of wealth in NI are driven by lower employment rates (relatively fewer people in employment) and lower productivity (workers producing less per hour and a lower concentration of employment in high productivity sectors).

Figure 2: Relative GVA per capita, productivity & employment rate (UK=100), NI, 2000-17



Source: ONS, BRES & UUEPC
Note: Productivity and GVA data are not available for 2019

2.4.2 NI's relative competitiveness will, in its widest sense, be the ultimate determinant of economic success as it allows firms to compete internationally, deliver sustainable wages for employees and higher standards of living. This update examines NI's competitive position in comparison to 2016, illustrating NI's current position and determines progress and/or setbacks in recent years.

[6] https://www.northernireland.gov.uk/consultations/draft-programme-government-framework-2016-21-and-questionnaire

3 Interpreting the competitiveness scorecard

3.1 How to interpret charts and summary tables

3.1.1 All charts and infographics are constructed with the objective of presenting information to the reader in a way that is easily accessible and understood. However, some indicators are challenging to interpret, and the following guidelines will be useful when interpreting charts and infographics:

1. The most competitive countries are on the left of the charts. At a quick glance, if NI is located on the left of a chart, it is relatively competitive and vice versa.
2. A low ranking is competitive. If NI is ranked 1, it is the most competitive of the countries analysed.
3. Ranking are colour coded. The total number of countries is provided to provide perspective and rankings are coded green for top third of rankings, amber for middle third and red for bottom third.
4. Where data are available, the UK, Ireland and EU/OECD averages are highlighted alongside NI for ease comparing NI's relative performance.
5. Direction of change is used to show whether an indicator has improved, remained stable or deteriorated in absolute terms over the past five years where data are available.
6. Change in percentile is used to standardise NI's relative position as the number of countries available varies by indicator. The change in percentile(s) is denoted by the number of arrows i.e. two upward arrows represents an improvement of two percentiles.
7. It should be noted that the charts will not always include the full list of countries for which data is available (sometimes more than 35). Country selections are based on the NCC approach.
8. Spider charts are included in the summary for each element of the pyramid. A percentile ranking of 1 (i.e. being close to the centre of the spider diagram illustrates that NI is relatively competitive and vice versa.
9. Each indicator within the Scorecard is weighted equally.

4 Competitiveness of NI's policy inputs tier

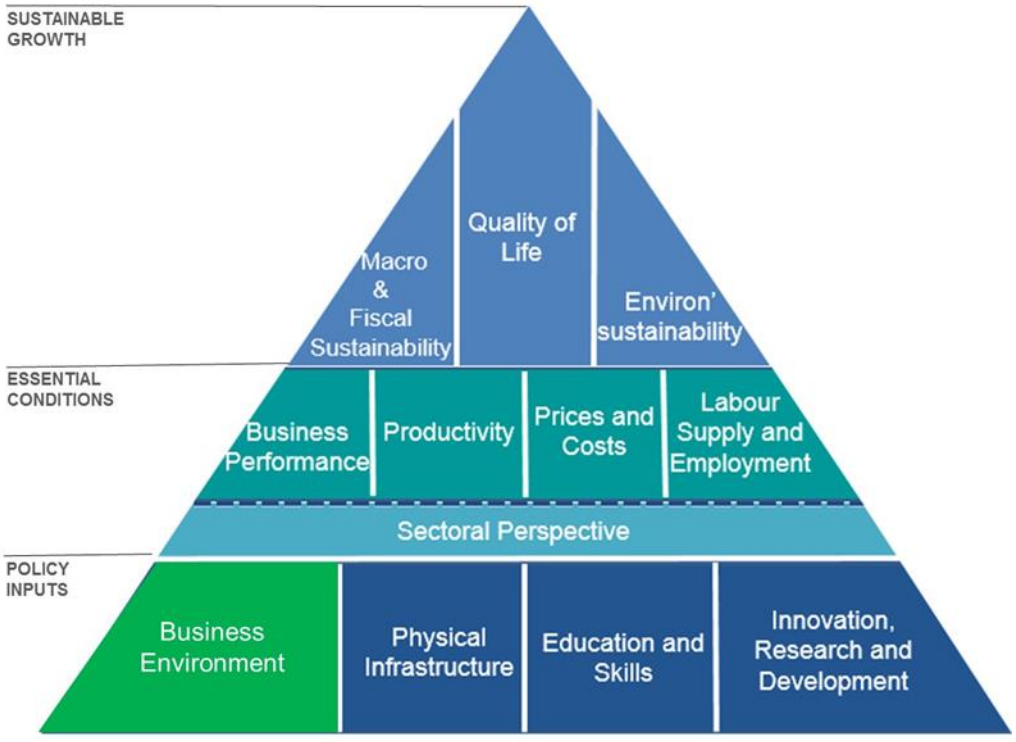
4.1.1 Policy inputs contribute to future economic competitiveness and are the areas in which policy makers can have the greatest impact.

4.1.2 The four elements contained within the policy inputs section are;

- Business Environment;
- Physical Infrastructure;
- Education and Skills; and
- Innovation, Research and Development.

4.1 Business environment

4.1.1 The business environment must be conducive, imbue confidence and expectations of good quality and high standards, and should not impose unnecessary restrictions or costs on firms in order for firms to compete successfully in international markets.

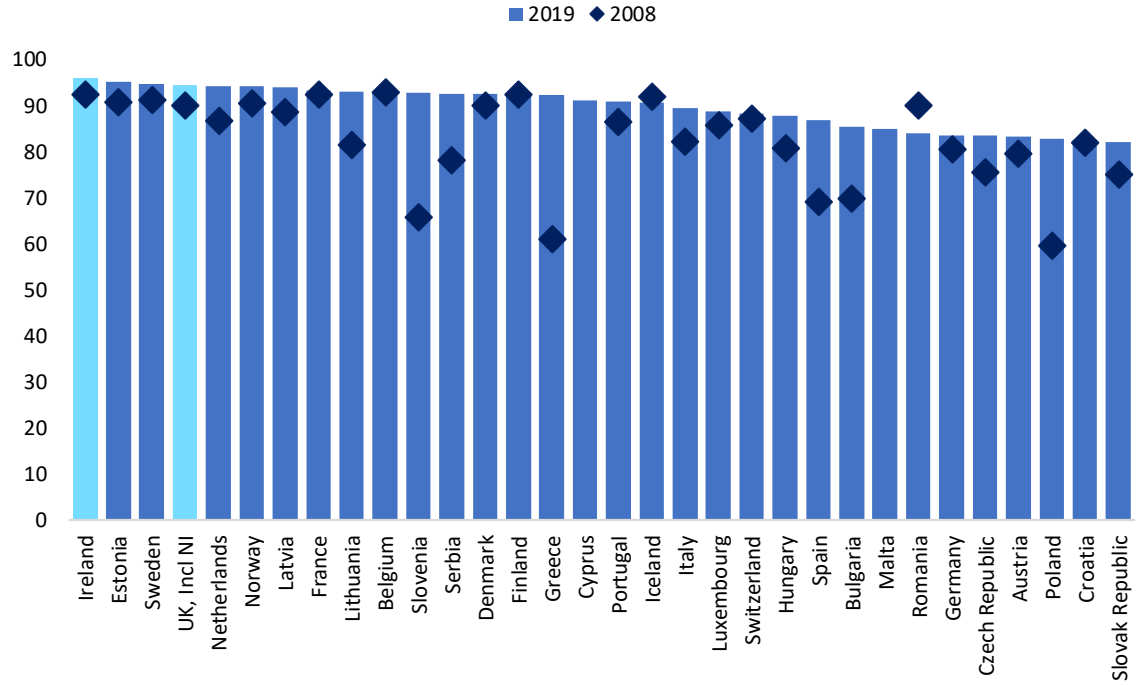


Source: UUEPC

Business Activity

Figure 4.1.1: Ease of Doing Business, UK & Ireland, 2008 - 2019

Business Environment	Rank	Direction of change	Change in decile	Year
Ease of doing business	4 / 33		↑↑	2019



Source: OECD
Note: UK used as a proxy for NI

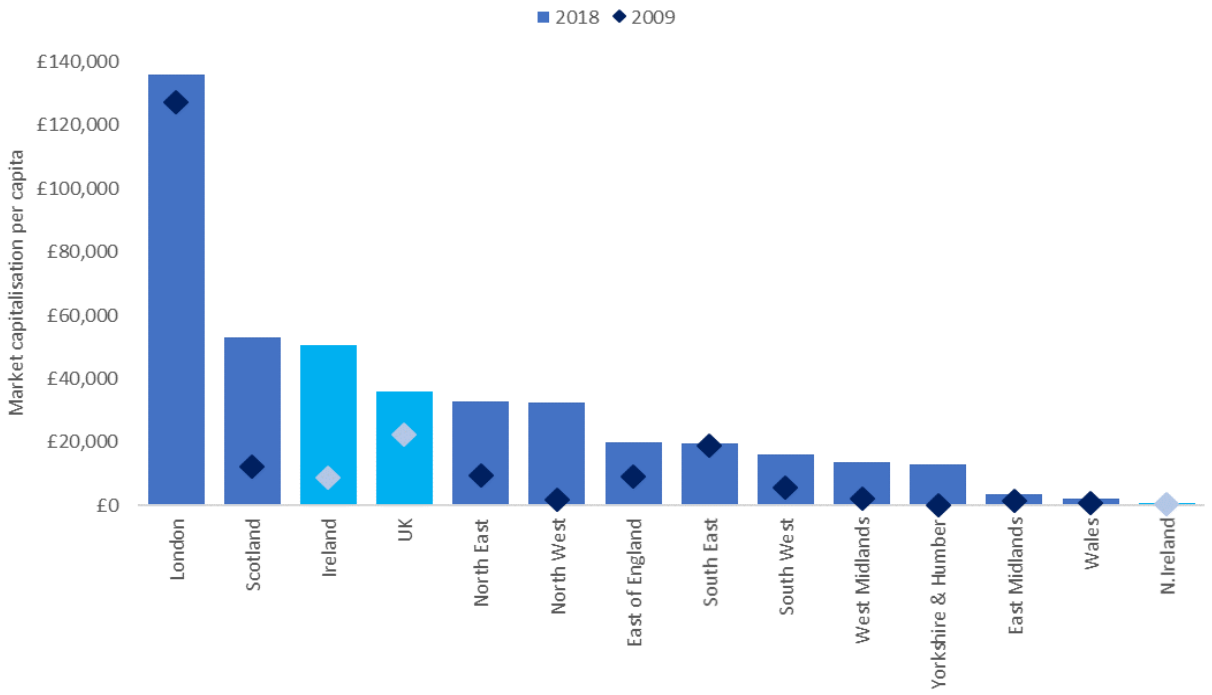
4.1.2 It should be noted that UK national data is used as a proxy for NI as regional data are not published and the factors that apply to GB also apply to NI.

4.1.3 This indicator ranks the UK's performance across 11 different 'Doing Business' metrics relative to other OECD countries. Almost every country has improved in terms of doing business since 2008. The UK and Ireland performed well historically and have continued to build upon this strength in recent years. The UK, and therefore NI, has improved and more importantly, moved ahead of competitor nations.

4.1.4 When component indicators are investigated, the UK and therefore NI, performs very well in terms of "getting electricity" and "ease of doing business". However, its performance is weak in relation to registering property, enforcing contracts and getting credit.

Figure 4.1.2: Market capitalisation per head of the population, 2009-18

Business Environment	Rank	Direction of change	Change in decile	Year
Market capitalisation per head of population	14 / 14		=	2018



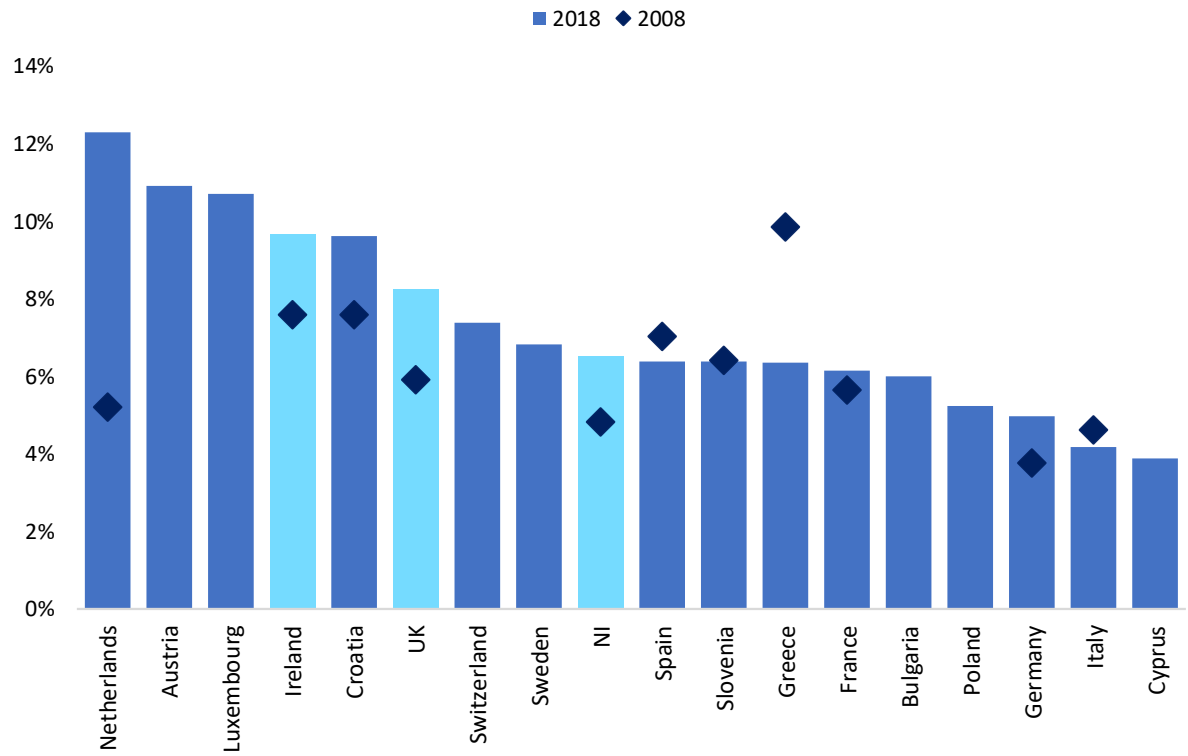
Source: London Stock Exchange

4.1.5 This indicator measures the total market value of the shares in all publicly traded companies headquartered throughout the UK region per capita.

4.1.6 Relative to the rest of the UK regions and Ireland, NI continues to perform poorly. While market value has been increasing (£65 per capita in 2009 to £796 in 2018), it remains much lower than the UK average. Ireland, the North West of England and Scotland have improved most over the period.

Figure 4.1.3: Total entrepreneurial activity (% of 18-64-year olds), 2008-18

Business Environment	Rank	Direction of change	Change in decile	Year
Total entrepreneurial activity	9 / 18		↑	2018



Source: GEM Total Entrepreneurial Activity
Note: 2008 data are unavailable for Austria, Luxembourg, Switzerland, Sweden, Bulgaria, Poland and Cyprus.

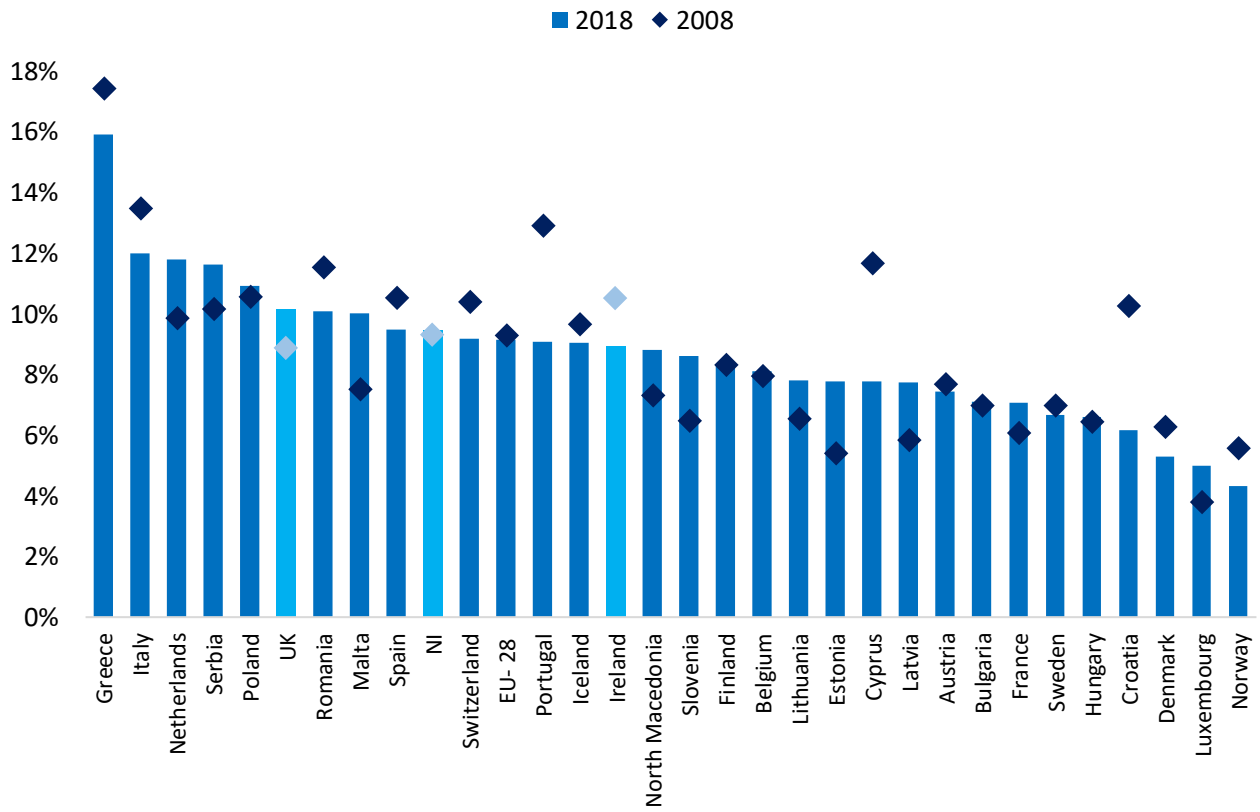
4.1.7 Total entrepreneurial activity (TEA) has improved in the majority of countries over the past decade. Ireland, the UK and NI have all improved by a roughly similar proportion.

4.1.8 TEA is now 6.5% in NI, improving from 4.8% in 2008. NI's TEA rates have improved annually since 2015, when it was ranked 21st of the 24 countries for which data were available.

4.1.9 NI still lags the UK and Irish averages, however performance has improved markedly in recent years and moved ahead of international competitors.

Figure 4.1.4: Numbers of persons self-employed, 2008-2018

Business Environment	Rank	Direction of change	Change in decile	Year
Self-Employment Levels (% of WPOP)	9 / 32		=	2018



Source: Eurostat and Annual Population Survey
Note: The 2016 report included 'Barriers to Entrepreneurship' as an indicator, but this data has not been updated and so it has been replaced with 'Self-Employment Levels' as a new indicator of addressing entrepreneurship levels.
No data available for Serbia 2008, 2010 used as the earliest year of data.

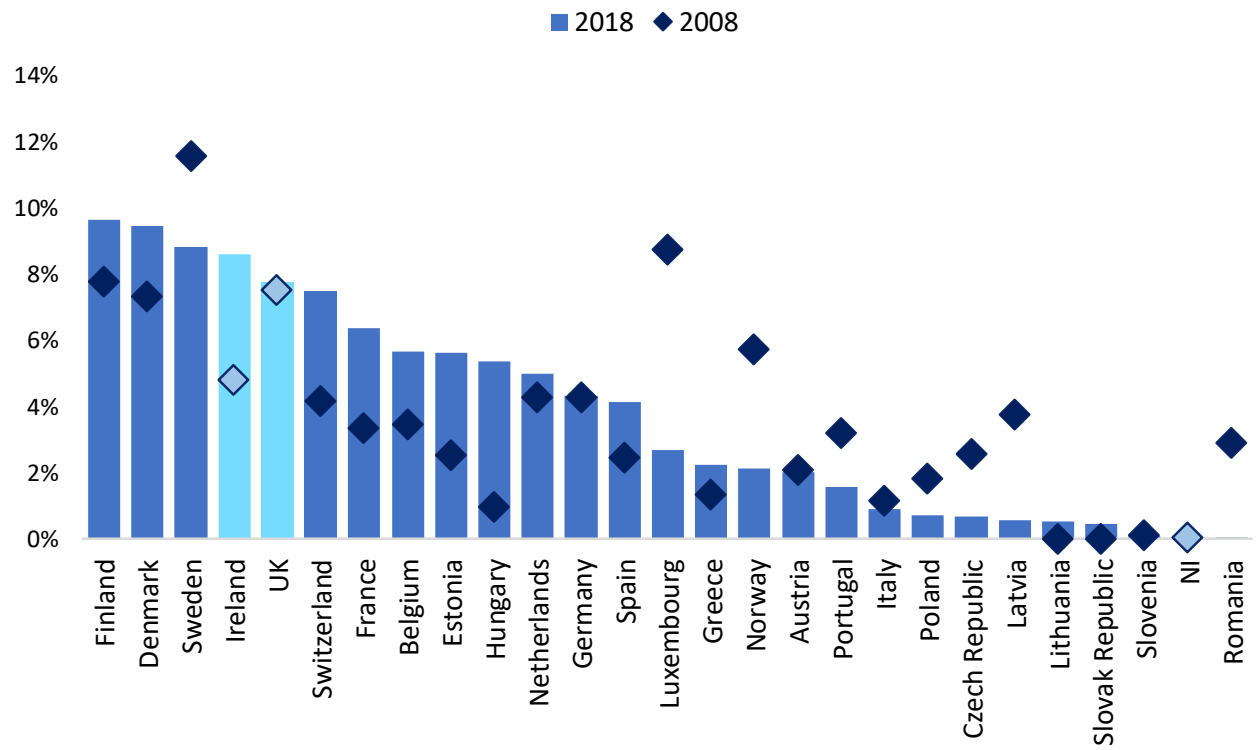
4.1.10 This indicator measures the percentage of the working age population who are self-employed. The UK and NI are relatively competitive, the UK has 10.2% of individuals who are self-employed whilst NI has 9.5%, slightly above the EU average of 9.1%. NI's position has remained steady over the decade. The UK and NI's position may support the proposition that there are fewer barriers to entry for entrepreneurs than in many competitor nations and perhaps increasingly positive attitudes towards self-employment.

4.1.11 In contrast, Ireland's levels of self-employment have dropped since 2008 from 10.5% to 8.9% in 2018. This may be due to more significant barriers to entrepreneurship in Ireland than most competitor nations, driven by factors such as high start-up costs.

Investment Activity

Figure 4.1.5: Venture Capital investment as % of GDP, 2008 - 2018

Business Environment	Rank	Direction of change	Change in decile	Year
Venture Capital Investment (% of GDP) Seed/Startup/ other early stage - Total	26 / 27		=	2018



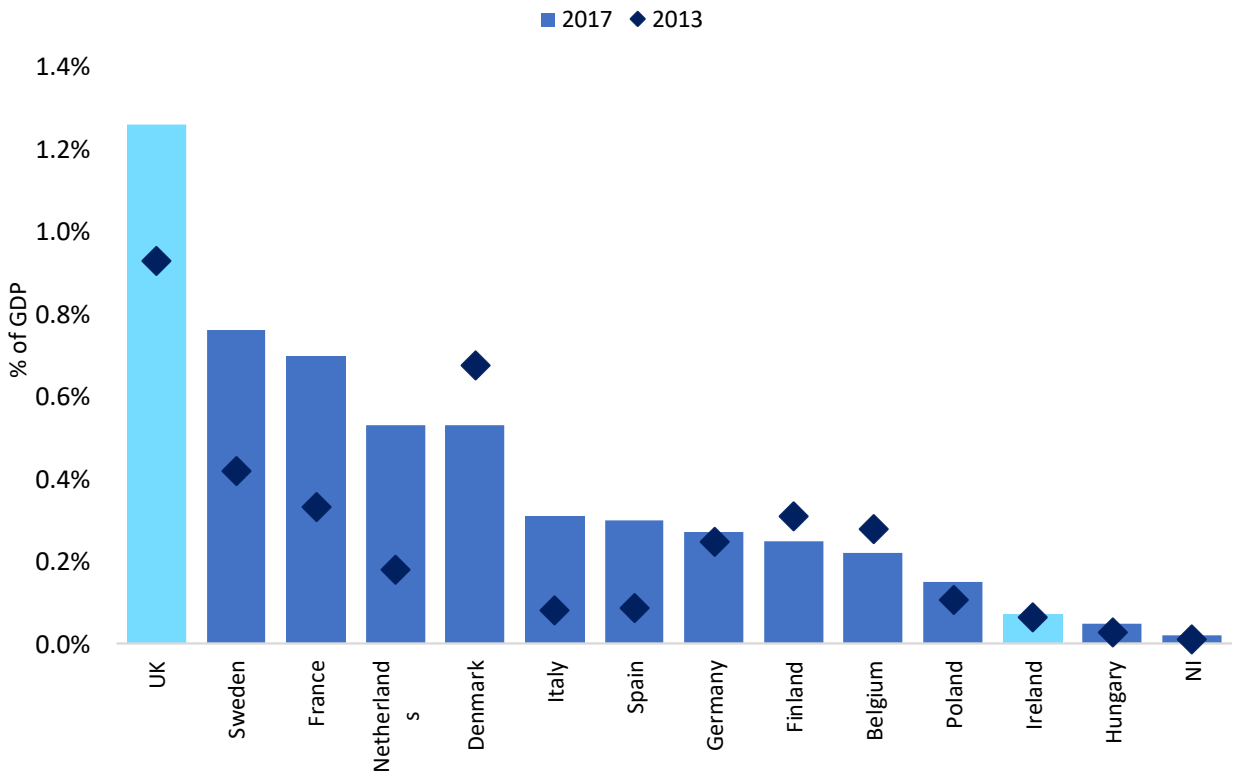
Source: OECD, BVCA & Invest Europe
Notes: 2017 figure used for NI as 2018 data is unavailable.
The Romanian figures are likely to be a misstatement, given historical trends.

4.1.12 Venture capital (VC) is typically provided to high-growth, risk taking companies. Scandinavian nations are generally very strong performers in this area, however, the UK and Ireland both perform well relative to competitor nations and Ireland has improved significantly since 2008.

4.1.13 The total value of VC in NI in 2018 was £26m rising from £9m in 2008, whilst this is an increase for NI it is still well below the benchmark economies of Ireland and the UK and other competitors. NI's overall position has remained unchanged over the decade.

Figure 4.1.6: Private equity investment (as % of GDP), 2013 - 2017

Business Environment	Rank	Direction of change	Change in decile	Year
Private equity investment	14 / 14		=	2017



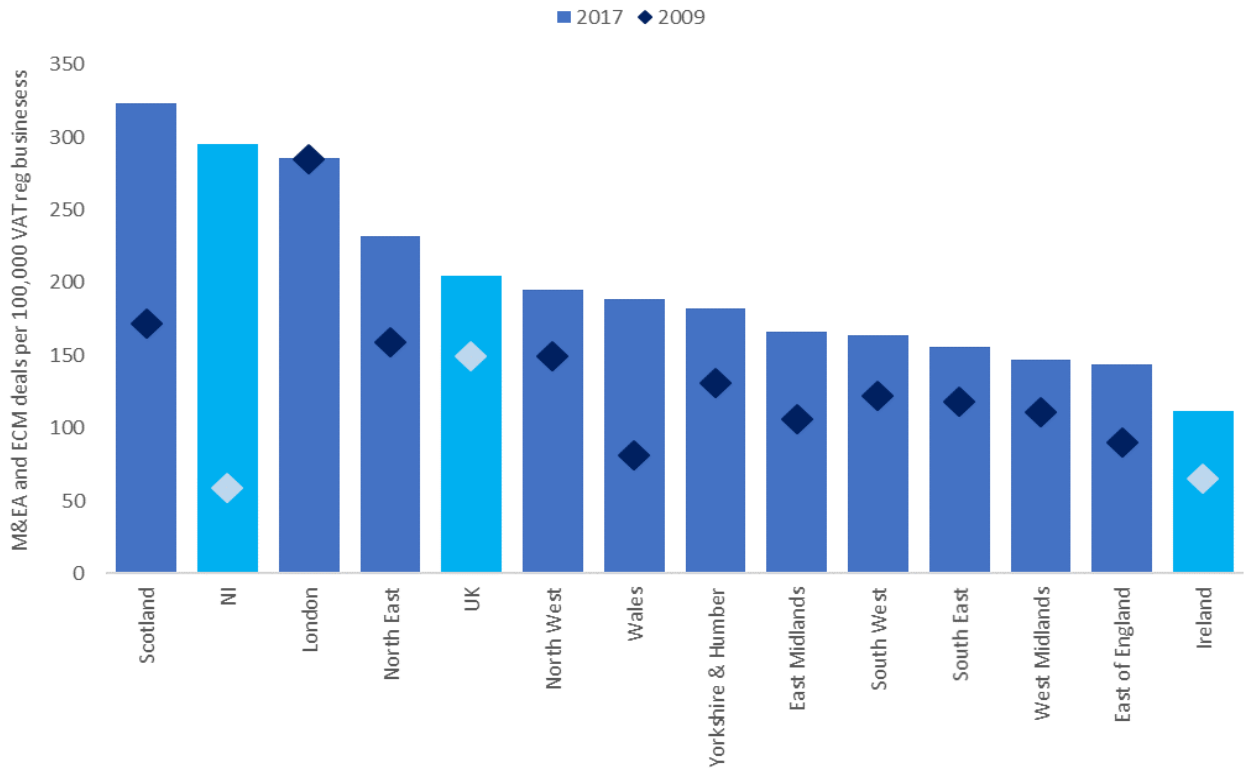
Source: Invest Europe, BVCA & ONS

4.1.14 Private equity comprises of all stage of finance, this includes seed, start-up, expansion, replacement capital and buyouts. The UK leads this field, in terms of the countries for which data are available, ahead of the Scandinavian nations and Ireland. The UK spends 1.26% of GDP on private equity investment and Ireland spends 0.07%.

4.1.15 NI is the lowest ranked of the countries included, spending 0.02% of GDP on private equity. Despite an improvement in NI's performance over the five-year period, it remains in 14th place.

Figure 4.1.7: Number of Merger & Acquisitions and ECM deals per 100,000 VAT registered businesses, 2009-2017

Business Environment	Rank	Direction of change	Change in decile	Year
Number of M&A deals per 100,000 VAT reg businesses	2 / 14		↑↑↑↑↑↑↑↑	2017



Source: Experian Corpfin & UUEPC

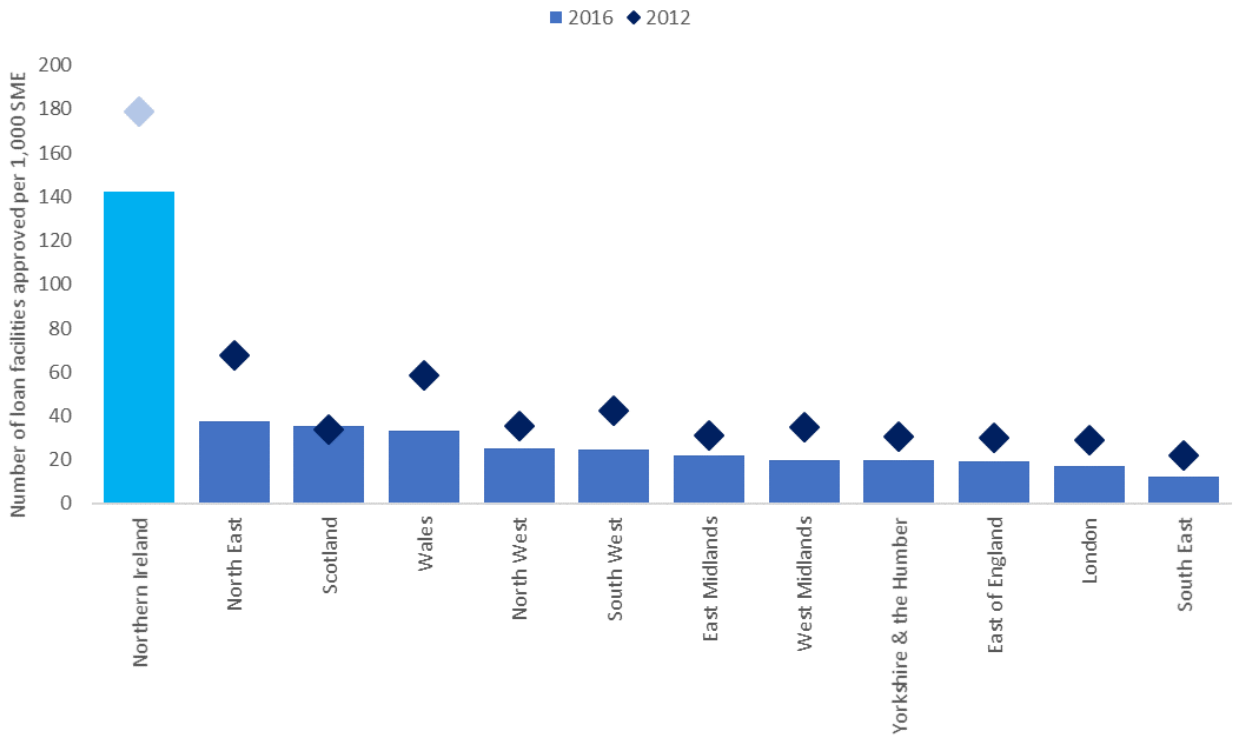
4.1.16 When compared with all other UK regions, NI performs well in M&A activity, moving from bottom of the rankings in 2009, to outperforming London in 2017.

4.1.17 Overall performance in this area has improved significantly, with the number of M&A deals per 100,000 VAT registered businesses in NI growing on average by 22.4% per annum.

Access to Finance

Figure 4.1.8: Number of SME loans approved per 1,000 SMEs, 2012-16

Business Environment	Rank	Direction of change	Change in decile	Year
SME Loans Approved per 1,000 SMEs	1 / 12		=	2016



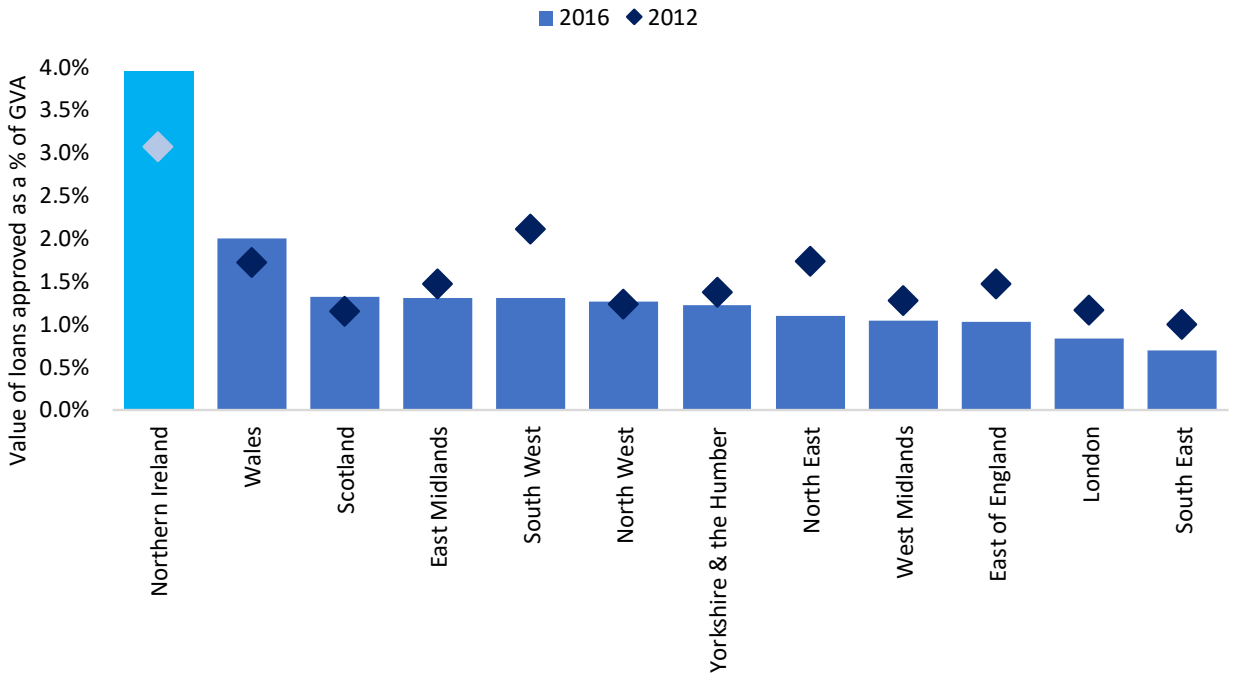
Source: BBA (up to 2016 – after this UK Finance which does not supply comparable regional figures)

4.1.18 NI has consistently had the greatest number of loan approvals per 1,000 businesses according to BBA statistics. Following the recession, there were significant issues regarding access to finance in NI. Whilst those issues were apparent, NI continues to have a high number of loan approvals compared to the other UK regions.

4.1.19 The BBA data are quite dated and UUEPC are investigating other sources of evidence to confirm the position in NI.

Figure 4.1.9: Value of loan facilities approved as a % of GVA, 2012-16

Business Environment	Rank	Direction of change	Change in decile	Year
Value of loan facilities approved (% of GVA)	1 / 12		=	2017



Source: BBA

Note: UK finance have provided data for NI, and UUEPC are seeking access to other UK regions in order to provide an up-to0date perspective.

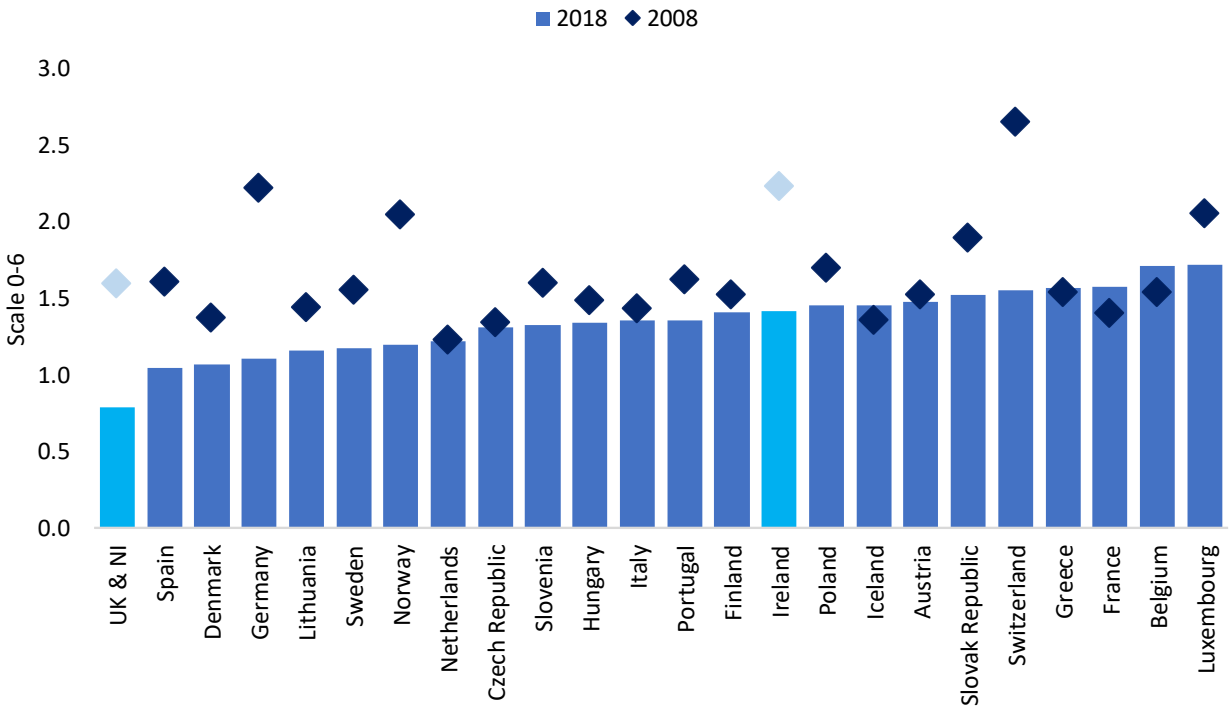
4.1.21 Similar to the number of loans to SME's approved, NI also has the greatest value of loans approved as a percentage of GVA. In 2017 NI had 3.9% (of GVA) loan facilities approved, this is an increase from 3.1% in 2012.

4.1.22 NI holds onto its 1st place position in this indicator, however it should be noted that NI appears to perform well on this indicator as it has a lower GVA in comparison to other UK regions helping the ratio to appear relatively high.

Regulation and Compliance

Figure 4.1.10 Product market regulation (scale 0-6), 2008-2018

Business Environment	Rank			Direction of change	Change in decile	Year
Product market regulation	1	/	27		=	2018



Source: OECD
Note: UK used as a proxy for NI

4.1.23 Regulation is a reserved policy matter and therefore UK figures are used for NI. The OECD indicators for product market regulation comprises of a comprehensive set of indicators that measure the degree to which policies promote or inhibit competition in those product markets where competition is viable. A low score indicates a greater competitive advantage, with the UK leading the field and improving markedly since 2008. Overall, NI continues to benefit from being part of the UK regulatory environment.

Figure 4.1.11: Regulation of professional services, 2018

Business Environment	Rank	Direction of change	Change in decile	Year
Product market regulation of professional services - Accounting	12 / 19		↓↓↓↓	2018
Product market regulation of professional services - Architecture	3 / 25		↑	2018
Product market regulation of professional services - Engineering	5 / 23		↓	2018
Product market regulation of professional services - Legal	2 / 27		↑	2018

Source: OECD
Note: UK used as a proxy for NI

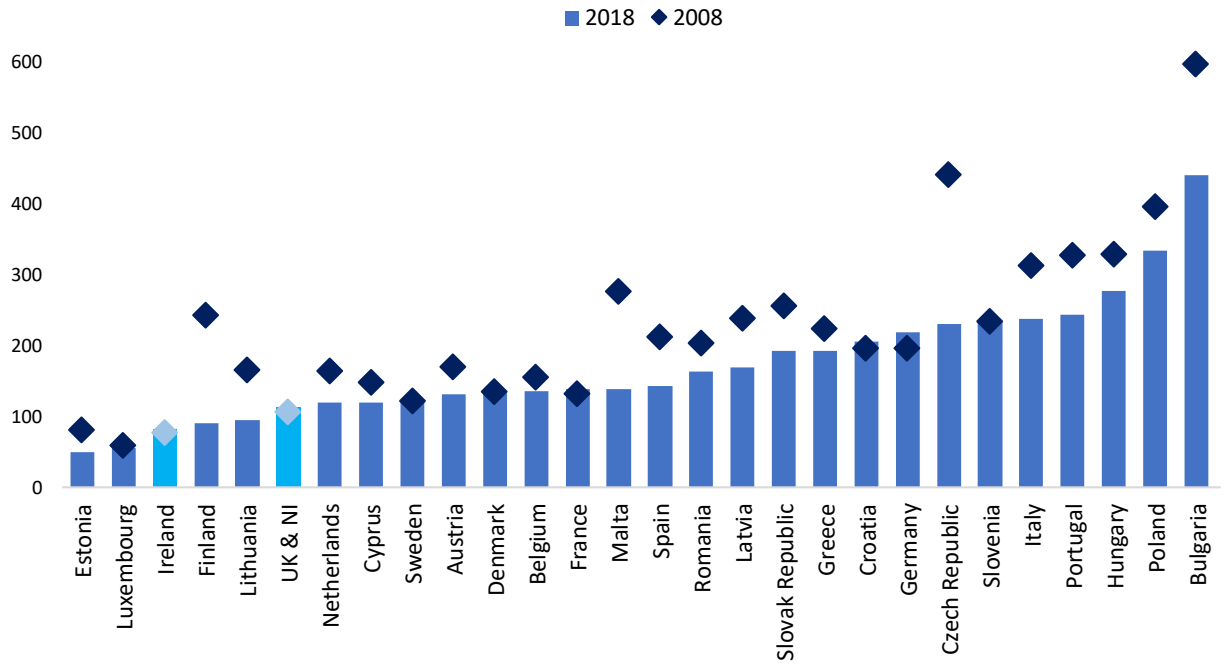
4.1.24 This indicator compares the level of regulatory restrictions which exist within professional services, specifically around market entry and conduct of business regulations. The UK, and therefore NI as part of the same regulatory framework, performs relatively strongly in these indicators, on average.

4.1.25 Accounting and engineering have improved in the UK, other countries have also improved ahead of the UK and NI, eroding the competitive position of earlier years. In 2016 accounting was ranked 5th and engineering 1st out of 19 countries[7]. Legal and architectural regulation have improved their competitive position.

[7] 2016 information available at UUEPC NI Competitiveness 2016

Figure 4.1.12: Time to comply with tax payments (hours per year), 2008-18

Business Environment		Rank			Direction of change	Change in decile	Year
Time to comply with tax payments		6	/	29		↓	2018



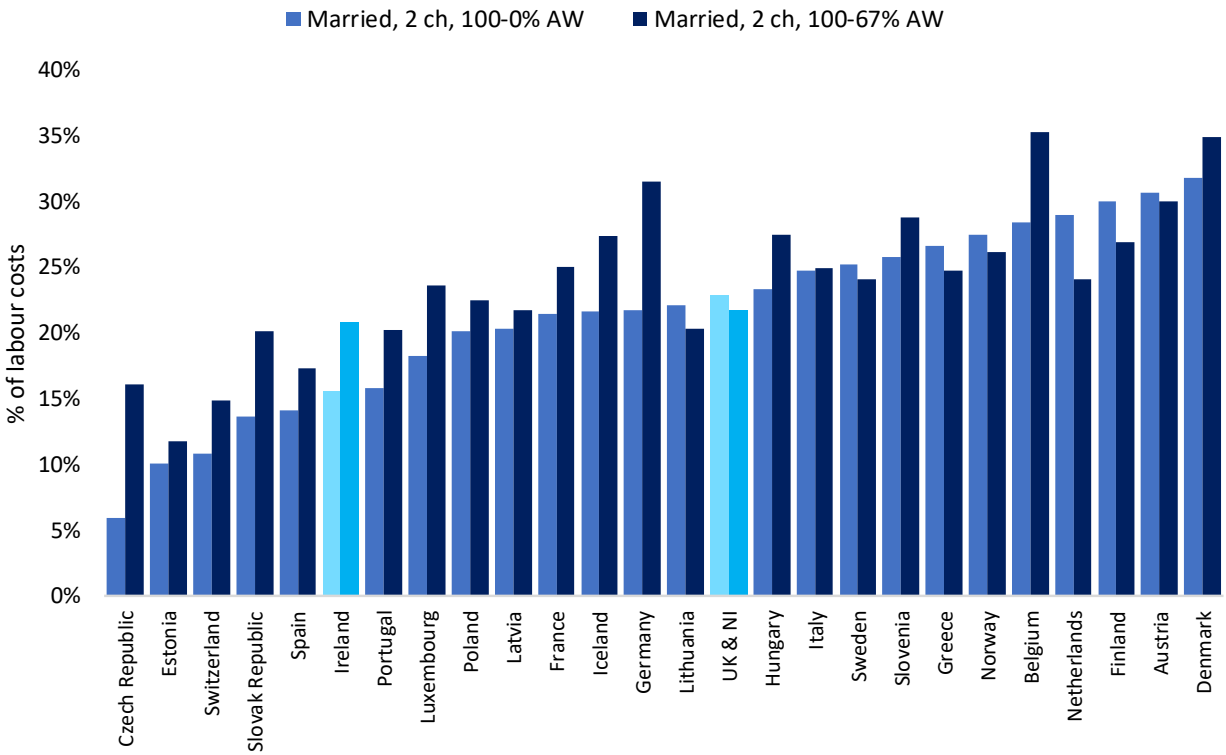
Source: PwC
Note: UK used as a proxy for NI, 2010 data used for Malta as no 2008 data available

4.1.26 This indicator measures the amount of time required for tax compliance (for corporate, labour and consumption taxes) by country. This includes time taken to prepare the tax figures, to complete and file the tax returns and to pay the taxes. As NI is part of the same tax regime as the UK, the UK data are used as a proxy.

4.1.27 Ireland performs strongly in this indicator requiring 82 hours (2018), whilst the UK (and therefore NI) also perform well, with 114 hours required per annum (2018), however this is an increase from 105 hours in 2008. While the UK and NI remain close to the top of the rank, other competitor nations have been able to move ahead of the UK (Finland and Lithuania), with the result that NI has slipped one decile.

Figure 4.1.13: Income tax plus employee contributions (% of gross wage earnings), (Married, 2 children, 100% & 167% AW), 2018

Business Environment	Rank	Direction of change	Change in decile	Year
Income tax + employee contributions as a % of GW (Married, 2 CD, 100% AW)	15 / 27		=	2018
Income tax + employee contributions as a % of GW (Married, 2 CD, 167% AW)	9 / 27		↓	2018



Source: OECD
Note: UK used as a proxy for NI

4.1.28 Income tax and employee contributions within NI are set by UK Government and are not devolved to NI and consequently the UK is used as a proxy. In 2018, for those married with 2 children on a combined income of 167% of the average wage (i.e. a two-earner family), 21.7% of total gross wage earnings were accounted for in income tax and employee contributions but much lower than countries such as Belgium (35.3%) and Denmark (34.9%). This is relatively high in comparison to other European countries such as Estonia (11.7%) and Switzerland (14.8%). Ireland performs well in this indicator at 20.8%.

4.1.29 The UK and NI are mid-table performers, and whilst they have improved over the decade, competitor nations have moved ahead in relation to higher earners. This is an important indicator, as in recent years, sentiment has shifted to the left in favour of funding better public services and the fiscal framework, borrowing rules or both will need to be amended to fund public services.

4.2 Business environment summary

4.2.7 NI benefits from a relatively competitive and improving business environment. The UK's strong performance in product market regulation, ease of doing business and ease of market access are areas of competitive strength and a key benefit to NI is being part of the UK framework in this context.

4.2.8 NI also made improvements its relative competitive position as improvements outstripped the performance of competitor nations. For instance, total entrepreneurial activity increased from 4.8% (2008) to 6.5% (2018) and self-employment has also increased slightly from 9.3% of the working age population in 2008 to 9.5% in 2018.

4.2.9 NI performs less well on VC, private equity provision and in terms of the value of public listed companies. The evidence gathered for the report does not allow a conclusion to be drawn on whether this is an issue of limited supply or a low demand for risk capital. However, these indicators are improving over time, but from a very low base and therefore it will take a significant improvement and time for NI to move from the bottom rankings. These indicators are important areas that merit close policy attention as doing so may help to assist the wider business environment such as assisting SME's, high-tech start-ups and businesses attempting to scale up, many of which often rely on these sources of finances. This will help to develop NI's overall level of competitiveness.

Figure 4.1.14: Summary of percentile placement for business environment indicators

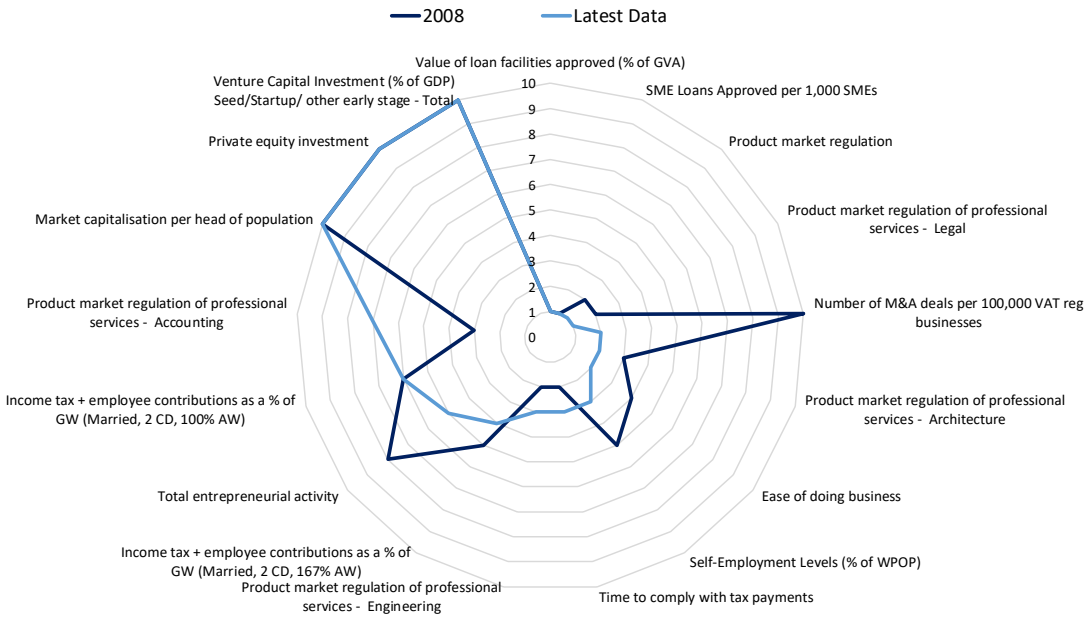


Table 4.1: Summary of Business Environment indicators

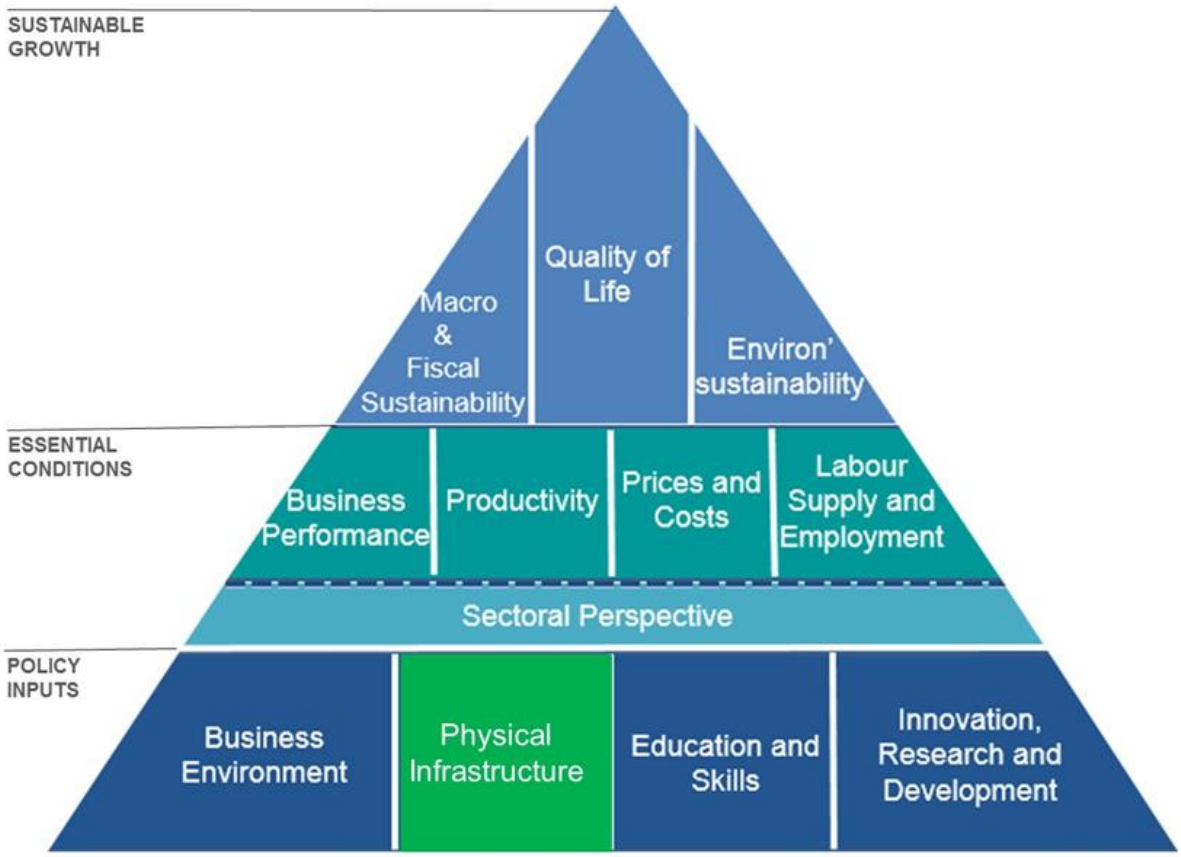
Business Environment	Rank	Direction of change	Change in decile	Year
Product market regulation	1 / 27		=	2018
Product market regulation of professional services - Legal	2 / 27		↑	2018
SME Loans Approved per 1,000 SMEs	1 / 12		=	2016
Value of loan facilities approved (% of GVA)	1 / 12		=	2017
Product market regulation of professional services - Architecture	3 / 25		↑	2018
Ease of doing business	4 / 33		↑↑	2019
Number of M&A deals per 100,000 VAT reg businesses	2 / 14		↑↑↑↑↑↑↑↑	2017
Time to comply with tax payments	6 / 29		↓	2018
Product market regulation of professional services - Engineering	5 / 23		↓	2018
Self-Employment Levels (% of WPOP)	9 / 32		=	2018
Income tax + employee contributions as a % of GW (Married, 2 CD, 167% AW)	9 / 27		↓	2018
Total entrepreneurial activity	9 / 18		↑	2018
Income tax + employee contributions as a % of GW (Married, 2 CD, 100% AW)	15 / 27		=	2018
Product market regulation of professional services - Accounting	12 / 19		↓↓↓↓	2018
Venture Capital Investment (% of GDP) Seed/Startup/ other early stage - Total	26 / 27		=	2018
Private equity investment	14 / 14		=	2017
Market capitalisation per head of population	14 / 14		=	2018

Source: UUEPC

4.3 Physical and technological infrastructure

4.3.7 Physical and technological infrastructure examines both the quality and availability of infrastructure to the population in NI. High quality and accessible infrastructure can enable and assist trade, the mobility of labour & capital and quality of life.

4.3.8 The quality of infrastructure – in the broadest sense of connectivity – also has the potential to impact upon the attractiveness of the country in the eyes of investors and highly skilled migrants.

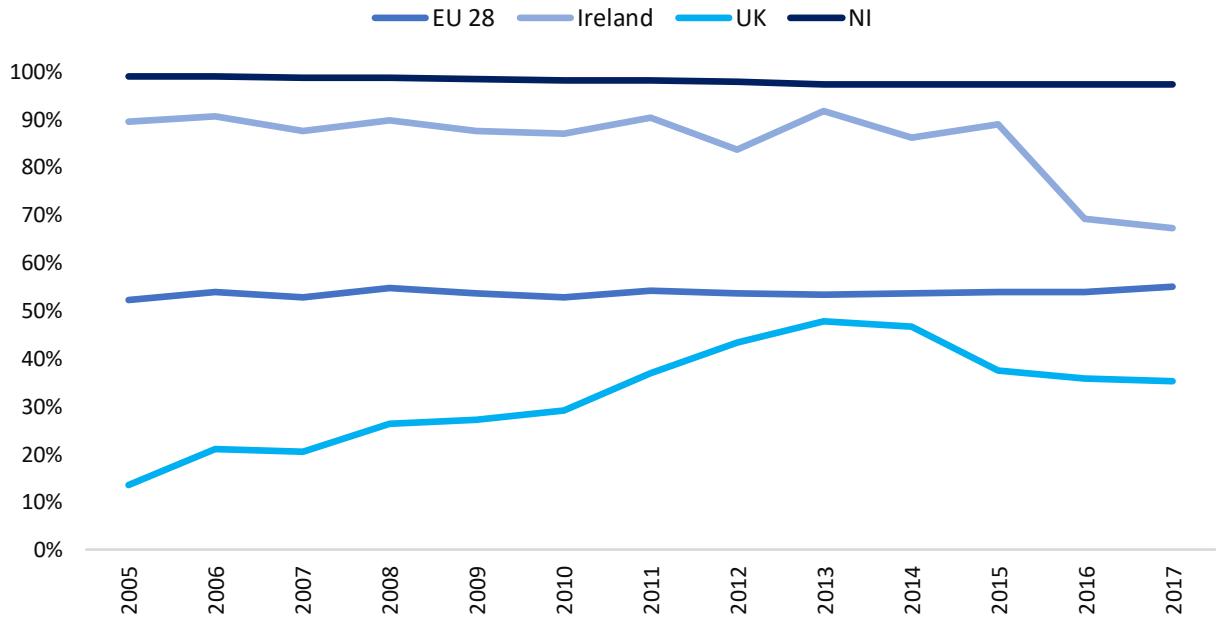


Source: UUEPC

Energy Dependency

Figure 4.3.1: Energy import dependency, 2005-2017

Physical Infrastructure	Rank	Direction of change	Change in decile	Year
Energy import dependency	31 / 32		=	2017



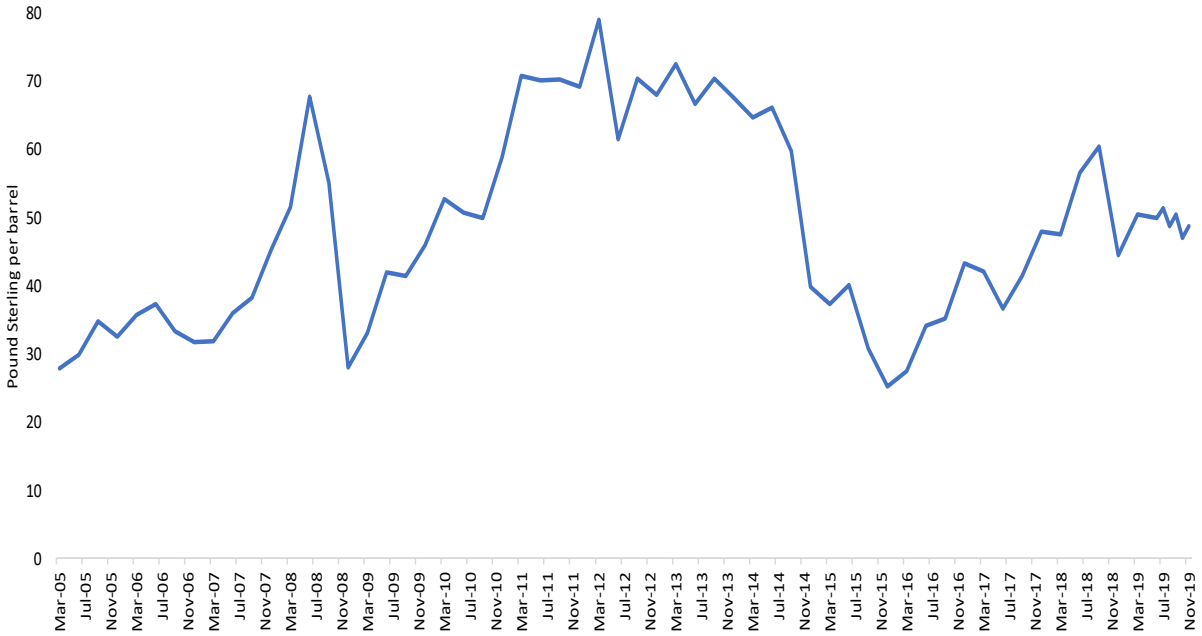
Source: Eurostat, Gov.uk

4.3.9 NI is heavily dependent on imported energy (just over 97% in 2017). The mix of fuel dependency is markedly different to other areas of the UK, as NI meets two thirds of its energy requirements through the use of petroleum products, whilst the UK average is two fifths. This means that any variation in global oil prices will have a much greater impact on NI than on other areas of the UK and EU.

4.3.10 It is worth noting the recent contrast with Ireland, which is reducing its dependency. Ireland has decreased its energy import dependency from 90% in 2005 to 67% in 2017.

Figure 4.3.2: Crude oil barrel prices in sterling, 2005-2019

Physical Infrastructure	Rank	Direction of change	Change in percentile
Crude oil barrel prices	n/a	n/a	n/a



Source: World Bank

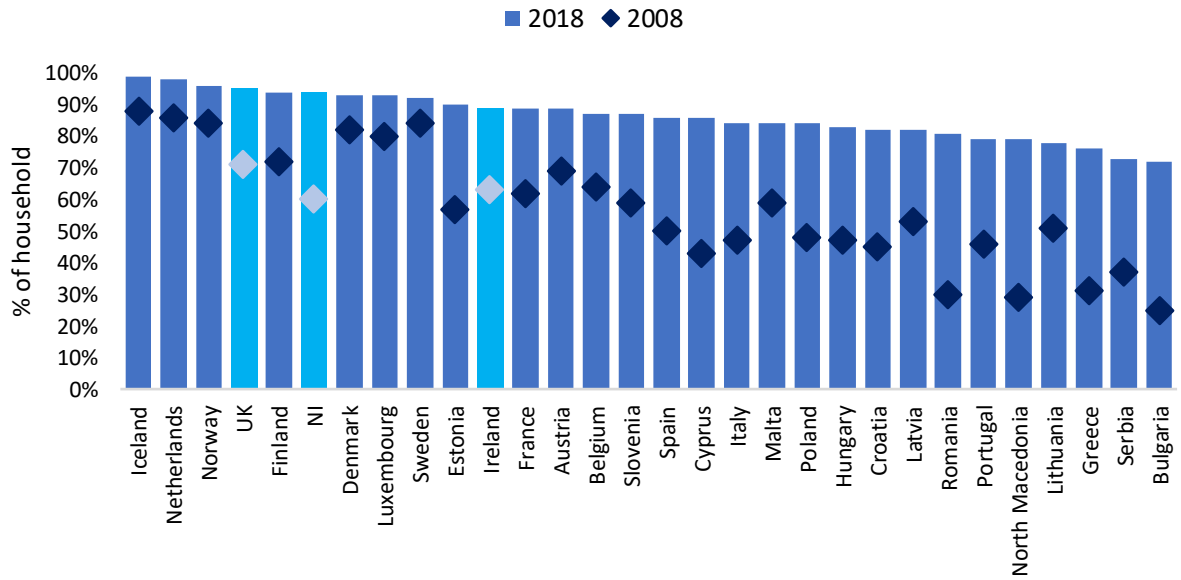
4.3.11 This indicator highlights the vitality of oil prices which can be dependent on wider global events and policies. Oil prices are on a general upward trajectory and prices are now around two thirds of the peak price experienced during 2012 (March 2012, £78.99 per barrel).

4.3.12 The reduction from 2014 to 2016 helped to keep input prices and transport costs down and contributed positively to households in terms of disposable incomes. However, the increase in price since 2014 has increased cost pressure and driven increases in Consumer Price Index (CPI) inflation.

Internet and Broadband Access

Figure 4.3.3: Percentage of households with access to internet, 2008-2018

Physical Infrastructure	Rank	Direction of change	Change in decile	Year
% of households with access to the internet	6 / 31		↑↑↑	2018



Source: Eurostat

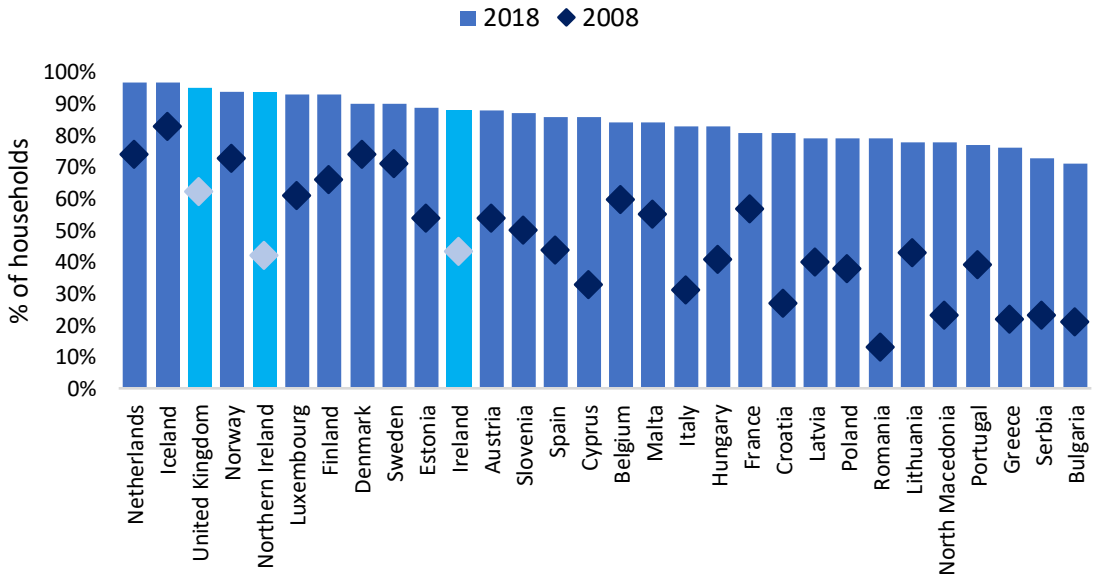
4.3.13 Household access to the internet has improved significantly in NI, growing from 60% in 2008 to 94% in 2018. This improvement has been relatively rapid, and NI ranks 6th of the countries included in the analysis.

4.3.14 The chart illustrates good progress for most countries, especially those that are improving from the lowest base. It is noteworthy that NI has improved its position relative to competitor nations and is amongst Scandinavian nations – this is a positive achievement for NI.

4.3.15 This increase in access to the internet from home helps to boost competitiveness as it allows more people to perform activities such as working from home, support learning at home, social engagement and consumerism therefore helping to engage the NI public in economic and development activities from home.

Figure 4.3.4: Percentage of households connected to broadband internet, 2008-2018

Physical Infrastructure	Rank			Direction of change	Change in decile	Year
% of households with broadband internet	4	/	31		↑↑↑↑↑	2018



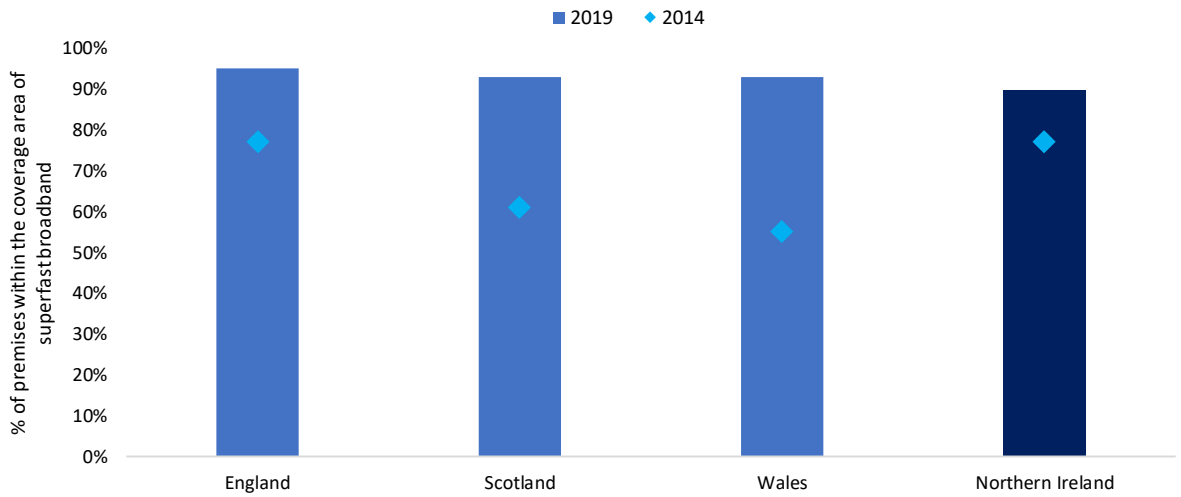
Source: Eurostat

4.3.16 In 2018 94% of households in NI were connected to broadband internet, compared to just 42% in 2008. This is a significant improvement from a relatively low base a decade ago. In comparison 88% of households have access to broadband in Ireland (2018) compared to 43% in 2008.

4.3.17 All countries have improved in this indicator, however NI's improvement was rapid, improving its relative position to 5th.

Figure 4.3.5: Percentage of premises within the coverage area of superfast broadband, 2014-2019

Physical Infrastructure	Rank	Direction of change	Change in decile	Year
% of premises within the coverage area of superfast broadband	4 / 4		↓↓↓↓↓	2019



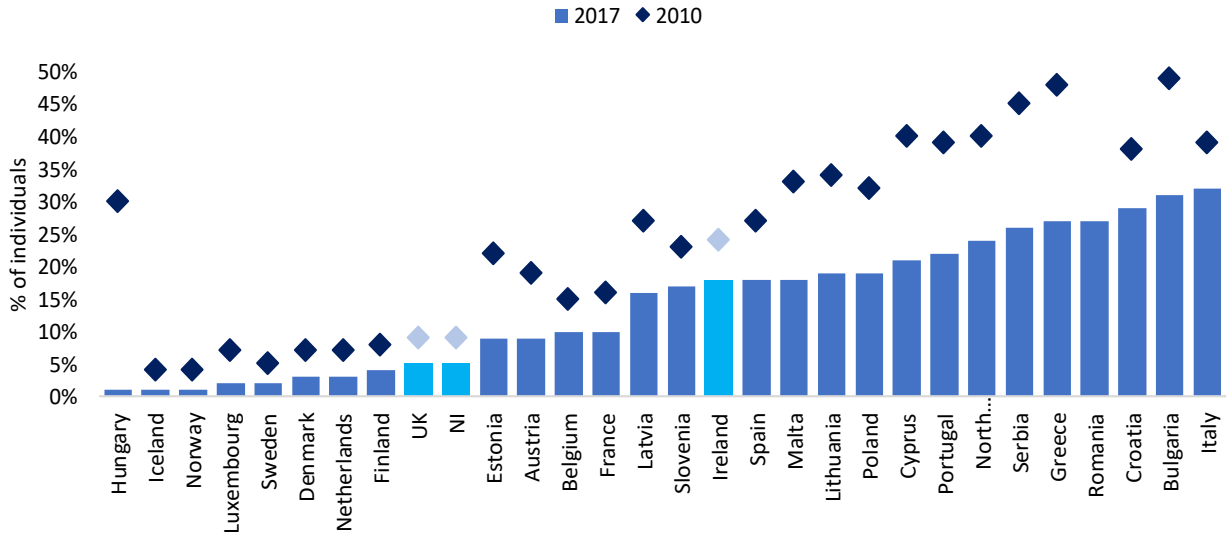
Source: Ofcom infrastructure report, 2019

4.3.18 NI has good coverage of next generation broadband in a historical context, currently 90% of premises have superfast broadband compared to 77% in 2014. The rate of improvement has slowed allowing Wales and Scotland to overtake NI.

4.3.19 The Department for the Economy (DfE) invested £52m in Next Generation Broadband and £23.7m in the Broadband Improvement Project, both of which were complete in 2017. These projects have contributed to NI's improving access to broadband however, it would appear that further investment will be required to close the gap with other parts of the UK to restore NI's relative competitive position.

Figure 4.3.6: Percentage of individuals who have never used a computer, 2008-2017

Physical Infrastructure	Rank	Direction of change	Change in decile	Year
% of Individuals that have never used a computer	10 / 31		↓	2017



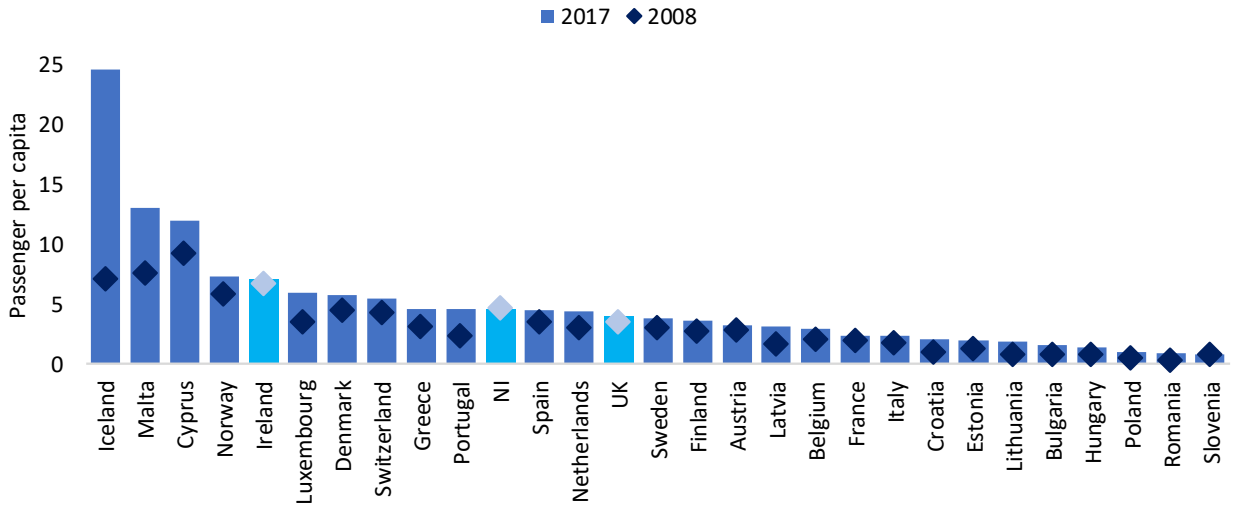
Source: Eurostat
Note: 2010 data not available for Serbia so 2009 data has been used

4.3.20 NI performs relatively well in this indicator as just 5% of individuals in NI have never used a computer decreasing from 9% in 2010. This is on par with the UK's performance (5%) and well ahead of the Irish benchmark where 18% of individuals have never used a computer in 2017.

Air and Maritime Transport

Figure 4.3.7: Air transport of passengers per capita, 2008-2017

Physical Infrastructure	Rank			Direction of change	Change in decile	Year
Air transport of passengers per capita	11	/	29		↓	2017



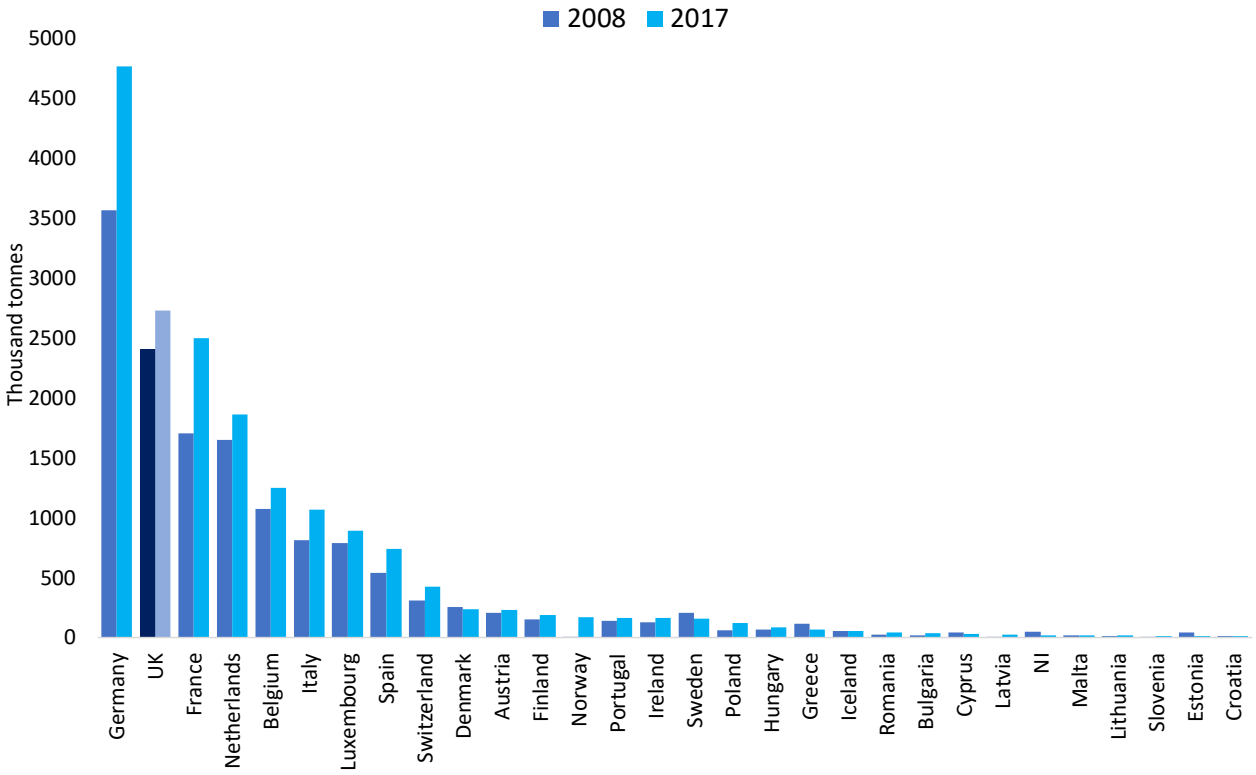
Source: Eurostat

4.3.21 NI posts a mid-table performance in terms of air transportation and has remained reasonably static over the decade. During 2017, 4.6 passengers per capita were transported by air, compared to 4.0 passengers per capita in the UK. Due to NI being in a peripheral area of Europe, air travel is likely to be more important than some continental nations. However, NI's competitiveness in this area has fallen since 2008 when it was ranked in 7th place to now being ranked 11th.

4.3.22 It should be noted that the passenger figures for Ireland will also include NI passengers who choose to fly from Dublin Airport to a range of international and domestic destinations. This contributes to Ireland transporting 7.2 passengers per capita during 2017.

Figure 4.3.8: Air transport of freight (loaded and unloaded, thousand tonnes) 2008-2017

Physical Infrastructure	Rank			Direction of change	Change in decile	Year
Air transport of freight	25	/	30		↓↓	2017



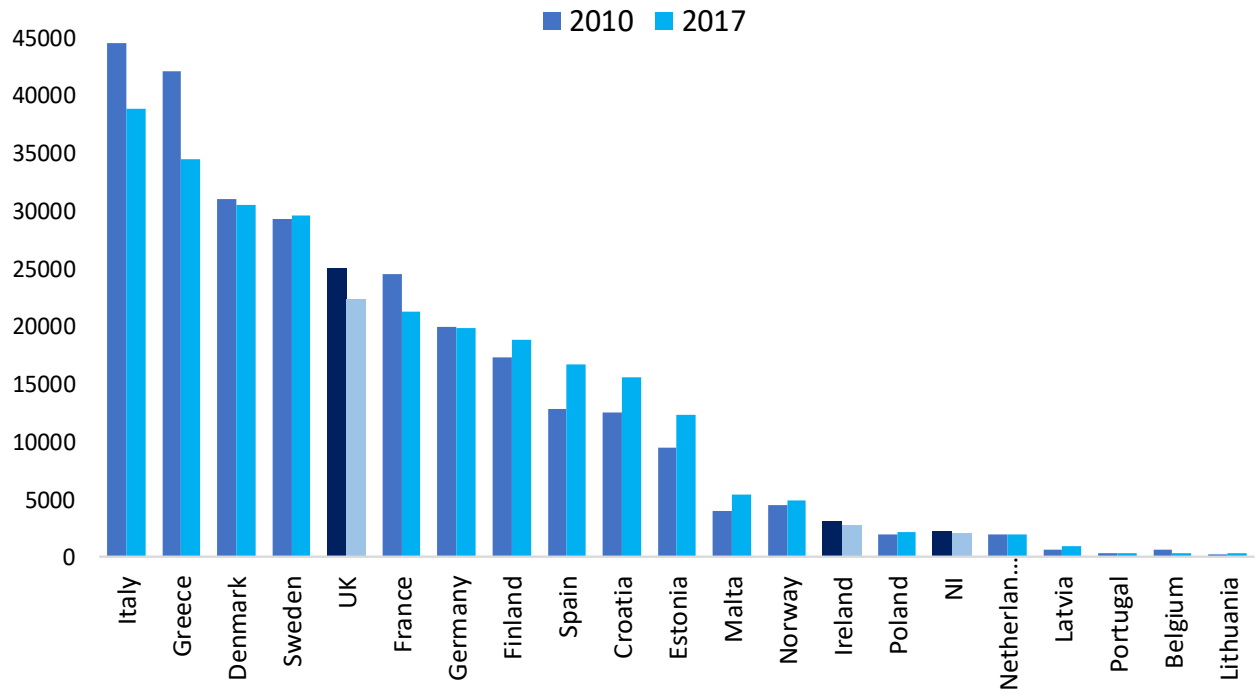
Source: Eurostat
Note: This indicator has been updated from the 2016 report which included number of air routes available.

4.3.23 Air transport of freight in NI, loaded and unloaded) has decreased since 2008 from 28 to 20 (thousand tonnes) in 2017. This may, in part, be due to substitution towards maritime transport of freight, which increased over the same period.

4.3.24 In comparison, the UK air transport of freight has increased from 2,411 (thousand tonnes) in 2008 to 2,734 in 2017 causing it to be ranked in 2nd place. Meanwhile Ireland has also increased from 127 in 2008 to 163 (thousand tonnes) in 2017.

Figure 4.3.9 Maritime transport of passengers (embark and disembark, total, thousands) 2010-2017

Physical Infrastructure	Rank	Direction of change	Change in decile	Year
Maritime transport of passengers (embarked and disembarked total)	16 / 21		↑↑	2017



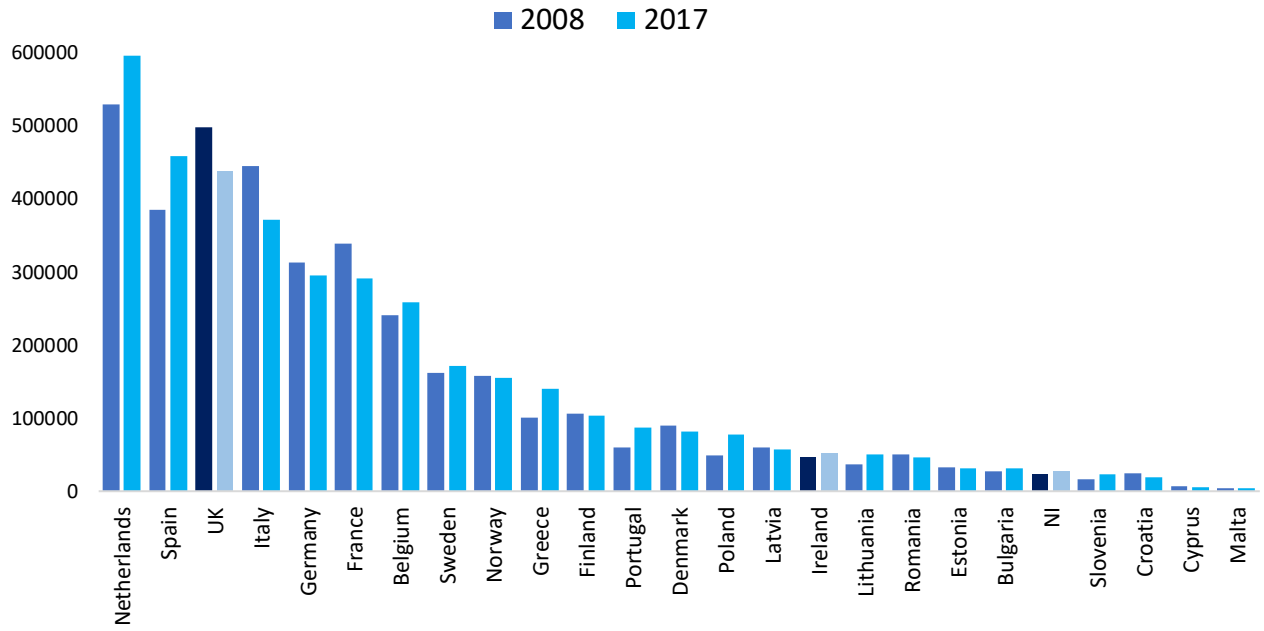
Source: Eurostat
Note: 2010 used as earliest data point due to inconsistencies in data.
Figure 4.4.9 and 4.4.10 have been used to update the previous indicator which addressed number of shipping routes.

4.3.25 Maritime transport has remained steady across the majority of EU countries since 2010. For NI maritime transport has remained a key method of domestic and international travel with over 1million passengers embarking on maritime travel in 2017. In comparison the UK embarked over 12million passengers in 2017. Positive developments in NI such as the cruise ship terminal at Belfast Harbour may help to increase passenger numbers for NI if passengers could embark from Belfast, this would also boost NI's tourism potential.

4.3.26 Overall since 2010 NI's relative position has remained in 16th place out of 21 countries, Ireland remains in 14th place and the UK has moved from 6th to 9th position.

Figure 4.3.10 Maritime transport of freight (loaded and unloaded, total, thousand tonnes), 2008-2017

Physical Infrastructure		Rank			Direction of change	Change in decile	Year
Maritime transport of freight (loaded and unloaded total)		21	/	25		=	2017



Source: Eurostat

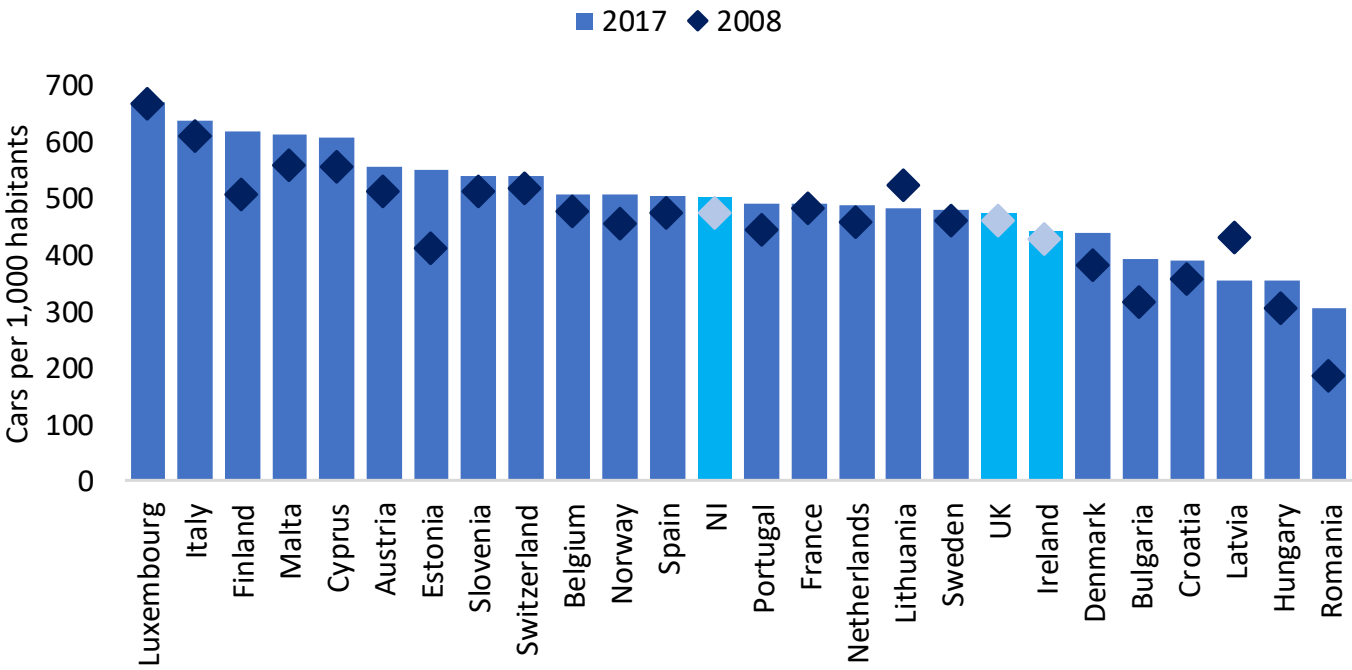
4.3.27 Maritime transport of freight loaded in NI has increased from 7,200 (thousand tonnes) in 2008 to 10,200 (thousand tonnes) in 2017, whilst unloaded freight has increased from 15,850 (thousand tonnes) to 16,640 (thousand tonnes) in 2017. Whilst NI has increased the volume of maritime trade, the figures are well below the UK which was ranked in 3rd place in 2017 for both loaded and unloaded freight.

Ease of Motorisation

Figure 4.3.11: Motorisation rate – passenger cars per 1,000 inhabitants, 2008-2017

Physical Infrastructure		Rank			Direction of change	Change in decile	Year
Motorisation Rate - cars per 1000 inhabitants		14	/	27		↓	2017

Source: Eurostat

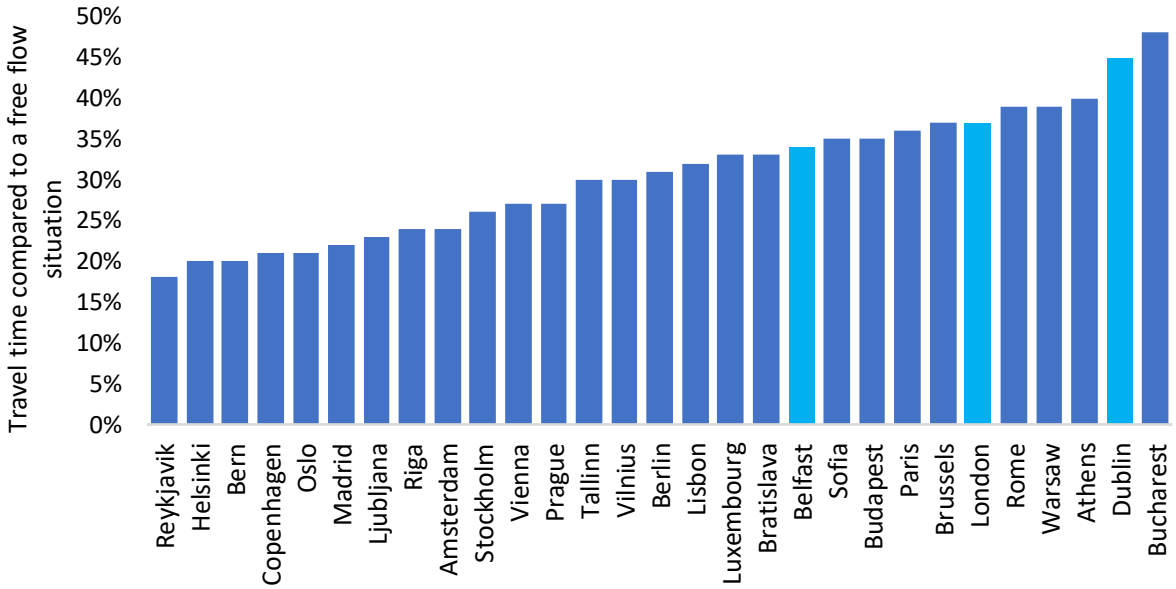


4.3.28 NI is often characterised as a "car dependent" region, the evidence supports this highlighting that NI has 502 cars per 1,000 inhabitants (2017) whilst the UK average is 476 and Ireland has 443 cars per 1,000 inhabitants. Overall NI ranks mid table with many European countries having more cars per inhabitants.

4.3.29 Motorisation rates have increased slightly from 2008 for almost every country which would have helped to increase the relative mobility of the labour force. However as environmental concerns rise there could be a shift in future to show a decrease in the motorisation rate as more people choose greener methods of transport.

Figure 4.3.10: Traffic congestion index, 2018

Business Environment	Rank	Direction of change	Change in percentile
Traffic congestion index	19/29	n/a	n/a

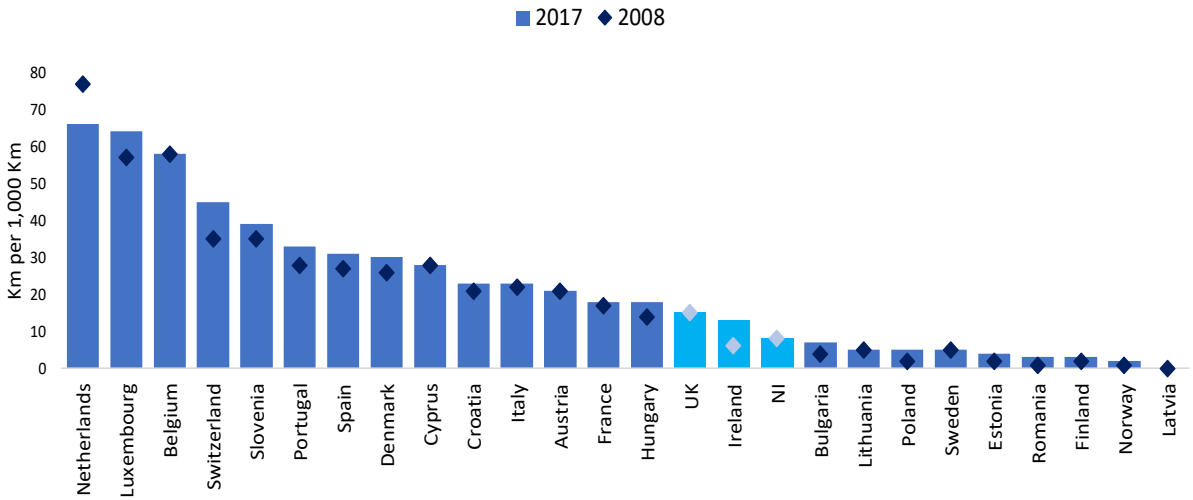


Source: Tom-Tom Traffic Congestion index
Note: Capital cities

4.3.30 This indicator measures the congestion in selected cities between peak and off-peak times and may be exacerbated by much lower levels of congestion during off-peak periods. Traffic congestion in Belfast is relatively severe in comparison to capital cities from a basket of countries measuring 34% congestion level. Belfast's congestion level whilst high, is less of a challenge than in London (37%) or Dublin (45%).

Figure 4.3.11: Motorway Kms per 1,000 sq. Kms, 2008-2017

Physical Infrastructure	Rank			Direction of change	Change in decile	Year
Motorway Kms per 1000 sq. Kms	14	/	23		↓	2017



Source: Eurostat
Note: The reduction in motorway kilometres in the Netherlands is likely to be a statistical error.

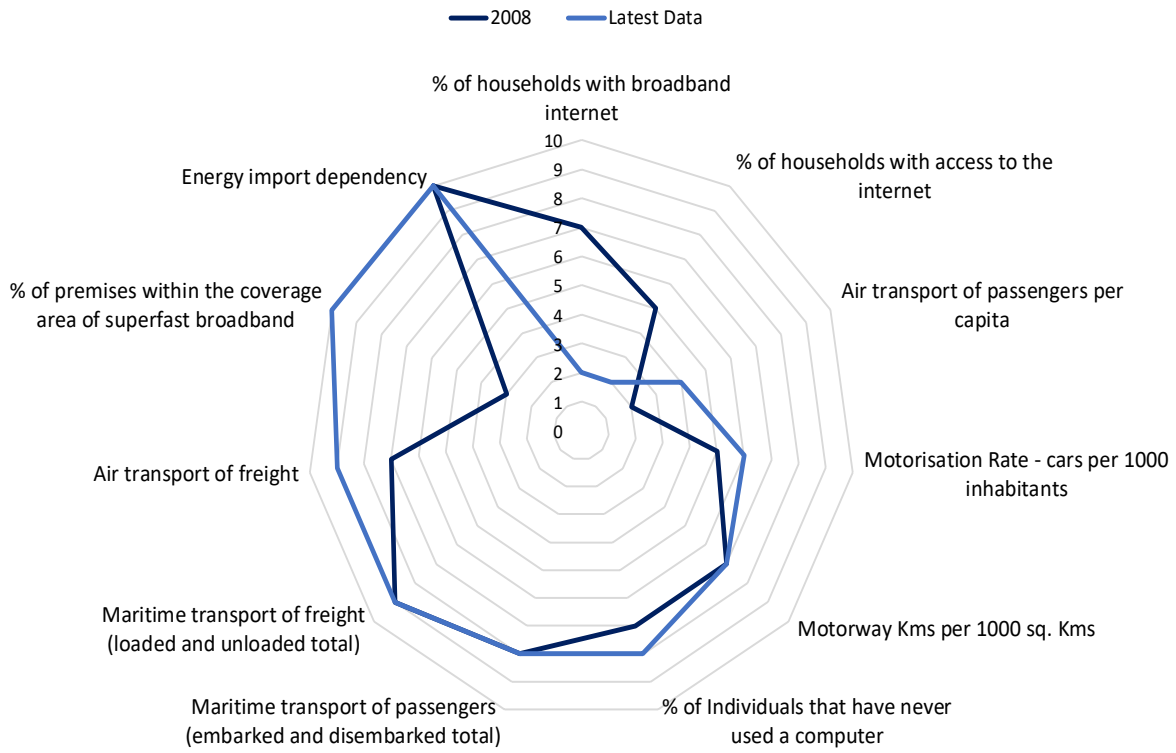
4.3.31 Most countries performances in this indicator have remained steady from 2008 to 2017, which is unsurprising given the cost of adding additional motorway infrastructure. NI has 8Kms of motorway per 1,000sq Kms. NI is ahead of some European nations however it remains behind the UK whilst the evidence shows that Ireland has lengthened its motorway network considerably over the period since 2008 with the completion of a number of motorway extension projects with the assistance of EU structural funds. Ireland has more than doubled the amount of motorways from 6Km motorway per 1,000sq. Kms (2008) to 13 (2017).

4.4 Physical infrastructure summary

4.4.1 The relative competitiveness of NI's physical infrastructure has improved across a range of indicators since 2016, boosting NI's relative competitiveness. Figure 4.4.1 and Table 4.4.1 show that the story is one of contrasts, like the business environment pillar. NI performs exceptionally well in terms of technological infrastructure - such as households with access to the internet and broadband. The exception is superfast Broadband. This helps to make positive contributions towards NI's productivity, entrepreneurship, lifelong learning and social connectivity. Additional information on the usage costs would be beneficial to understanding the provision of technological infrastructure.

4.4.2 NI's is relatively uncompetitive in terms of physical infrastructure. For instance, the motorway network is not very extensive and air and maritime connectivity are relatively weak, although people may travel via Dublin or London in order to get to a range of international destinations. NI's dependence on imported fuel sources remains a significant challenge, and one that will not be easily changed, given NI's resource endowments.

Figure 4.4.1: Summary of percentile placements for Physical Infrastructure indicators



Source: UUEPC

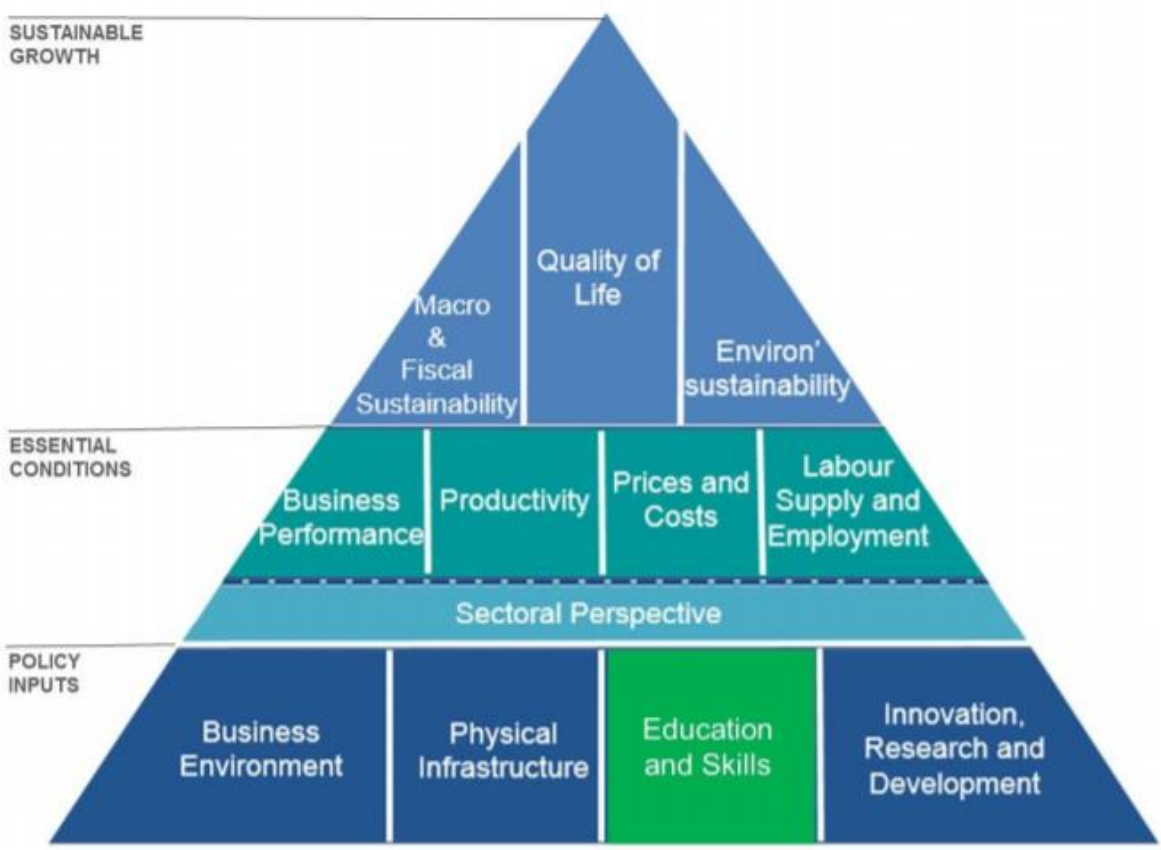
Table 4.4.1: Summary of physical infrastructure indicators

Physical Infrastructure	Rank	Direction of change	Change in decile	Year
% of households with broadband internet	4 / 31		↑↑↑↑↑	2018
% of households with access to the internet	6 / 31		↑↑↑	2018
Air transport of passengers per capita	11 / 29		↓	2017
Motorisation Rate - cars per 1000 inhabitants	14 / 27		↓	2017
Maritime transport of passengers (embarked and disembarked total)	16 / 21		↑↑	2017
Motorway Kms per 1000 sq. Kms	16 / 25		=	2017
% of Individuals that have never used a computer	10 / 31		↓	2017
Energy import dependency	31 / 32		=	2017
% of premises within the coverage area of superfast broadband	5 / 5		↓↓↓↓↓↓↓	2019
Number of air routes (countries) available	10 / 10		=	2019
Air transport of freight	25 / 30		↓↓	2017
Maritime transport of freight (loaded and unloaded total)	21 / 25		=	2017

Source: UUEPC

4.5 Education and Skills

4.5.1 Education and skills supply and quality in an economy is vital for economic growth. A highly skilled and dynamic labour force is more productive, innovative and attractive to foreign investors. Knowledge oriented sectors are more export intensive, helping to generate additional income and grow the economy. This pillar will address indicators which contribute to the skills of NI's labour force.

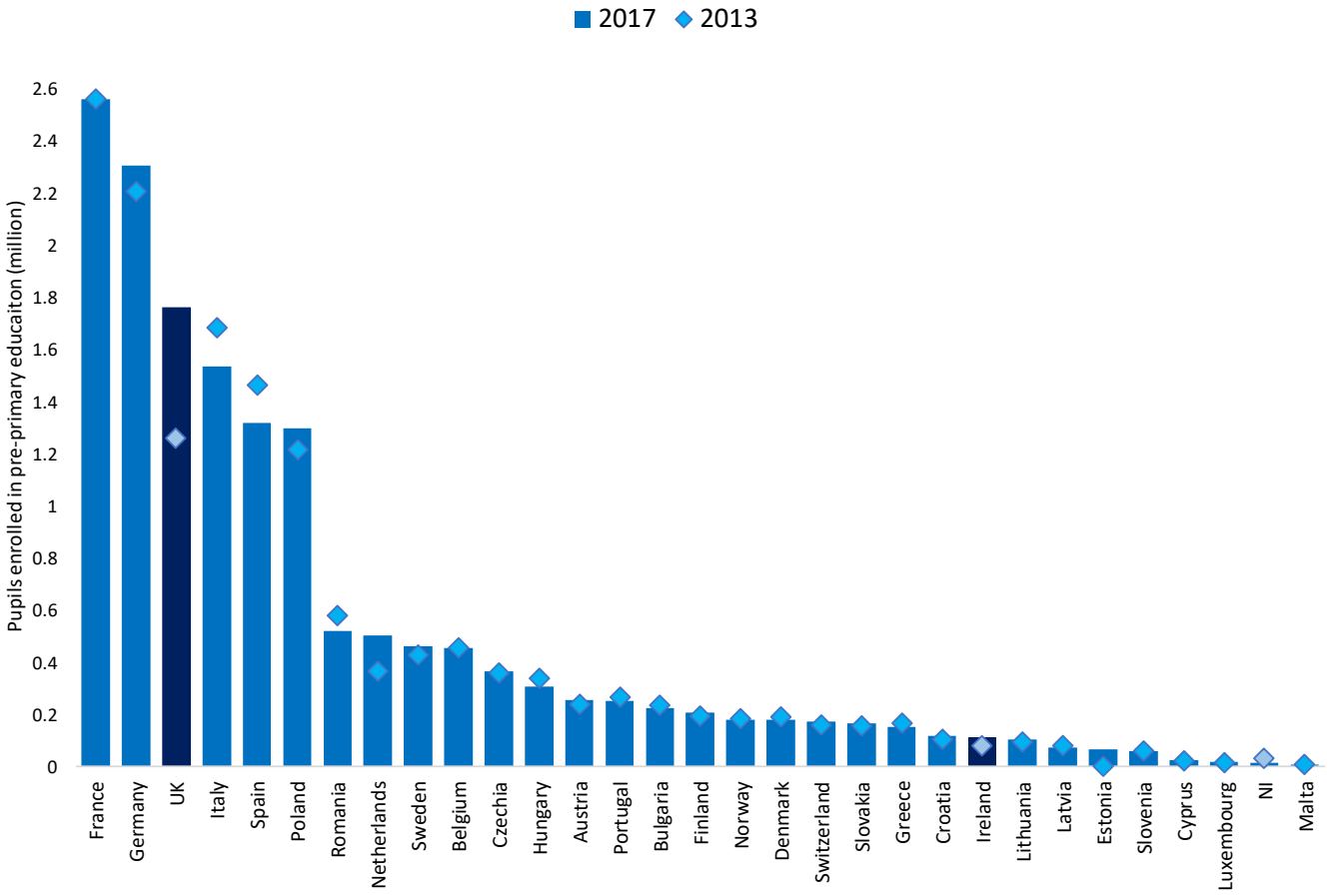


Source: UUEPC

Educational Participation and Attainment

Figure 4.5.1 Pre-primary education (million),2013-2017

Skills and Education	Rank			Direction of change	Change in decile	Year
Pre-primary education	30	/	31		↓	2017
Pre-primary education Index	32	/	33		↓	2017



Source: Eurostat

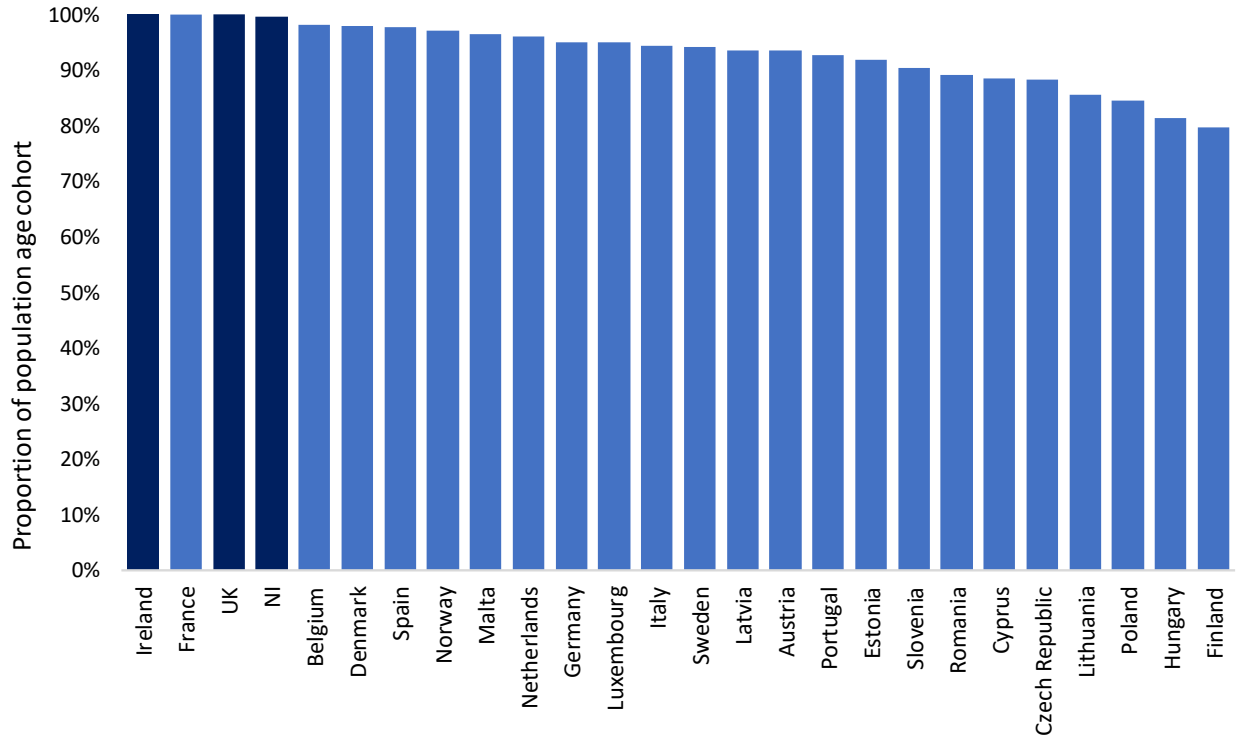
4.5.2 This indicator measures the number of pupils enrolled in early childhood education per country whilst the index measures enrolment as a percentage of the EU average.

4.5.3 NI, whilst it does have a smaller population that competitor nations, has a significantly smaller number of pupils enrolled in childhood education and figures have dropped from 32,200 pupils enrolled (2013) to 15,000 in 2017. This signals a significant change in enrolment levels and the readiness of children for primary education. This decline in enrolment may be linked to increased childcare costs or more parents choosing to work or stay at home whereby education can be provided informally and thus not officially recorded. Scotland is the only other UK region to also experience this decrease, whilst other regions have continued to increase enrolment since 2013.

Figure 4.5.2 Participation rate of 4-year olds in education (as a % of population age cohort), 2017

Skills and Education	Rank			Direction of change	Change in decile	Year
Participation Rate of 4 year olds in education (% of population age cohort)	4	/	31		↓	2017

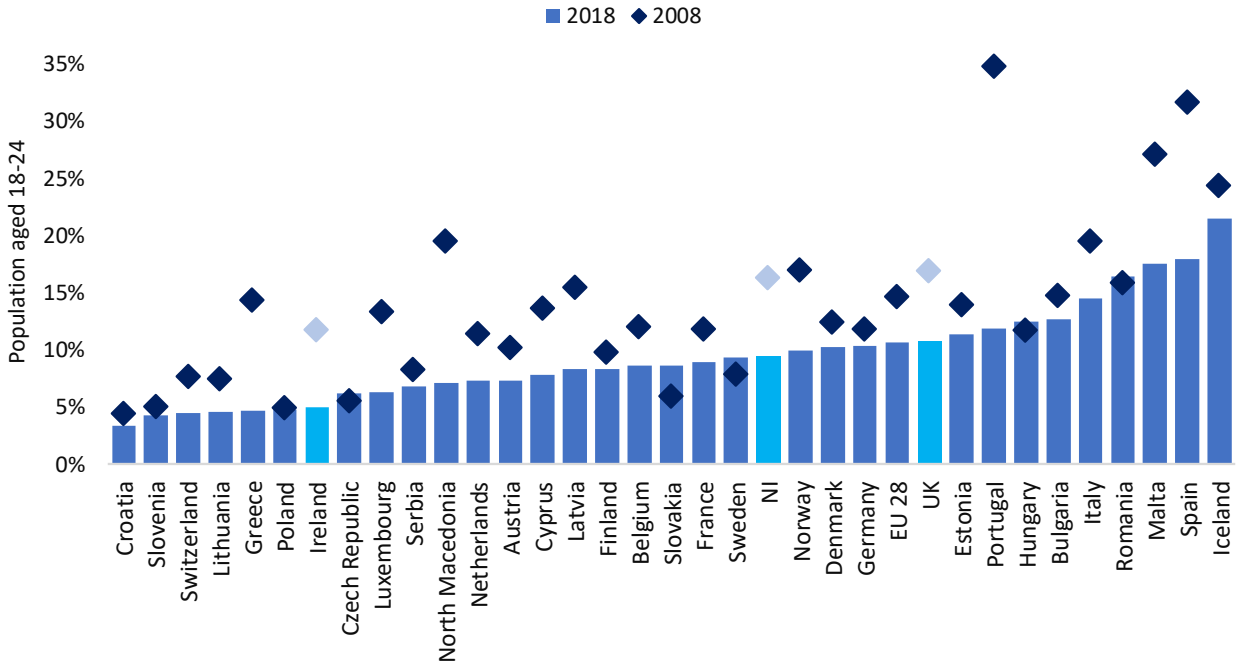
Source: Eurostat



4.5.4 The participation rate of 4-year olds in education in NI is high with 100% of children this age participating in education. This is on par with Ireland, France and the UK and an increase from 97% on 2009.

Figure 4.5.3: Early school leavers as a percentage of population aged 18-24, 2008-2018

Education and Skills	Rank	Direction of change	Change in decile	Year
Early School Leavers as a % of population aged 18-24	21 / 35		↑↑	2018

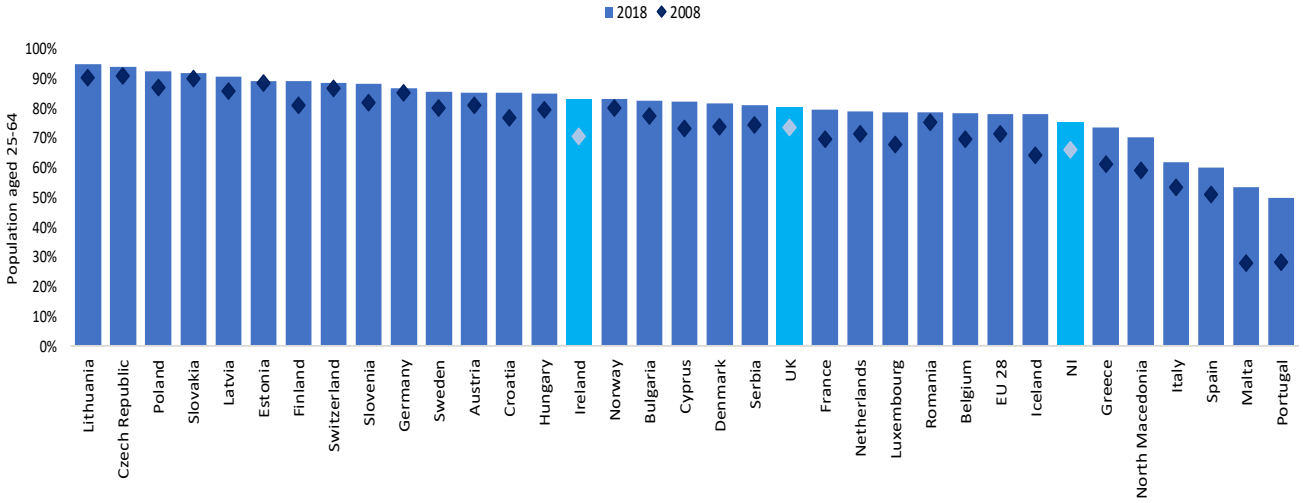


Source: Eurostat

4.5.5 In 2018, 9% of young people aged 18 to 24 left education early. Whilst this is high compared to competitor nations it is an improvement since 2008 when 16% of young people left education early. Over the last ten years NI has significantly outperformed other countries and has increased its ranking demonstrating that NI is improving its educational outcomes.

Figure 4.5.4: Percentage of the population aged 25-64 that has at least upper secondary education, 2008-2018

Education and Skills	Rank	Direction of change	Change in decile	Year
% of population aged 25-64 that has at least upper secondary education	29 / 35	↓		2018

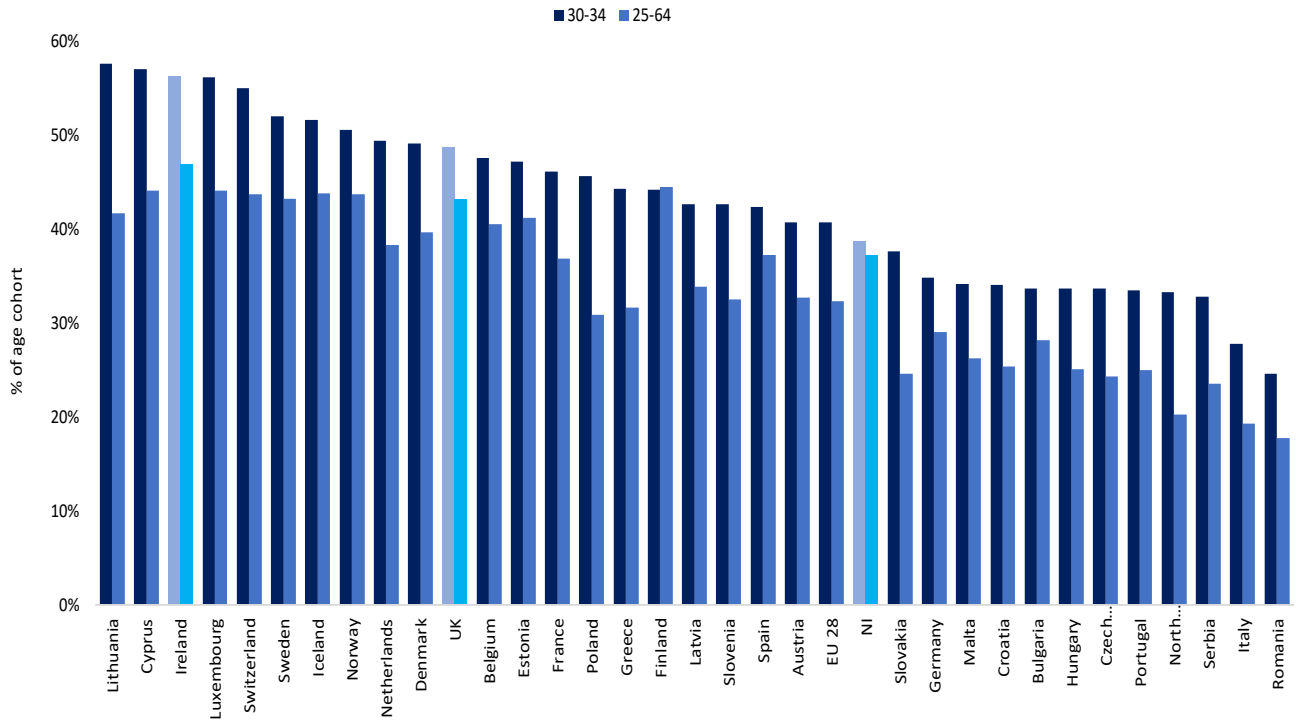


Source: Eurostat

4.5.6 NI has a significantly lower proportion of its population educated to at least secondary level education (often regarded as an overall base level of skills) compared to other EU countries. However, NI has made significant improvements since 2008 when only 66% of adults aged 25-64 had upper secondary education to 2018 when 75% of 25-64 year olds had attained this level. Despite improvements being made in recent years, NI has been unable to increase its overall ranking and remains below the EU average (78%) and well below the Irish and UK benchmarks.

Figure 4.5.5: Population by age cohort that has at least third level education, 2018

Skills and Education	Rank			Direction of change	Change in decile	Year
Highest levels of education (population age 25-64) Tertiary	16	/	35		↓	2018
Population age 30-34 that has at least third level education	23	/	35		↓↓	2018

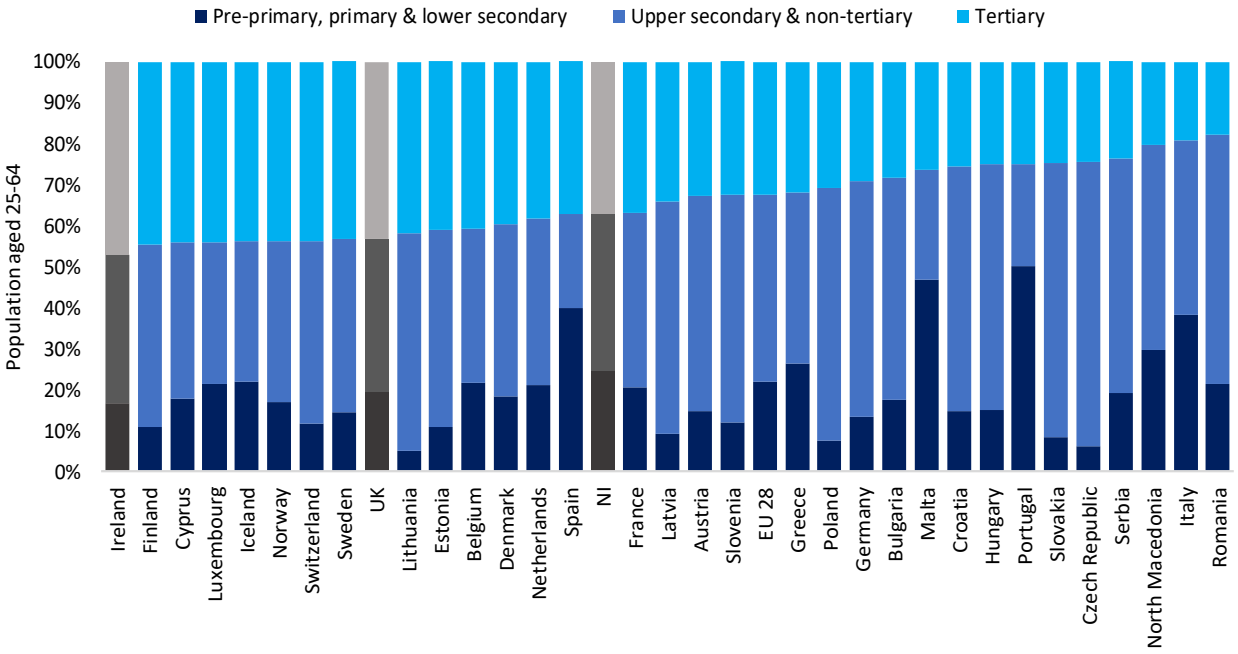


Source: Eurostat

4.5.7 In 2018, 37% of the NI population aged 25-64 had at least third level education, this is an improvement from 30% in 2008. For those aged 30 to 34 the ranking is 23rd, whilst for those aged 25-64 the ranking is 16th. Worryingly, this reveals that while other countries have been improving, NI has slipped further behind since 2008. In comparison Ireland outperforms many European countries ranking 3rd place 47% of adults aged 25-64 having third level education, whilst in the UK it is 43%.

Figure 4.5.6: Educational attainment of population aged 25-64 by highest level of education (%), 2018

Education and Skills		Rank			Direction of change	Change in decile	Year
Highest levels of education (population age 25-64) pre-primary, primary post secondary		29	/	35		↓	2018
Highest levels of education (population age 25-64) upper secondary non tertiary		27	/	35		↑	2018
Highest levels of education (population age 25-64) Tertiary		16	/	35		↓	2018



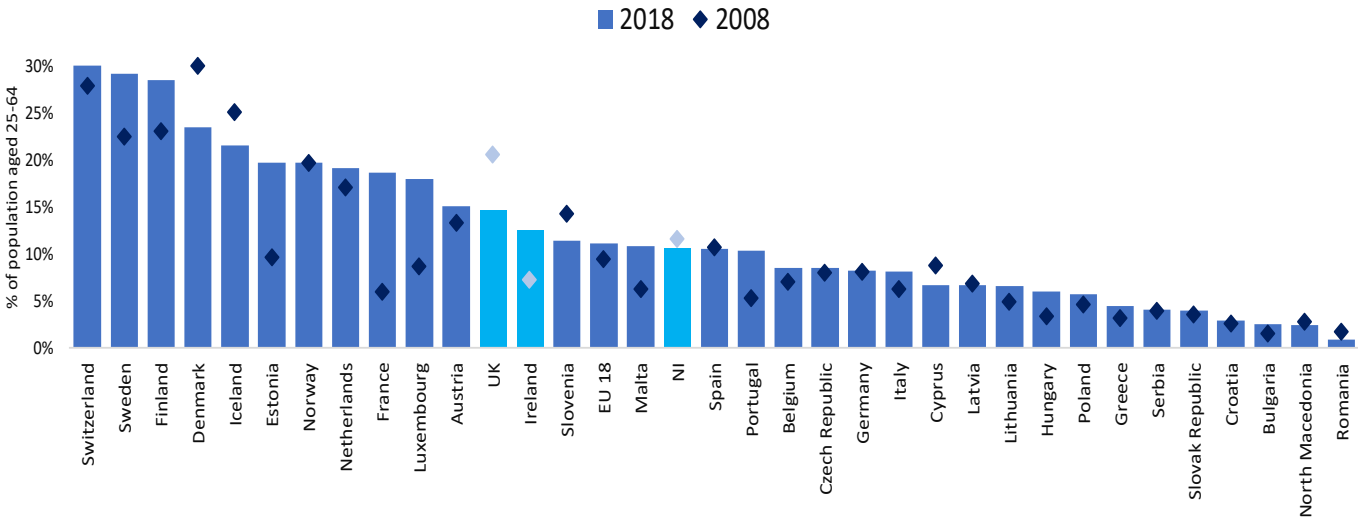
Source: Eurostat

4.5.8 NI's performance has improved for the percentage of adults (25-64 who have only pre-primary, primary post-secondary education from 34% in 2008 to 25% in 2018. Other countries have also improved more rapidly, causing NI's overall position to remain static.

4.5.9 NI performed strongly for tertiary education with 37% of the population having this level of education compared to 30% in 2008, giving NI an edge over competitor nations. However, while it remains ahead of the EU average, it continues to lag well behind both the UK and Ireland. Part of the reason for this lagging is that NI has a relatively large proportion of the population with low qualifications, larger than most comparator countries, which is likely to affect its global competitive position.

Figure 4.5.7: Lifelong learning (as a percentage of 25-64 year olds), 2008-2018

Education and Skills	Rank	Direction of change	Change in decile	Year
Lifelong learning (as a % of 25-64 year olds)	17 / 35		↓	2018



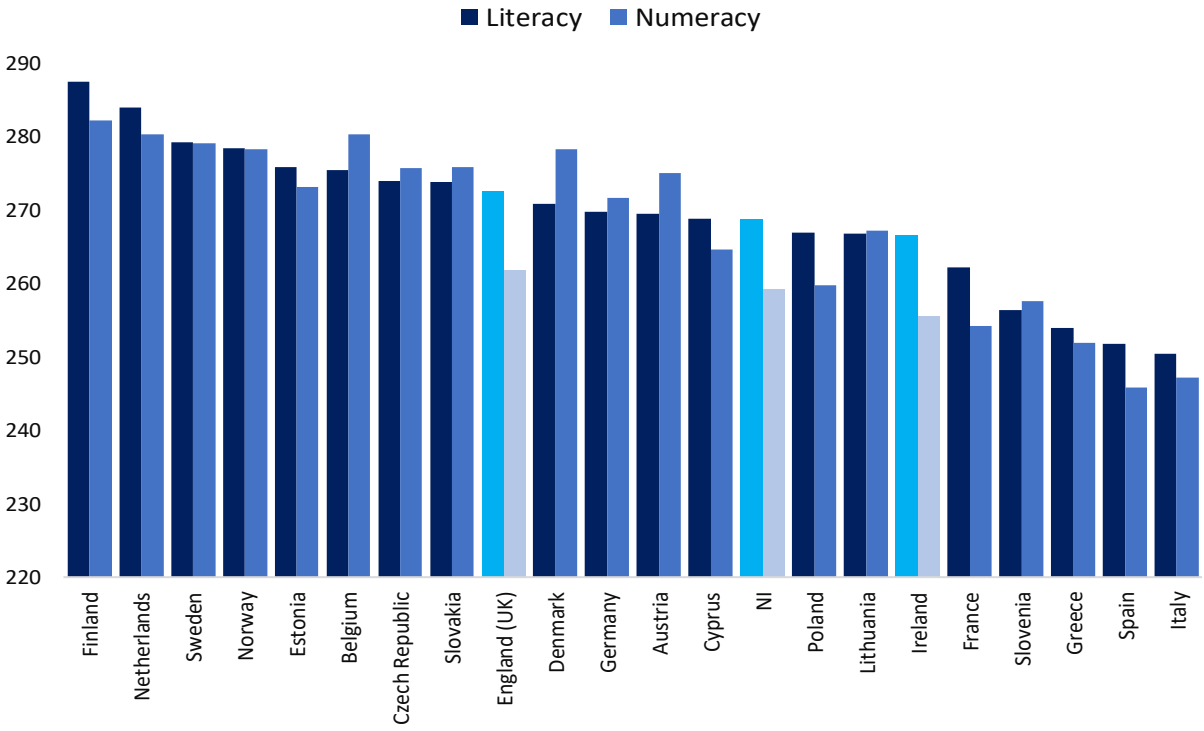
Source: Eurostat

4.5.10 This indicator measures the percentage of people aged 25-64 who were engaged in education (both formal and non-formal) in the four weeks prior to the survey. NI ranks just below the EU average and the rate of participation has fallen since 2008 from 11.6% to 10.6% in 2018. Lifelong learning is particularly important for competitiveness and employability as continuing the development of skills is crucial given technological advancements.

Proficiency in Maths, Science and Reading

Figure 4.5.8: Proficiency in maths and reading (16-65 year olds), 2015

Education and Skills	Rank			Direction of change	Change in decile	Year
Proficiency in Reading (16-65 year olds)	14	/	22		=	2015
Proficiency in maths (16-65 year olds)	16	/	22		=	2015

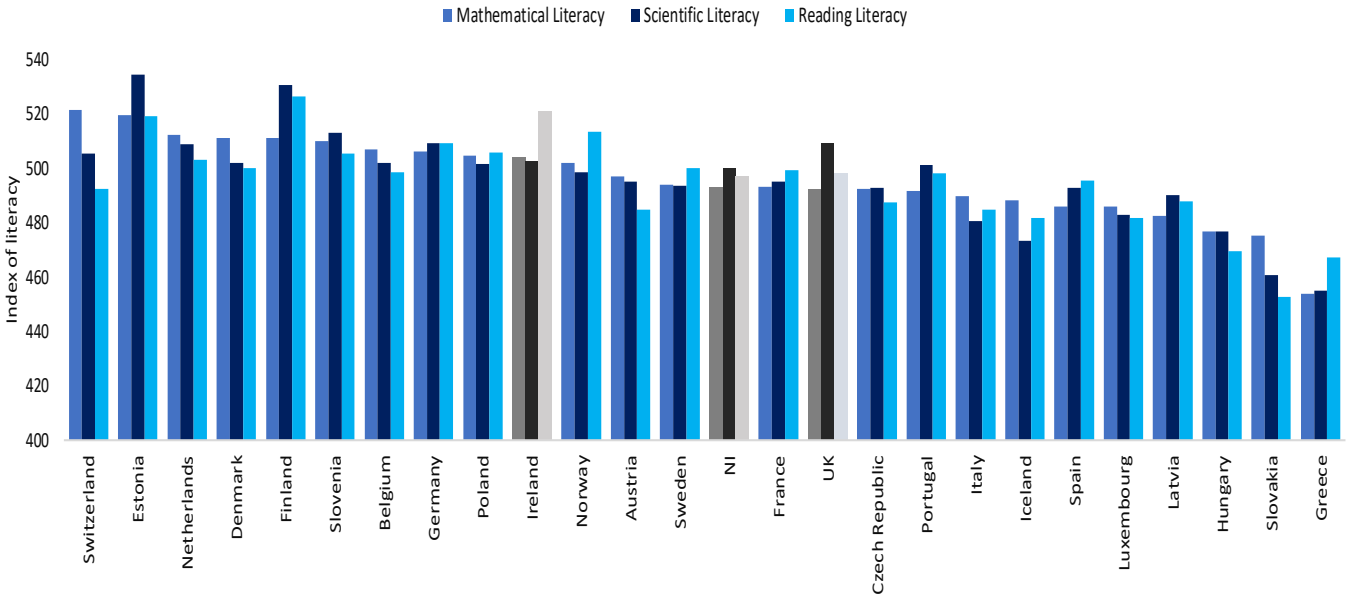


Source: HESA

4.5.11 NI is below average in both literacy and numeracy rates. NI lags well behind the UK for both indicators, but does however, outperform Ireland in both. Literacy and numeracy skills are essential features in the labour market and overall competitiveness and so performance here should be a focus for future improvement.

Figure 4.5.9: Scientific, Mathematical and reading literacy of 15-year olds, 2015

Education and Skills	Rank	Direction of change	Change in decile	Year
Scientific literacy of 15 year olds	13 / 26		↓	2015
Mathematical Literacy of 15 year olds	14 / 26		↑	2015
Reading Literacy	15 / 26		↓↓	2015

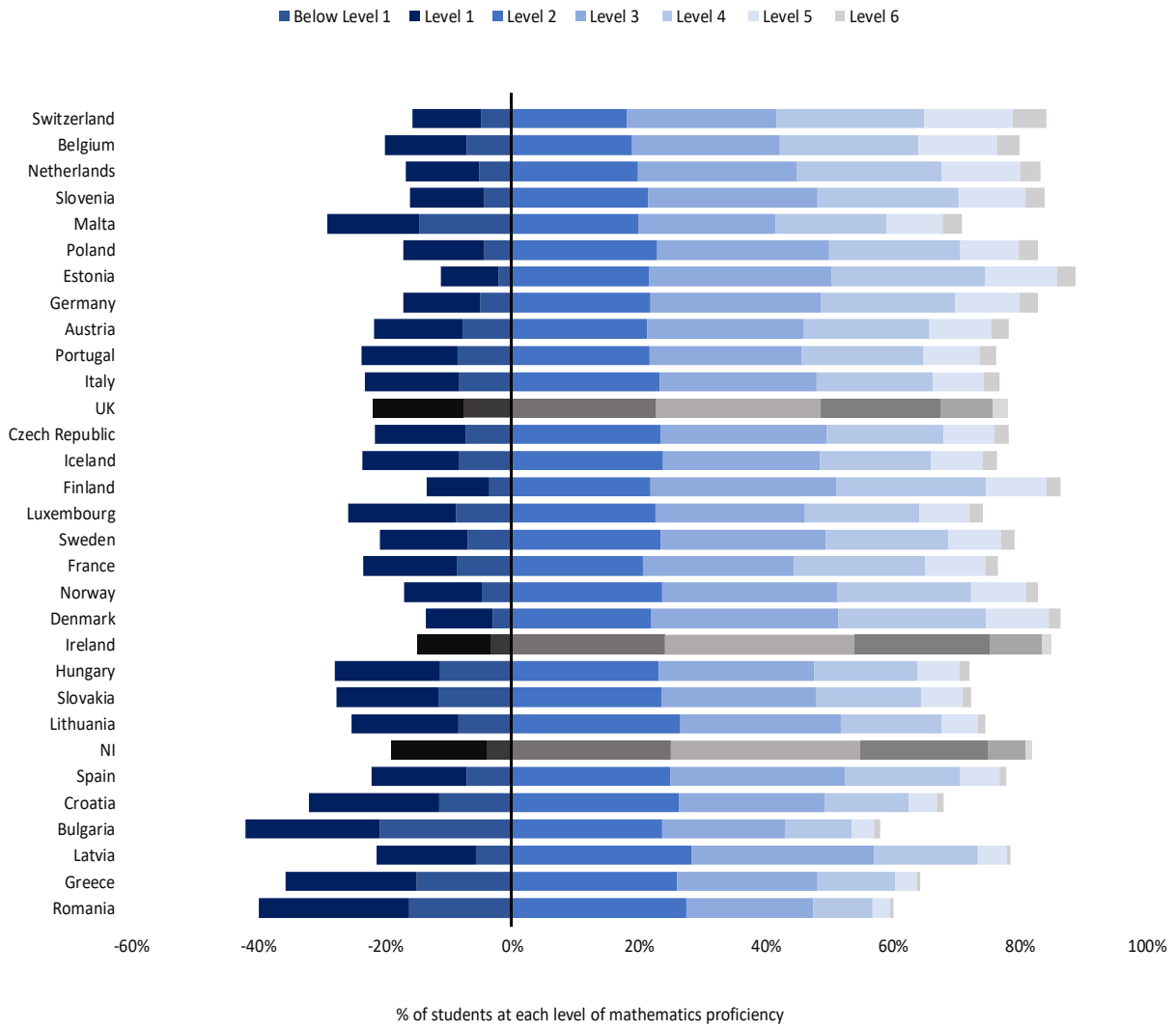


Source: PISA

4.5.12 NI ranks mid-table for each of the literacies: reading, science and mathematical. The literacy of NI's 15-year olds has declined in reading and science but improved in mathematics in the past three years. In comparison, Ireland ranks above NI across all three literacy rates, which points to all three areas as a key policy challenge for NI.

Figure 4.5.10: Percentage of students at each proficiency level on the mathematics scale, 2019

Education and Skills	Rank	Direction of change	Change in decile	Year
Percentage of students at each proficiency level on the mathematics scales	23 / 29		↓	2019



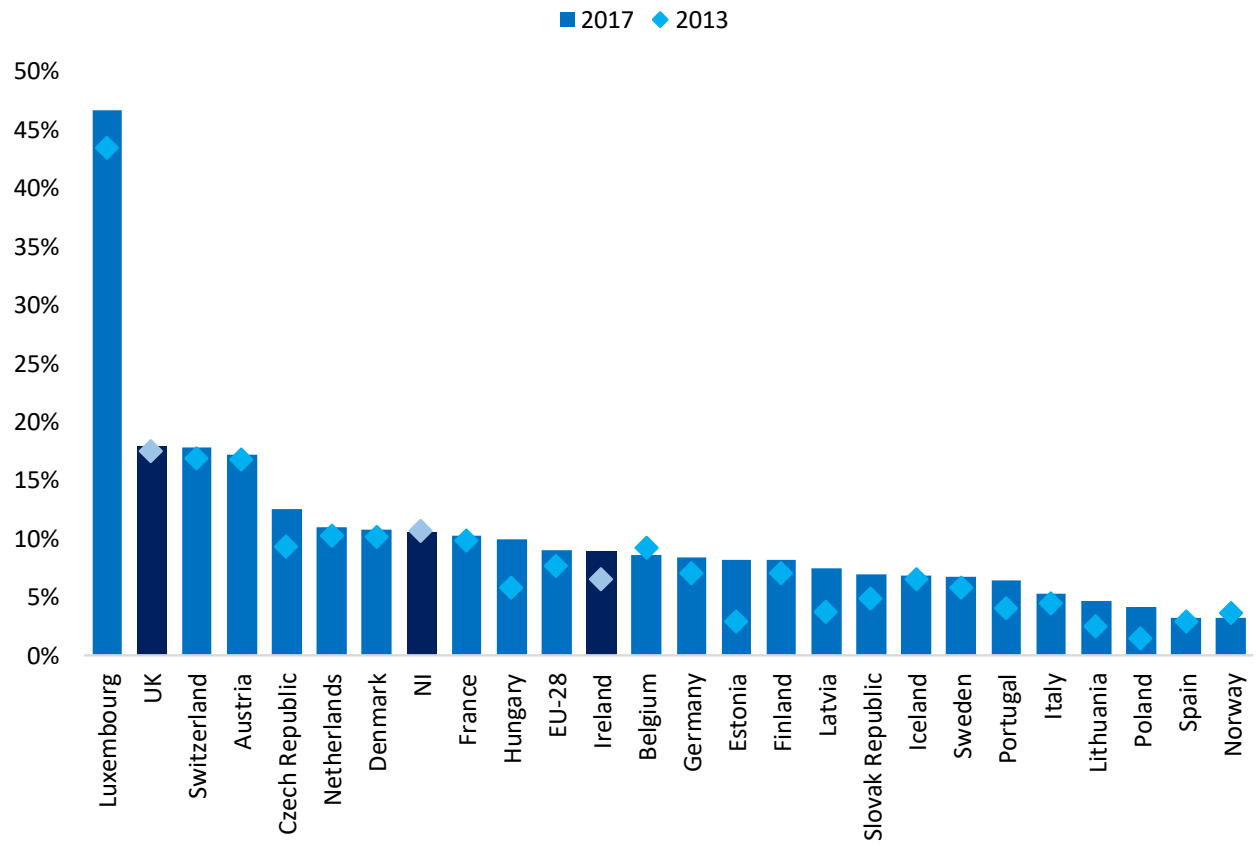
Source: PISA

4.5.13 NI's mathematics students are less proficient than their counterparts in the UK and Ireland. Only 1% of students have Level 6 in mathematics compared to 2% in the UK and 1.5% in Ireland, in NI the majority of students (30%) have Level 3. Whilst NI's overall level of proficiency in mathematics has increased, the change has not been significant enough for NI to move up the ranks. This may point to the necessity for more time to pass before the results of policy actions in education are seen in the data.

International Engagement

Figure 4.5.11: International students (% of all students in tertiary education), 2013-2017

Skills and Education		Rank			Direction of change	Change in decile	Year
International students (as a % of all students in tertiary education)		8	/	26		↓↓	2017



Source: HESA, OECD & DfE

4.5.14 Since 2013 NI has been increasing the proportion of international students significantly relative to other countries; ranking 8th out of the 26 countries analysed. In 2017, international students comprised 11% of NI tertiary enrolments – ahead of and Ireland (9%). The UK performs strongly with 18% of enrolments consisting of international students. International enrolments reflect a combination of factors including both cost and reputation. Research suggests international students boost the NI economy by £170m[8]. However, Brexit may pose future challenges when attracting foreign students and staff.

[8] Higher Education Policy Institute (2018); The costs and benefits of international students by parliamentary constituency; https://www.hepi.ac.uk/wp-content/uploads/2018/01/Economic-benefits-of-international-students-by-constituency-Final-11-01-2018.pdf

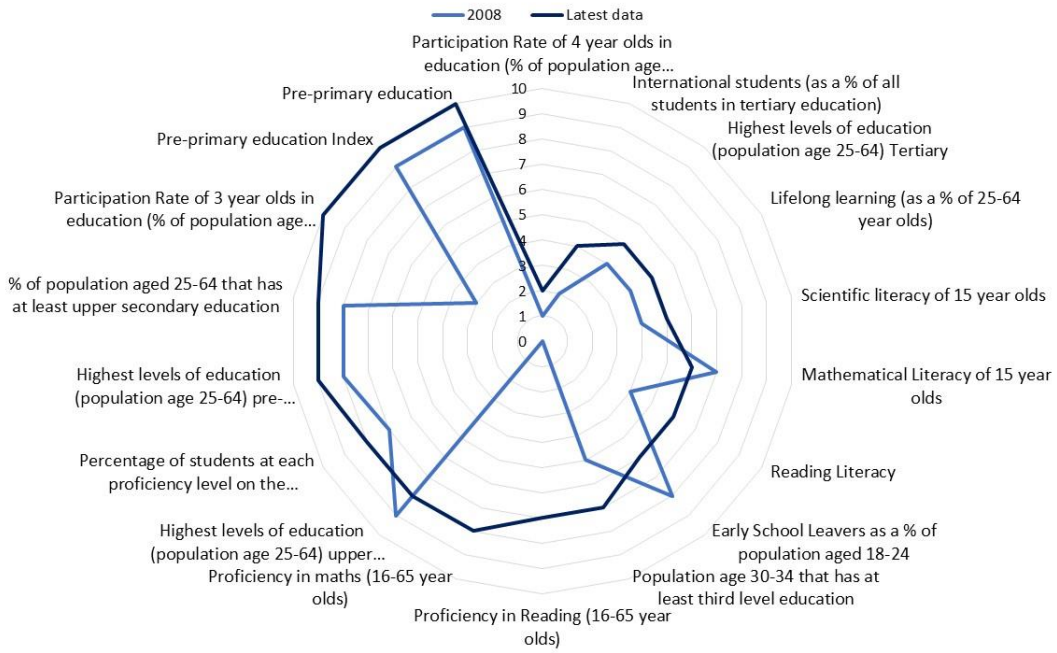
4.6 Education and skills summary

4.6.1 NI's overall performance in this element of the Scorecard has deteriorated as other countries have improved more rapidly than NI resulting in NI's comparative position being eroded. However, NI has made improvements in some areas such as the proportion of adults who have upper secondary education, which increased to 75% and 37% for those who have third level education.

4.6.2 The education and skills indicators present a range of challenges, including literacy rates for science, reading and mathematics, where NI ranks below average in all three indicators. Given that STEM subjects continue to be of importance and the demand for STEM skills by businesses is expected to continue to grow throughout the fourth industrial revolution, specific policy attention needs to be given to science and literacy as in each of these indicators NI performance has deteriorated.

4.6.3 Of the four drivers of future competitiveness, the erosion of NI's relative position is concerning as other countries will have access to a more plentiful supply of skilled and educated individuals. This will in turn require NI to consider migration policies in order to ensure that firms have access to the required number of skilled individuals in order to meet demand.

Figure 4.6.1: Summary of percentile placements for education and skills indicators



Source: UUEPC

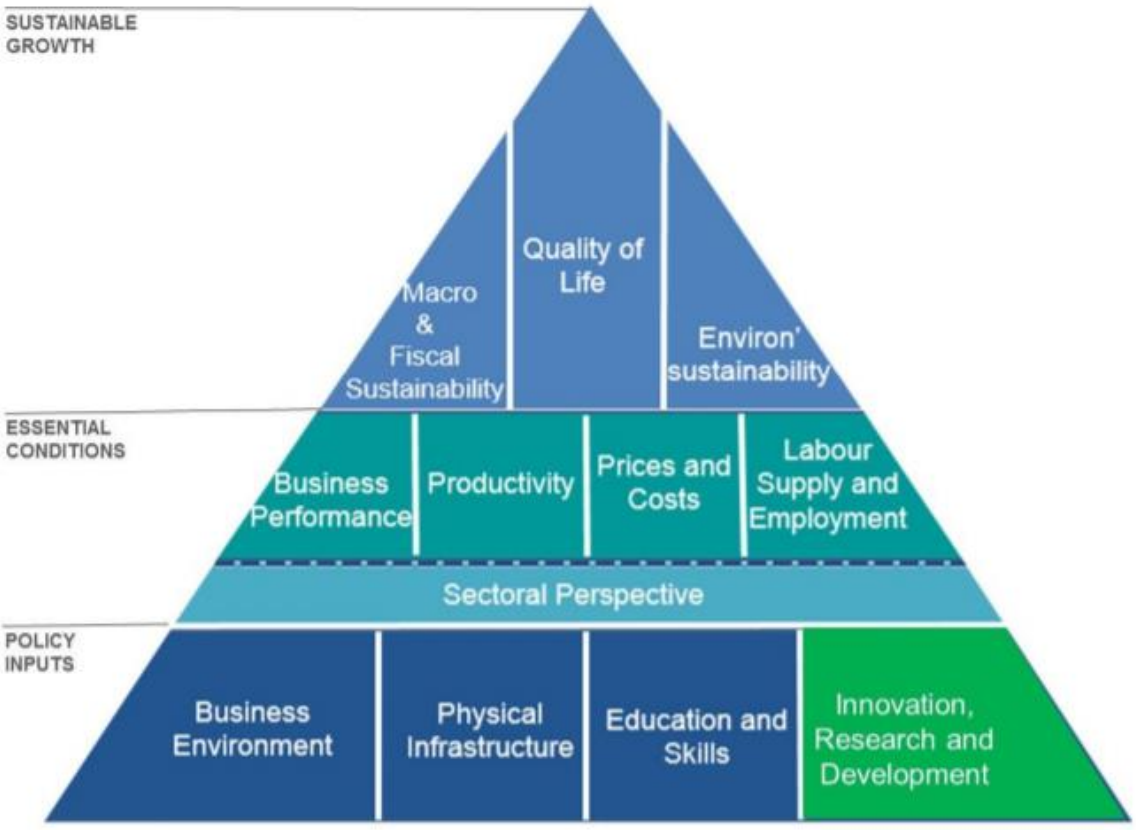
Table 4.6.2: Summary of Education & Skills indicators

Skills and Education	Rank	Direction of change	Change in decile	Year
Participation Rate of 4 year olds in education (% of population age cohort)	4 / 31		↓	2017
International students (as a % of all students in tertiary education)	8 / 26		↓↓	2017
Highest levels of education (population age 25-64) Tertiary	16 / 35		↓	2018
Lifelong learning (as a % of 25-64 year olds)	17 / 35		↓	2018
Scientific literacy of 15 year olds	13 / 26		↓	2015
Mathematical Literacy of 15 year olds	14 / 26		↑	2015
Reading Literacy	15 / 26		↓↓	2015
Early School Leavers as a % of population aged 18-24	21 / 35		↑↑	2018
Proficiency in Reading (16-65 year olds)	14 / 22		=	2015
Population age 30-34 that has at least third level education	23 / 35		↓↓	2018
Proficiency in maths (16-65 year olds)	16 / 22		=	2015
Highest levels of education (population age 25-64) upper secondary non tertiary	27 / 35		↑	2018
Percentage of students at each proficiency level on the mathematics scales	23 / 29		↓	2019
Highest levels of education (population age 25-64) pre-primary, primary post secondary	29 / 35		↓	2018
% of population aged 25-64 that has at least upper secondary education	29 / 35		↓	2018
Participation Rate of 3 year olds in education (% of population age cohort)	29 / 31		↓↓↓↓↓↓	2017
Pre-primary education	30 / 31		↓	2017
Pre-primary education Index	32 / 33		↓	2017

Source: UUEPC

4.7 Innovation, research and development

4.7.1 Innovation, research and development (R&D) is a key driver of economic growth and competitiveness. Companies that innovate and research and develop products and processes are often leaders in their field, competing on quality, unique attributes and value rather than cost. These companies tend to employ highly skilled individuals, pay higher wages and generate income to NI from export sales therefore contributing positively to NI's overall competitiveness.



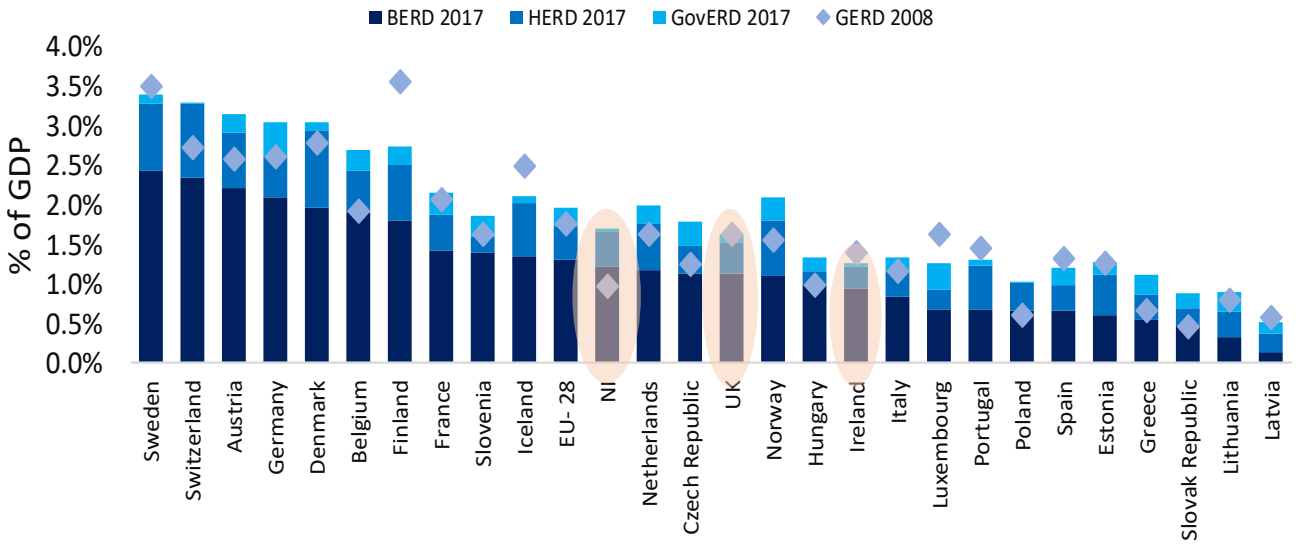
Source: UUEPC

Expenditure on R&D

Figure 4.7.1 Overall Expenditure on R&D as a percentage of GDP (business, higher education & Government), 2017

Innovation, Research and Development		Rank			Direction of change	Change in decile	Year
Expenditure on R&D as a percentage of GDP (Business)		12	/	28		↑↑↑	2017
Expenditure on R&D as a percentage of GDP (Higher Education)		14	/	27		=	2017
Expenditure on R&D as a percentage of GDP (Goverd)		26	/	28		=	2017

Source: OECD & NISRA

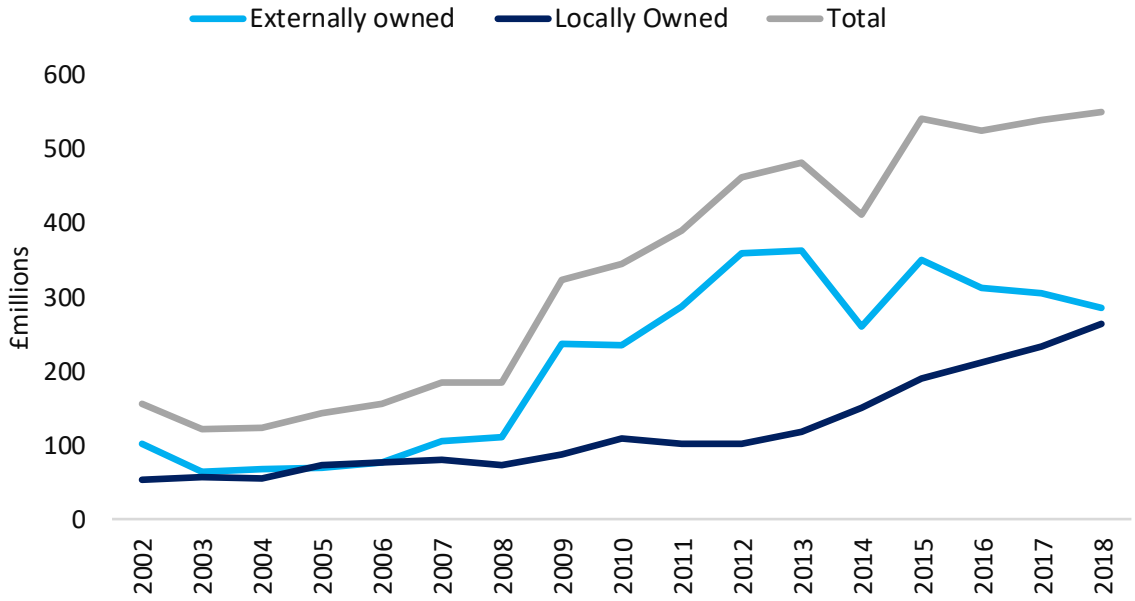


4.7.2 NI's R&D performance has improved significantly over the last decade to surpass UK and Irish levels but remains behind the EU average. During 2017, NI's expenditure on R&D was equal to 1.7% of GDP (GERD), in 2008 this was 1%.

4.7.3 Business expenditure on R&D (BERD) accounted for the majority as BERD spent 1.2% of GDP on R&D. The Higher Education sector (HERD) spent 0.4% of GDP on R&D and Government (GovERD) 0.05%. The continued rise of R&D expenditure emphasises its importance to the wider economy and competitiveness.

Figure 4.7.2: Business sector R&D expenditure by firm type, 2008-18

Innovation, research and development	Rank	Direction of change	Change in percentile
Business sector R&D expenditure by firm type	n/a	n/a	n/a



Source: NISRA

4.7.4 In 2018, businesses in NI spent around £550m on R&D, which marks a significant increase in annual expenditure of £340m since 2008. The major share of this expenditure is by foreign-owned businesses with around 52% of NI's R&D expenditure.

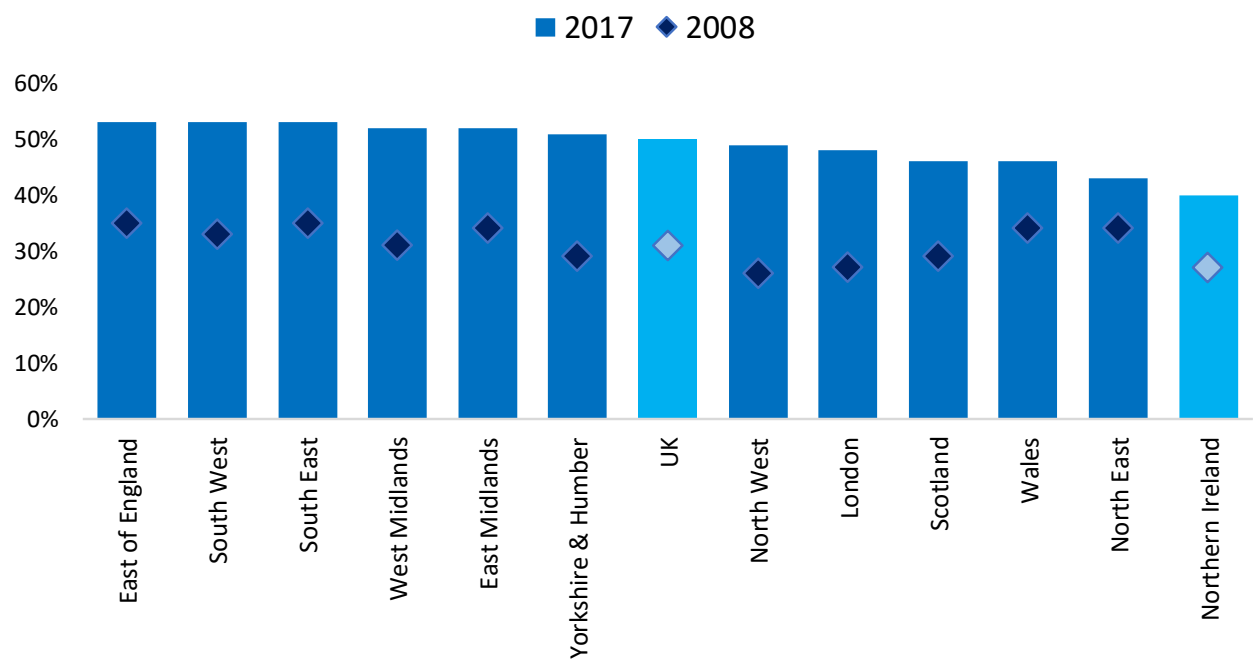
4.7.5 Interestingly, expenditure by foreign owned companies decreased since 2015 from £350million to £285million in 2018.

4.7.6 Expenditure by locally owned firms has been steadily increasing since 2008, where expenditure by these companies was £73million, in 2018 it came to £264million. This increase may have been assisted by funding for R&D from public sources.

Innovative Activity

Figure 4.7.3 Enterprises engaging in innovation activity by UK region, 2008-2017

Innovation, Research and Development	Rank			Direction of change	Change in decile	Year
Enterprises engaging in innovation activity by UK region	12	/	12		=	2017



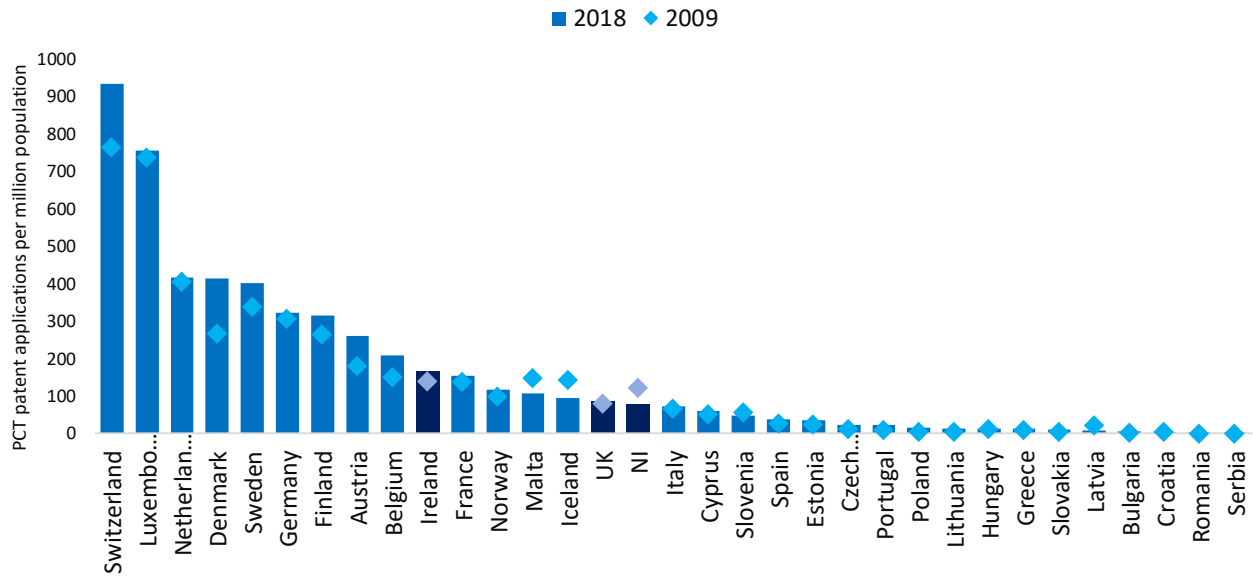
Source: UK Innovation Survey, gov.uk

4.7.7 In NI 40% of firms were engaging in innovative activity in 2017, this is a strong development from 37% in 2008. However, whilst improvement has been made NI lags behind the UK average (50%) with the result that NI is still ranked 12th.

Patent Applications

Figure 4.7.4: Patent Cooperation Treaty (PCT) applications per million population, 2009 Vs. 2018

Innovation, Research and Development	Rank			Direction of change	Change in decile	Year
PCT patent applications per million population	16	/	33		↓	2018



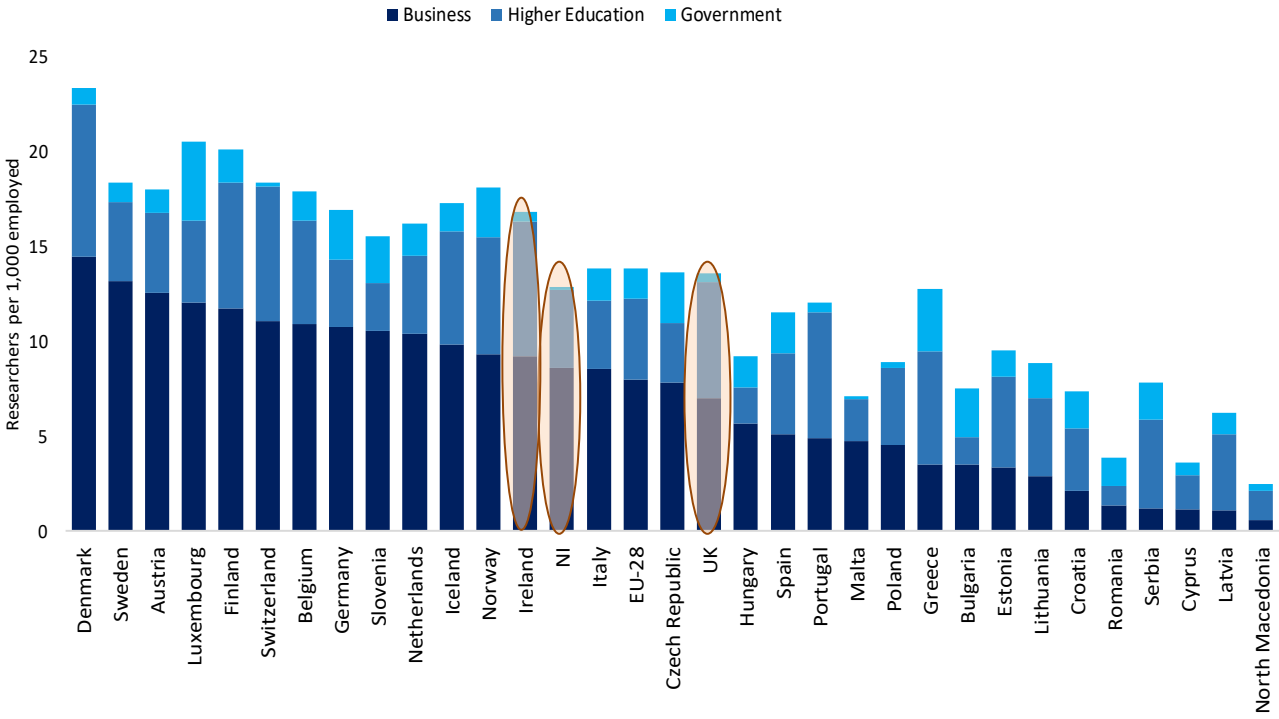
Source: OECD, Eurostat & ONS

4.7.8 NI's performance is mid table, ranked 16th out of 33 countries. There has been a decrease in the number of applications since 2009, dropping from 119 (PCT applications per million population) to 76 in 2018. The UK has risen from 77 (2009) to 87 (2018, PCT applications per million population), whilst Ireland's position has remained strong out of the basket of countries rising from 138 (PCT applications per million population-2009) to 166 in 2018.

Employment in Research

Figure 4.7.5: Researchers per 1,000 in total employment, 2017

Innovation, Research and Development	Rank			Direction of change	Change in decile	Year
Researchers as a % of total employment (Government)	4	/	24		↑↑	2016
Researchers as a % of total employment (Business)	9	/	25		↑↑↑	2016
Researchers as a % of total employment (Higher Education)	11	/	29		↓	2016

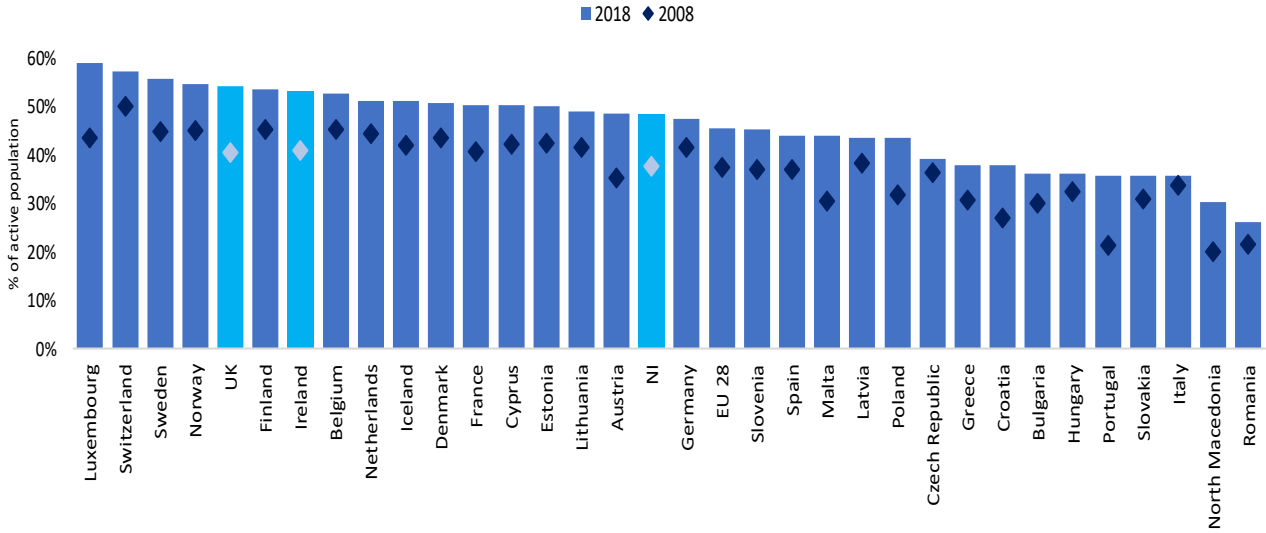


Source: Eurostat
Note: 2016 data used for NI as latest available

4.7.9 NI performs strongly for the number of researchers employed per 1,000 in employment. A breakdown of researchers by sector shows that business accounted for most researchers in NI employment with 8.6 per 1,000 employed followed by followed by Higher Education (4) and government sectors (0.1). NI continues to lag the Irish averages however NI has overtaken the UK for the number of researchers in the business sector. This highlights NI's developing competitiveness in this area.

Figure 4.7.6: Persons with tertiary education (ISCED) and/or employed in science and technology as a % of active population, 2008-18

Innovation, Research and Development	Rank			Direction of change	Change in decile	Year
Persons with tertiary education (ISCED) and/or employed in science and technology as a % of active population	17	/	35	↑		2018

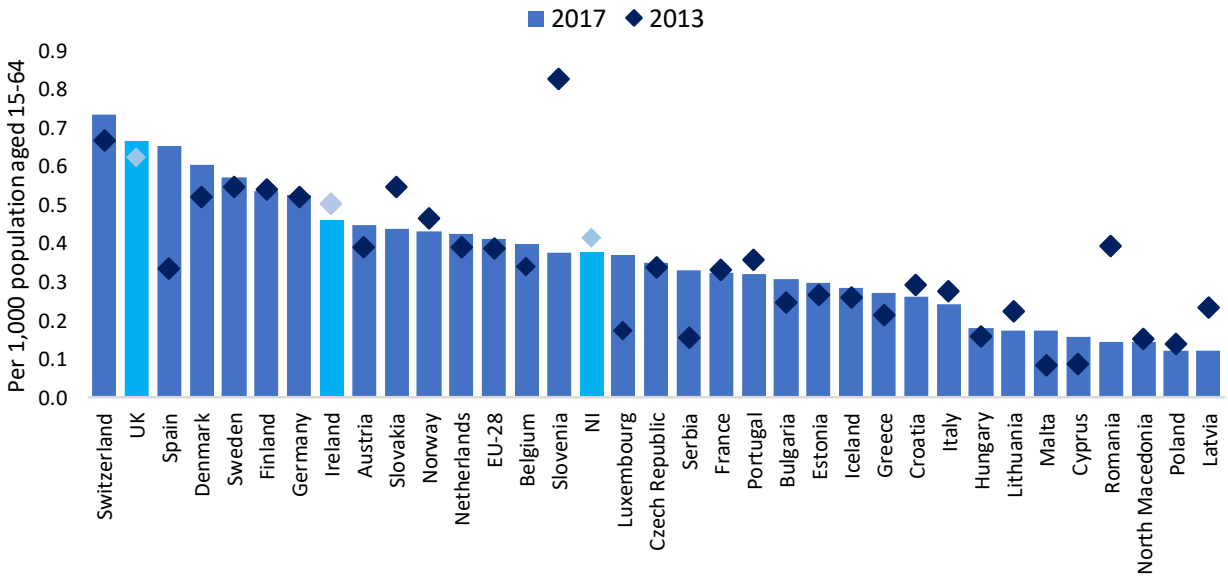


Source: Eurostat

4.7.10 The proportion of people with tertiary education and/or employed in Science and Technology has increased over the past ten years with the resulting in NI improving its position to 17th out of the 34 countries analysed. The UK ranks 5th and has risen from 40% in 2008 to 54% in 2018, whilst Ireland has improved from 41% to 53%. The rise in proportion of people with tertiary education and/ employed in Science and Technology supports the demand for STEM skills within growing industry and the advancement of automated workings.

Figure 4.7.7: PhD Graduates per 1,000 of population (aged 15-64), 2013-17

Innovation, Research and Development	Rank			Direction of change	Change in decile	Year
PhD graduates per 1,000 population (aged 15-64)	14	/	35		=	2017



Source: Eurostat
Note: 2014 figures used for NI and Serbia to represent 2013 due to data availability.

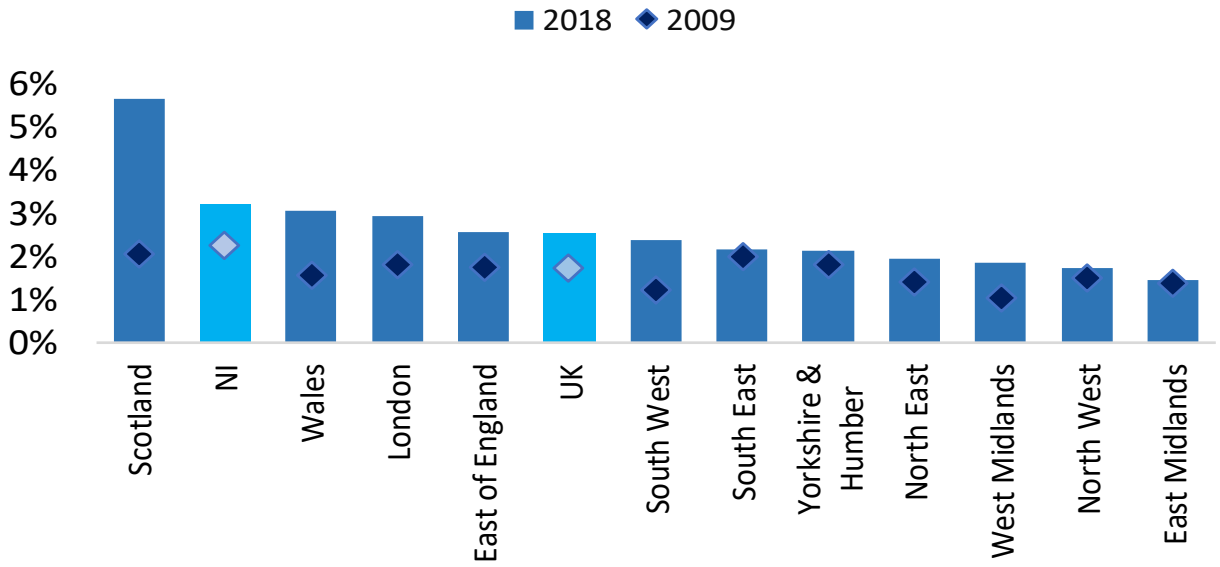
4.7.11 In 2017, NI had 0.4 PhD graduates per 1,000 people, a slight decrease from 2014 (of 0.415). NI's middling performance is weaker compared to both the UK (0.67) and Ireland (0.46). However, NI has actually improved its performance relative to Ireland since 2012, where there has been a fall in PhD graduates per 1,000 of population of 0.03. This has helped to close the competitiveness gap between both countries.

Research Grants and Contracts

Figure 4.7.8: EU research grants & contracts as a % of total university income, 2009-2018

Innovation, Research and Development		Rank			Direction of change	Change in decile	Year
EU research grants & contracts as a % of total university income		2	/	13		↓	2018

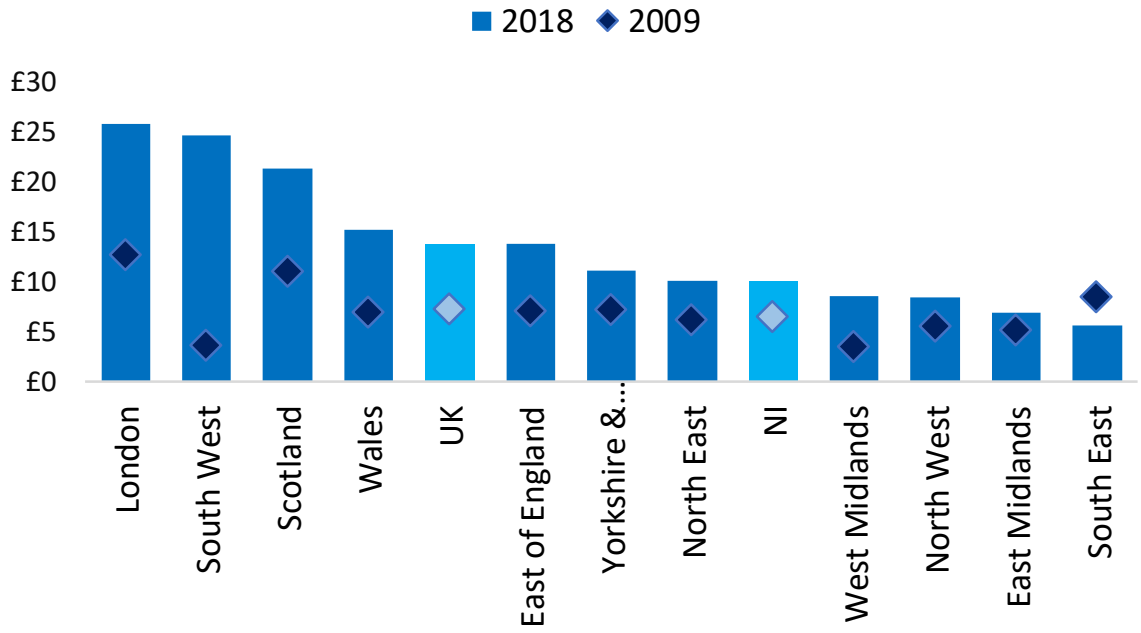
Source: Eurostat



4.7.12 In 2018, 3.2% of NI's total university income was in the form of EU research grants and contracts. This helped to produce NI's ranking for NI in the top three UK regions. Moreover, NI's performance in this area has improved considerably from 2009 when 2.2% of income was from EU research grants and contracts helping NI to maintain its relative competitive position compared to other UK regions.

Figure 4.7.9: EU university research grants per 1000 inhabitants, 2009-2018

Innovation, Research and Development	Rank			Direction of change	Change in decile	Year
EU university research grants per 1,000 inhabitants	9	/	13		=	2018



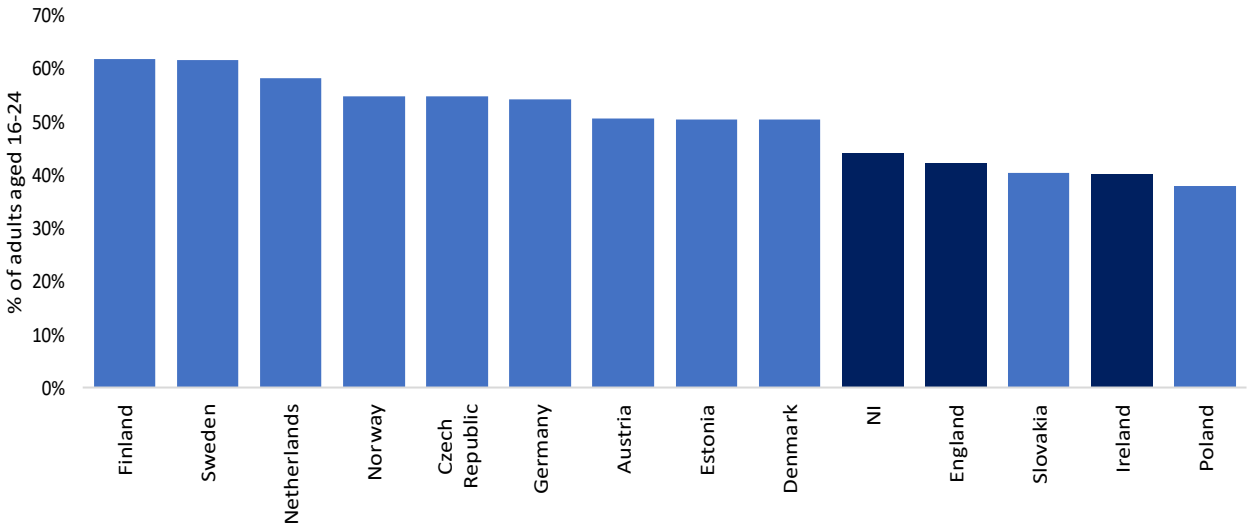
Source: HESA, ONS & Eurostat

4.7.13 NI generates £10.03 in EU research grants per 1,000 inhabitants, which is below the UK average of £13.85. This results in NI having a lower performance in this indicator relative to other UK regions. However, NI has experienced growth in EU university research grants from £6.47 in 2009 where other parts of the UK such as the South East have experienced a decline in grants.

Problem Solving Skills

Figure 4.7.10: Percentage of 16-24 year olds who score level 2 or 3 in problem solving in technology rich environments, 2015

Innovation, Research and Development	Rank			Direction of change	Change in decile	Year
Percentage of adults (16-24 year olds) who score level 2 or 3 in problem solving in technology rich environments	10	/	14		=	2015



Source: OECD

4.7.14 The proportion of young adults who are capable of problem solving in technology rich environments is relatively low; with NI, Ireland and England all ranked in the bottom third. NI is ahead of England and Ireland averages but continues to lag the OECD average. Problem solving skills in technology rich environments will continue to be demand as technology evolves and so it is important that policy helps to equip young adults with skills to prepare them for the future of work with technology.

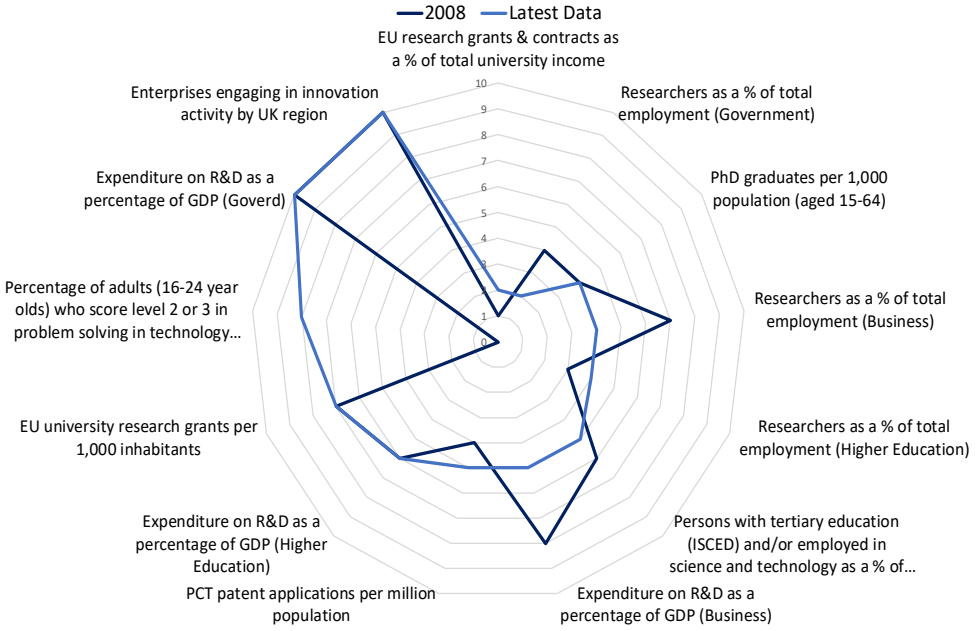
4.8 Innovation, research and development summary

4.8.1 NI's R&D and innovation performance is average in terms of the countries included in the research. Improvements are evident in a number of indicators; however, competitor nations have also improved over time with the result that NI has more or less retained its relative competitive position in this pillar.

4.8.2 On a positive note, expenditure on R&D by firms has increased significantly from £184m in 2009 to £550m in 2018. Externally owned firms have historically driven this expenditure since 2008 locally owned firms have continued to increase their R&D expenditure and in 2018 contributed £264m. This is a positive development showing the increasing capability and application of indigenous firms. However, it is important that externally owned firms also maintain and increase expenditure in order to drive and facilitate competitive R&D opportunities within NI.

4.8.3 Unfortunately, NI continues to lag in terms of innovative activity and patent application numbers. Since 2009 applications have dropped from 119 (per million population) to 76 in 2018. The university perspective is mixed, with EU research grants and contracts increasing from 2.2% of total university income to 3.2% ranking NI 2nd in this indicator. However, PhD graduates per 1,000 population have dropped from 0.41 (2013) to 0.38 (2017) and any further reduction in future PhD graduate numbers may prove to be a challenge in terms of boosting future R&D and innovative activity in NI.

Figure 4.8.1: Summary of percentile placements for innovation, research and development



Source: UUEPC

Table 4.8.1: Summary Table of Innovation, Research and Development indicators

Innovation, Research and Development	Rank	Direction of change	Change in decile	Year
Researchers as a % of total employment (Government)	4 / 24		↑↑	2016
EU research grants & contracts as a % of total university income	2 / 13		↓	2018
Percentage of adults (16-24 year olds) who score level 2 or 3 in problem solving in technology rich environments	10 / 14		=	2015
Researchers as a % of total employment (Business)	9 / 25		↑↑↑	2016
Researchers as a % of total employment (Higher Education)	11 / 29		↓	2016
PhD graduates per 1,000 population (aged 15-64)	14 / 35		=	2017
Expenditure on R&D as a percentage of GDP (Business)	12 / 28		↑↑↑	2017
PCT patent applications per million population	16 / 33		↓	2018
Persons with tertiary education (ISCED) and/or employed in science and technology as a % of active population	17 / 35		↑	2018
Enterprises engaging in innovation activity by UK region	12 / 12		=	2017
Expenditure on R&D as a percentage of GDP (Higher Education)	14 / 27		=	2017
EU university research grants per 1,000 inhabitants	9 / 13		=	2018
Expenditure on R&D as a percentage of GDP (Goverd)	26 / 28		=	2017

Source: UUEPC

5 Conclusions

5.4.1 This research has focussed on NI's relative competitiveness in the policy inputs tier of the competitiveness scorecard. This tier focusses on the drivers of future competitiveness and comprises of;

- Business Environment;
- Physical Infrastructure;
- Education & Skills; and
- Innovation, Research, Development & innovation.

5.4.2 These are the areas in which NI, in most instances, has devolved policy control. The aim of this project is to measure objectively where NI's relative strengths and challenges lie, and signpost policy action and resources to those areas where intervention is required most urgently. Addressing the challenges that face NI across the four pillars will help to boost competitiveness and in the longer-term, income in NI.

5.4.3 There are a number of positive findings for NI. These include the improvement in relative competitiveness in the business environment and infrastructure, driven by UK reserved policy matters in the main for business environment and the technological improvements in the case of the infrastructure pillar.

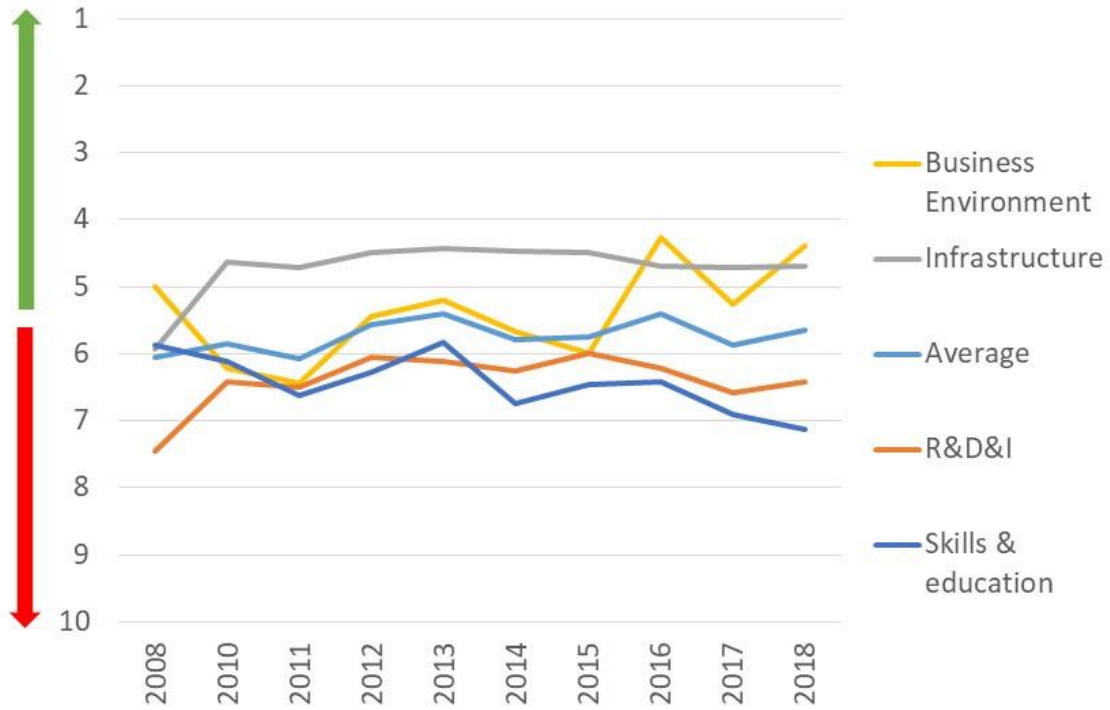
5.4.4 R&D&I is a mixed picture, with recent improvements in R&D evident. However, these improvements have not yet translated into more innovative activity or patents being granted. However, challenges remain as in many small economies[9], FDI companies expenditure on R&D makes up a significant proportion of overall expenditure dependency or over reliance on these firms brings dangers of FDI companies reducing spending or moving the R&D function to another location outside of NI. Therefore, NI needs to ensure it provides a competitive and well skilled and educated workforce along with attractive infrastructure to maintain and attract FDI companies.

5.4.5 The erosion of competitiveness in the skills and education pillar is of most concern, as it is now the weakest of the four pillars and on a downward trajectory. The evidence shows that NI's performance has improved in a historical context, however, competitor nations are improving much more rapidly with the result that NI's competitiveness has slipped over the last decade in skills and education. If not dealt with in the immediate period these issues have longer-term implications for employment opportunities, wage levels and potential continued and further disengagement from the labour market for some.

[9] David Skilling, *The Strategic Integration of Skills and Innovation Policy in Northern Ireland: An international small economy perspective* (August 2019 for Department for the Economy).

5.4.6 When considered over the last decade and across all four pillars, NI's relative competitiveness has increased marginally as improvements in the technological infrastructure and business environment have outweighed the decline in skills and education. Despite this improvement, more than half of the competitor nations included are more competitive than NI, outlining the scale of the challenge if it is to deliver upon the economic aspirations in the Programme for Government and the Economic Strategy.

Figure 5.1.1: NI's relative competitive performance, by policy input pillar, 2008 - 2018



Source: UUEPC

5.4.7 As NI faces the challenges that Brexit and the fourth industrial revolution are likely to bring, and politicians and policy makers begin to implement the New Decade, New Approach[10] in a the recently restored NI Executive, it is essential that NI focusses on the areas of greatest need in order to boost future competitiveness and sustainability.

5.4.8 This research outlines a number of areas where policy attention is required in the immediate term. Most specifically in education and skills, focussing on the outputs and attainment levels in the education system and addressing lifelong learning and low qualifications within the workforce as NI prepares for a more automated and constantly evolving future of work. Innovation, seed capital,

[10] https://static.rasset.ie/documents/news/2020/01/new-decade-new-approach.pdf

and physical infrastructure are all areas in which NI could boost competitiveness with carefully considered investments. The Competitiveness Fund that was launched in the New Deal, New approach document should consider the findings of this and other competitiveness research in order to identify priorities for the future and areas for further research.

5.4.9 These findings highlight a modest improvement in the drivers of competitiveness over the last decade, but there is much to do order to build sustainability and resilience into the NI economy.