

Symposium: The Economies on the Island of Ireland

Competitiveness on the Island of Ireland

Richard Johnston
Frances Ruane
Laura Heery
Ulster University

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Abstract This paper considers Ireland and Northern Ireland's relative international competitive performance across four policy input domains: education and skills; research, development & innovation; infrastructure and the business environment. The evidence demonstrates that Ireland was relatively more competitive and on a positive trajectory from 2011-16, while Northern Ireland continued to lag Ireland and most of its European neighbours in most domains. Both countries' competitiveness performances are benchmarked against various EU/OECD countries, some of whose policies may be relevant to policy design for addressing these performance weaknesses on the island of Ireland.

Keywords: competitiveness, Ireland, Northern Ireland

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1. INTRODUCTION AND BACKGROUND

The publication of Michael Porter's seminal work, *The Competitiveness of Nations* (Porter, 1990) marked a resurgence of competitiveness research in academic literature and public policy development. More recently, the focus on national competitiveness has extended to regions and cities (Porter, 2002) and to a new policy focus on city regions (Hall, 2009). The emphasis on competitiveness in academic literature and in public policy reflects the fact that geographic areas increasingly compete with one another, both as bases for efficient production (and hence market growth) and in attracting mobile investment and human talent (Birnle, Johnston, Heery & Ramsey, 2019). For a small, open, trade-dependent economy, policies which enhance competitiveness are essential to support the creation of sustainable employment and facilitate improvements in living standards. Regions within a country that are relatively less competitive require relatively larger income transfers from central government if residents are to enjoy the same living standards as others in more competitive regions within the same country.

Two economies share the island of Ireland - Ireland, which is a small and highly-open national economy and Northern Ireland which is a devolved region of the United Kingdom. Over the past three decades, both Ireland and Northern Ireland have increasingly benchmarked their competitiveness performances against other small open economies, although developments in Northern Ireland have generally been later and less extensive. In Northern Ireland, strategies generally aim to seek to match the UK average on productivity, incomes or employment rates (such as Strategy 2010 and the NI Economic Strategy).

Whilst there are differences between the two economies, there are also obvious similarities. Both share a single island, time zone, language and many cultural factors. Both are major exporters of food commodities reflecting their similar resource endowments. Both have been competing in the market for foreign direct investment (FDI) for many decades. Like many smaller EU countries, both have benefited from the reduction in barriers to trade within Europe since Ireland and the UK joined the EU in 1973. Access to larger markets has facilitated enterprise growth through economies of scale and scope. The reduction of tariffs and the eventual removal of non-tariff barriers when the Single Market was created in 1992 provided opportunities for greater economic integration on the island of Ireland. In a series of lectures in the 1990s, the late Sir George Quigley promoted the idea of an island economy and argued that the European Community should regard the island of Ireland as one economic

area.¹ This single economic area argument underpinned EU funding for the Border Regions over the past 30 years; see Quigley (2015). Integration has continued to increase, especially in the two decades since the Belfast Agreement was signed, with cross-border bodies being established to support economic cooperation on the island. See D'Arcy and Ruane (2019).

If small countries are to continue and expand their economies and to raise living standards, a key channel is through increasing net exports of goods and services. The need to compete internationally explains why competitiveness has been a core policy theme in Ireland for over four decades, and particularly in the past two decades. This was mainstreamed with the establishment of the National Competitiveness Council (NCC) in 1997. Competitiveness frameworks have been used in Ireland as an integrating policy platform aimed at increasing growth and providing sustainable employment. The NCC framework continues to develop, drawing on developments in the literature. The latest framework has introduced several new elements into it, such as clusters and firm specialisation. (See NCC, 2018).

Whilst a range of competitiveness studies have been carried out in Northern Ireland over the last decade, they have focussed on either a small number of small open economies or a specific policy area. An overarching assessment of Northern Ireland's international competitiveness across all areas and relative to EU and OECD countries was carried out at the request of the Economic Advisory Group in Northern Ireland (EAGNI). The EAG promoted the use of competitiveness indicators as part of the process of aligning policies to support the restructuring of the economy and increasing its growth rate. This paper draws on a major research exercise commissioned by the EAGNI from the Ulster University Economic Policy Centre (UUEPC). That research led to the publication of a Competitiveness Summary for Northern Ireland (Economic Advisory Group, 2016) and a full Competitiveness Scorecard Report (Johnston and Heery, 2016). The data collected make possible an examination of the relative competitiveness of the two parts of the island of Ireland. In this paper, we focus on the subset of competitiveness metrics that can be influenced directly or be driven by policy.

Section 2 looks briefly at the study which allowed the first comparison of international competitiveness of both economies from 2011-16. Section 3 examines those indicators of competitiveness which are directly influenced by policy. Section 4 looks at possible implications for policies on the island.

2. MEASURES OF COMPETITIVENESS FOR NORTHERN IRELAND AND IRELAND

The measurement of competitiveness is challenging as there is no internationally agreed definition. Cascading from the lack of an agreed definition, numerous methodologies and indicators are used to benchmark international competitiveness at national level. Examples of these methodologies include the World Economic Forum's Competitiveness report (WEF, 2018), the IMD Competitiveness Year Book (IMD, 2018), Ireland's National Competitiveness Council's Competitiveness Scorecard (NCC, 2018) and the Competitiveness Scorecard for Northern Ireland (Economic Advisory Group, 2016; Johnston and Heery, 2016).

As a region of the UK, Northern Ireland has not traditionally been included in international measures of competitiveness. Furthermore, measuring and reporting Northern Ireland's relative competitiveness is subject to additional complexity and challenge. Policies that influence competitiveness in Northern Ireland are a combination of those that are set at national level (reserved matters such as regulation) and others that are set at local level by the Northern Ireland Executive and civil service (devolved matters such as education, although these are often heavily influenced by reserved policies). Data that are available at a national level are not always available at regional level, restricting the number of indicators that can be used.

Ireland, by comparison, has been included in various international measurements of competitiveness for over two decades, including those listed above. The overarching framework in Ireland's own competitiveness scorecard, compares different dimensions of competitiveness in an international context and measures progress over time against selected competitor nations (typically EU and/or OECD countries). The 2016 Competitiveness Scorecard for Northern Ireland provides a foundation and evidence base upon which to compare relative competitiveness of the economies of Ireland and Northern Ireland for the first time. This approach drew on the NCC framework that was in use at that time and developed it further by adding quality of life indicators and a sectoral perspective. For the purposes of this paper, we draw on the Competitiveness Scorecard for Northern Ireland as the only source for making comparisons between both economies on the island in an international context. Consequently, it does not take into account developments in the Ireland's Competitiveness Framework and Scorecard over the past two years.

¹ In 1992, Sir George Quigley expressed the view in 1992 that Northern Ireland agenda should pursue "innovation geared to competitiveness and growth". This comparative island focus in this paper draws on the inaugural Sir George Quigley Memorial lecture delivered by Frances Ruane in Armagh in June 2016.

As noted above, our interest lies in the areas where policy can be seen as directly impacting on overall competitiveness, both directly and through essential conditions which shape the competitiveness environment for business. For both economies on the island, which have broadly similar natural endowments, we see the key areas of policy inputs on the foundation tier of the Competitiveness Scorecard that underpin the essential conditions and overall competitiveness as:

- Education and skills;
- Research, development and innovation;
- Infrastructure; and
- Business environment.

The Competitiveness Scorecard for Northern Ireland and its structure are detailed in Annex C. In presenting the material below, we use spider diagrams to contextualise the relative position of both economies, in the context of comparator countries. We then use tables to focus on the relative changes in the competitiveness metrics over the past five years. Section 3 of the paper looks at each of these in turn.

3. DRIVERS OF FUTURE COMPETITIVENESS

This paper focuses on the policy areas that impact on competitiveness for several reasons. Firstly, these are the drivers of current and future competitiveness, influencing the essential conditions in which enterprises operate and ultimately the outputs and outcomes in the economy. Secondly, the policy inputs include a range of indicators upon which the Northern Ireland Executive and the Irish Government have direct influence through policy initiatives and programmes. These policy inputs can be examined to assess whether they are pro- or anti-competitive, and policy makers are able to adjust these policies over time. It should be noted that some of the Northern Irish indicators are influenced by UK Government policy as they relate to reserved rather than devolved policy areas, such as regulation and social security; reserved policies lie outside the remit of NI policy makers. These factors will be discussed in more detail later in the paper.

3.1 Education and skills

The stock of human capital and the quality and quantity of new entrants to the labour market (either from the education system or migration) are vital elements of competitiveness. A skilled workforce is generally more productive and knowledge-intensive sectors tend to grow more rapidly and be more export-oriented, generating income flows from external sources and further contributing to economic growth; in relation to Northern Ireland, see Catalyst (2018). In addition, human capital is a key factor in attracting foreign investment and having a strong skills base leads generally to a more attractive investment climate (Kheng, Sun, Anwar, 2016).

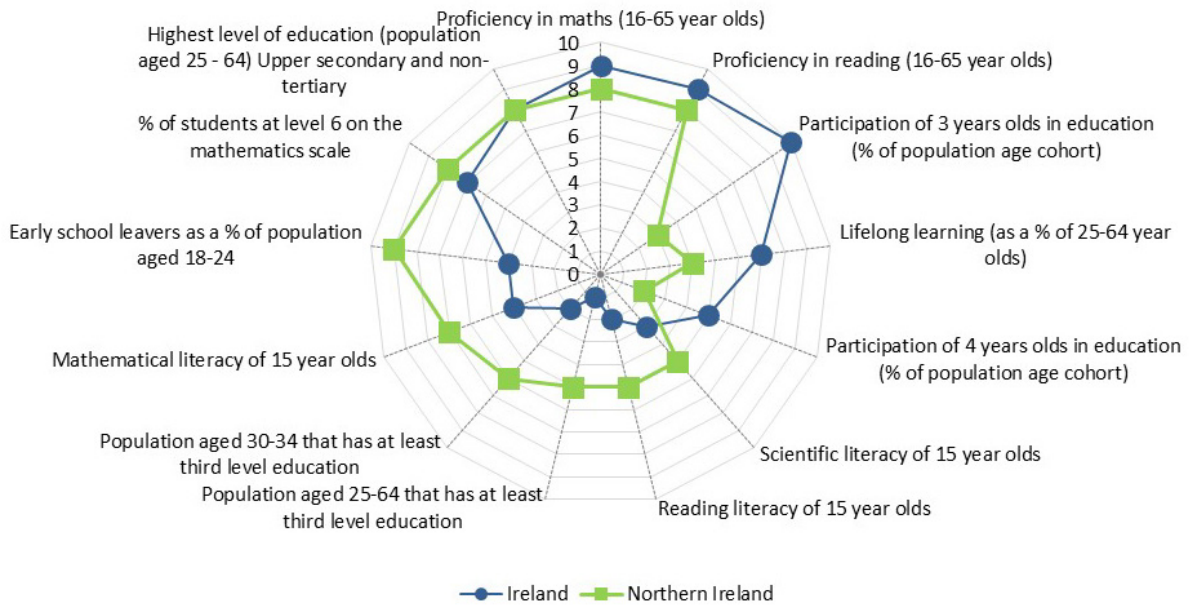
Policy has a direct impact on the stock of and flows into education and skills. The impacts of policy are more often long-term, and it takes time to address any deficits or gaps in the stock. The stock and flows are also influenced by inward and outward migration patterns, as these impact on the net skills position and on the composition of available skills within the working age population.

Figure 3.1 shows that Ireland is relatively more competitive than Northern Ireland with regard to Education and Skills, and this difference is more than 10 per cent², as calculated from the Competitiveness Scorecard for Northern Ireland. The spider diagram, in which greater competitiveness is measured by being closer to the centre, shows that in eight out of thirteen indicators, Ireland is relatively more competitive than Northern Ireland. In each of the following sections we look in turn at the subsets of indicators for education and skills, starting with the stock of skills and qualifications, participation in education and then investment in education and skills for the future.

Both countries are relatively similar and uncompetitive in terms of the formal qualification levels of the adult population. Northern Ireland is more competitive in participation and lifelong learning and Ireland is ahead on literacy, numeracy and scientific ability (especially in the young population) and third level education.

² The 10 per cent differential refers to the differences in average ranking of the countries that are included. For example, an average rank of 3rd out of 30 countries vs 6th is a differential of 10 per cent.

Figure 3.1: Education and Skills indicators of International Competitiveness, Ireland & Northern Ireland



Sources: Various – see Annex B

3.1.1. Stock of skills and qualifications

The stock of skills and qualifications that are available within the population and working-age population across five indicators are detailed in Table 3.1.1. For each indicator in this and subsequent tables, we show the country’s rank among the number of countries included in the Scorecard; where data are available, the tables also show the change in direction of the past five year and any change in the decile position.

Table 3.1.1: International Competitiveness in Education and Skills – Stock Indicators, Ireland & Northern Ireland

Education & Skills - stock	Country	Rank	Direction of change	Change in decile
Population aged 25-64 that has at least third level education	Northern Ireland	13 / 29	↑	=
	Ireland	1 / 29	↑	↑
Population aged 30-34 that has at least third level education	Northern Ireland	15 / 29	↑	↓
	Ireland	4 / 29	↑	↓
Highest level of education (population aged 25 - 64) Upper secondary and non-tertiary	Northern Ireland	22 / 29	↑	↑
	Ireland	23 / 29	↑	↑
Proficiency in maths (16-65 year olds)	Northern Ireland	17 / 22	n/a	n/a
	Ireland	18 / 22	n/a	n/a
Proficiency in reading (16-65 year olds)	Northern Ireland	17 / 22	n/a	n/a
	Ireland	19 / 22	n/a	n/a

Sources: Various – see Annex B

Ireland performs particularly well in its stock of education, ranked 1st in the basket of countries for the proportion of the working population (aged 25 – 64) that are educated to tertiary level, compared with Northern Ireland which is ranked 13th out of 29 countries. The proportion of that population with third level education is 42 per cent in Ireland and 33 per cent in Northern Ireland. In Ireland’s case, this reflects: (i) the expansion of investment in third level education since the 1990s, following on from an increase in investment at secondary level starting in the mid-1960s; and (ii) skilled immigration during the past two decades, where employment opportunities have attracted individuals with higher skills to Ireland. An additional factor impacting on Ireland’s relative position may be the emigration of young people with low to mid-level skills following the Great Recession as construction demand collapsed. Northern Ireland, by contrast, has focussed relatively fewer resources on Higher Education (HE) and has seen more outmigration of individuals participating in HE in GB and further afield, many of whom do not return to Northern Ireland.

Between 2011 and 2016, the general trajectory is positive for the stock of skills and qualifications in both countries, where data are available. Ireland has improved its average relative international ranking to 12th of the 27 countries analysed, while Northern Ireland has held but not improved its average relative competitive position at 18th out of 27 countries. Data are not available on the extent of progress in relation to the proficiency of the overall workforce in maths and reading. Both countries are relatively uncompetitive in relation to these proficiencies, most likely reflecting lower levels of investment at the time when older generations were in education.

3.1.2 Participation in education

In 2016, there appear to be quite different patterns between the two countries in relation to participation in education. These are shown in Table 3.1.2.

Table 3.1.2: International Competitiveness in Education and Skills – Participation Indicators, Ireland & Northern Ireland

Education & Skills - participation	Country	Rank	Direction of change	Change in decile
Participants of 3 years olds in education (% of population age cohort)	Northern Ireland	7 / 28	↓	=
	Ireland	28 / 28	↑	↑↑↑
Participants of 4 years olds in education (% of population age cohort)	Northern Ireland	5 / 29	↓	↓
	Ireland	13 / 29	↑	↑↑
Early school leavers as a % of population aged 18-24	Northern Ireland	25 / 29	↓	=
	Ireland	10 / 29	↑	↑↑↑↑
Lifelong learning (as a % of 25-64 year olds)	Northern Ireland	10 / 29	↑	=
	Ireland	20 / 29	↑	↑↑↑

Sources: Various – see Annex

One striking difference relates to ‘early years’ participation (three and four-year olds). The rate in Ireland, especially for 3-year olds is particularly low (lowest out of the countries included), whereas in Northern Ireland the corresponding ranking is 7th out of 28 countries. This difference reflects the Irish government’s very late decision to invest in early childhood education, a policy which only began to change in 2010. The rates in 2019 are expected to be significantly higher than those captured in the data here but there remains a different approach because the compulsory age of school attendance in Ireland is 6 (with the option to join from 4) whereas the equivalent in Northern Ireland is 4.

Northern Ireland has a major issue in terms of retention, with a relatively large proportion of pupils continuing to leave school early. Furthermore, there is no sign that Northern Ireland is improving its position in this regard, with the direction of change registered as negative. Ireland’s three strand leaving certificate appears to be successful in increasing retention levels which are now in the top third of the comparator countries whereas Northern Ireland is in the bottom fifth.

Ireland’s much poorer performance with regard to lifelong learning may in part reflect higher participation rates at earlier stages of education and skilled immigration, while the stronger engagement in lifelong learning in Northern Ireland may reflect larger numbers leaving school early. Comparative research could provide an opportunity to establish whether the stronger investment in education initially in Ireland is the reason for less investment in upskilling later and whether in Northern Ireland, early leavers with relatively lower qualifications may need to invest in more upskilling later to address the challenges of leaving school early. In the rapidly changing technological environment, as the economy becomes more automated and digitised with new technologies making certain tasks redundant, it is important that individuals stay connected with training and Ireland may be vulnerable to weak links with lifelong learning in the future.

3.1.3 Investment in education and skills for the future

Table 3.1.3 shows that Northern Ireland is below average relative to comparator countries in education and skills investment indicators. It is particularly weak in terms of mathematics, and mid-table in terms of reading and scientific literacy. Furthermore, the trend has been downwards over the past five years in three of the five indicators, suggesting future challenges for Northern Ireland. Ireland is stronger, especially in reading literacy, with mathematical and scientific literacy at mid-table. Both countries are relatively uncompetitive but improving in absolute terms in the proportion of students at level 6 on the mathematics scale. This indicator measures higher level skills such as conceptualisation, modelling and complex problem solving. In contrast to Northern Ireland, Ireland has improved both its relative and absolute position significantly in recent times.

Table 3.1.3: International Competitiveness in Education and Skills - Investment Indicators, Ireland & Northern Ireland

Education & Skills - investment	Country	Rank	Direction of change	Change in decile
Reading literacy of 15 year olds	Northern Ireland	16 / 33	↓	=
	Ireland	4 / 33	↑	↑↑↑
Scientific literacy of 15 year olds	Northern Ireland	15 / 33	↓	↓
	Ireland	9 / 33	↑	↑↑
Mathematical literacy of 15 year olds	Northern Ireland	23 / 33	↓	=
	Ireland	12 / 33	↑	↑↑↑↑
% of students at level 6 on the mathematics scale	Northern Ireland	25 / 33	↑	=
	Ireland	21 / 33	↑	↑↑↑

Sources: Various – see Annex B

These indicators suggest a widening of the gap between the two countries with Ireland having more internationally competitive skills, due to both investment and inward migration, compared with Northern Ireland. Over time, Northern Ireland's relative position regarding the stock of skills is unlikely to improve against international competitors unless additions are made through skilled immigration.

3.1.4 Competitiveness summary for education and skills

Of the four policy areas discussed in this paper, education and skills has the second largest differential between Northern Ireland and Ireland, with Ireland performing better (by more than ten percent, as calculated on the basis of the competitiveness scorecard). In addition, while Ireland's international competitiveness has improved, Northern Ireland has become less competitive over the previous five years. The gap between the two is largely driven by Ireland's relatively more highly qualified workforce, higher school retention rates and better results in core subjects such as maths, science and reading for young people

The patterns for Northern Ireland suggest a challenge for its future economic competitiveness. The lower outcomes in terms of literacy, numeracy and scientific ability may reflect patterns in the structure of the education system as well as the patterns of emigration. Patterns which see young people attending HE institutions in Great Britain and internationally or emigrating to Great Britain when they have completed their studies in Northern Ireland, with no compensating inward or return migration, undermine the quality of the labour force. The extent of net outward migration of skilled people also has a negative exchequer impact, as Northern Ireland has borne the cost of building those skills.

While Ireland is more competitive than Northern Ireland, it is still only mid-table for many indicators. Furthermore, Ireland's lower uptake of lifelong learning (Table 3.1.2) may represent a serious challenge for reskilling the workforce as increasing levels of automation require additional skills in the future. The need to address this challenge is recognised in Department of Business, Enterprise and Innovation (2019).

3.2 Research, development & innovation

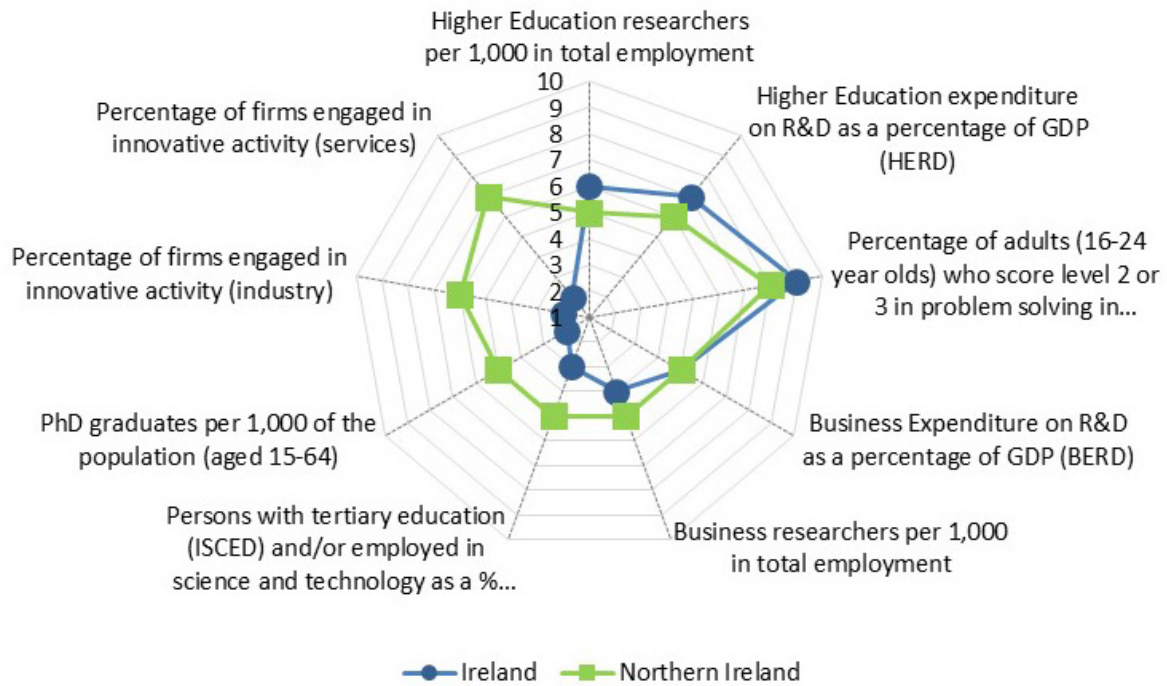
An economy in which the research, development and innovation (R&D&I) culture thrives will generally be more competitive in global markets as enterprises and individuals create their own competitive advantage and bring new products and services to market. Innovative and research-intensive enterprises also tend to export a greater proportion of their output, employ highly skilled individuals given the nature of the tasks required and pay higher wages to secure and retain those highly skilled individuals.³

Figure 3.2 benchmarks the relative competitive performances of Ireland and Northern Ireland against competitor economies, by indicator. Many R&D indicators post a similar performance in both countries, and in the mid-range of the comparator countries.⁴ Northern Ireland is marginally stronger in Higher Education R&D, both are poor on problem-solving ability in technological environments. Ireland is stronger in Business R&D and much more competitive on innovation indicators. We now look in turn at the Higher Expenditure on Research and Development (HERD) indicators, followed by the Business Expenditure on Research and Development (BERD) indicators and then at the Innovation Indicators.

³ See, for example, Siedschlag and Zhang (2015), Ruane and Siedschlag (2013).

⁴ International indicators for R&D often include Government Expenditure on R&D (GOVerd) and researchers per 1,000 employees in the Government Sector. We note that both Ireland and Northern Ireland are ranked in the in the bottom ten percent for these indicators but do not consider them further in this paper.

Figure 3.2: Research, Development & Innovation indicators of International Competitiveness, Ireland & Northern Ireland



Sources: Various – see Annex B

3.2.1 Higher Education R&D Indicators

Table 3.2.1 shows that Northern Ireland and Ireland are similar in their overall rankings in the Higher Education element of R&D, with Northern Ireland slightly ahead except on the number of PhD graduates. This latter difference reflects policy in Ireland to ‘double the numbers of PhD students’ in the mid 2000’s and the inflow of highly educated migrants into the high tech and financial sectors.

Table.3.2.1: International Competitiveness in Research, Development & Innovation – Higher Education indicators, Ireland & Northern Ireland

Research, Development & Innovation - Higher Education	Country	Rank	Direction of change	Change in decile
Higher Education Expenditure on R&D as a percentage of GDP (HERD)	Northern Ireland	18 / 32	↓	↓↓
	Ireland	22 / 32	↑	=
Higher Education Researchers per 1,000 in total employment	Northern Ireland	14 / 29	↓	↓↓
	Ireland	17 / 29	↑	=
PhD graduates per 1,000 population (aged 15-64)	Northern Ireland	14 / 29	↓	↓↓↓↓
	Ireland	4 / 29	↑	↑
Percentage of adults (16-24 year olds) who score level 2 or 3 in problem solving in technology rich environments	Northern Ireland	14 / 18	n/a	n/a
	Ireland	16 / 18	n/a	n/a

Sources: Various – see Annex B

Northern Ireland’s relative performance has dipped significantly over the previous five years, moving down the international competitiveness rankings. This may reflect a tighter public spending environment in Northern Ireland in recent years and the policy of protecting healthcare budgets from austerity at the expense of other areas, such as PhD and higher education research funding. In contrast, Ireland has been able to improve its performance in absolute terms and to maintain its international position.

The final indicator in Table 3.2.1 shows that both countries are relatively uncompetitive in terms of the proportion of young adults with a high capability of problem solving in technology-rich environments. This poor performance poses a risk to future competitiveness given that the fourth industrial revolution is creating jobs in technology dependent sectors and automation is replacing more routine tasks.

3.2.2 Business R&D Indicators

The indicators in Table 3.2.2 show that both countries are in the top half of the distribution in relation to all the business R&D indicators. Furthermore, both countries have shown an improved or unchanged performance over the previous five-year period, relative to comparator countries. Ireland is ahead of Northern Ireland in business R&D, ranked 10th compared with 14th of the countries analysed. Competitor economies are also creating research jobs at a similar rate, so that while Northern Ireland and Ireland have improved in absolute terms, they have remained static in relative terms.

Table 3.2.2: International Competitiveness in Research, Development & Innovation – Business indicators, Ireland & Northern Ireland

Innovation, research and development - Business	Country	Rank	Direction of change	Change in decile
Business Expenditure on R&D as a percentage of GDP (BERD)	Northern Ireland	13 / 32	↑	↑↑
	Ireland	14 / 32	↑	↑↑
Business researchers per 1,000 in total employment	Northern Ireland	14 / 29	↑	=
	Ireland	10 / 29	↑	=
Persons with tertiary education (ISCED) and/or employed in science and technology as a % of active population	Northern Ireland	14 / 29	↑	↑↑
	Ireland	6 / 29	↑	↑

Sources: Various – see Annex B

Ireland's performance is strong internationally and well ahead of Northern Ireland's in terms of the proportion of individuals with tertiary education employed in Science and Technology. Again, this may reflect both the sectoral composition of Ireland's enterprise base (with more opportunity for employment in these sectors in Ireland) and migratory patterns as the FDI enterprise base expanded with enterprises such as Google, Facebook, Paypal, Apple and Microsoft locating in Ireland and attracting large numbers of foreign employees with science and technology skills.

3.2.3 Innovation Indicators

Ireland's performance as an innovative economy in international terms puts it close to the top of the table now and five years ago. Northern Ireland has improved both in absolute terms and against competitor nations but started from a very weak base and is now only mid-table despite these improvements. In both countries, an examination of the sectoral patterns for Ireland and Northern Ireland reveals that a larger proportion of industrial enterprises are engaged in innovation (66% and 51% respectively) when compared with services enterprises (55% and 42% respectively). The contrasting relative positions in terms of innovation, given the broadly similar R&D patterns, suggests the value of undertaking research on the drivers of these differences and the extent to which they reflect Ireland's larger FDI base (which is concentrated in innovation intensive sectors), the extent of more globally connected enterprises, or cultural differences.

Table 3.2.3: International Competitiveness in Research, Development & Innovation – Innovation Indicators, Ireland & Northern Ireland

Innovation, research and development - Innovation	Country	Rank	Direction of change	Change in decile
Percentage of firms engaged in innovative activity (industry)	Northern Ireland	15 / 29	↑	↑↑
	Ireland	3 / 29	↑	=
Percentage of firms engaged in innovative activity (services)	Northern Ireland	19 / 29	↑	↑
	Ireland	5 / 29	↓	=

Sources: Various – see Annex B

3.2.4 Competitiveness summary for research, development and innovation

The differential between Ireland and Northern Ireland in the R&D&I pillar is the most pronounced of the four areas considered, at around 15 per cent according to the Competitiveness Scorecard for Northern Ireland. Ireland's business R&D, innovation and PhD environment is relatively competitive, and its Higher Education performance is mid-table. All but one of the Irish indicators is on a positive trajectory with the result that Ireland is retaining or improving its international ranking in all areas. In contrast, Northern Ireland is around mid-table and its

performance is mixed. Higher Education R&D investment has declined and whilst it improved on the business and innovation indicators, it was from a relatively weak baseline position.

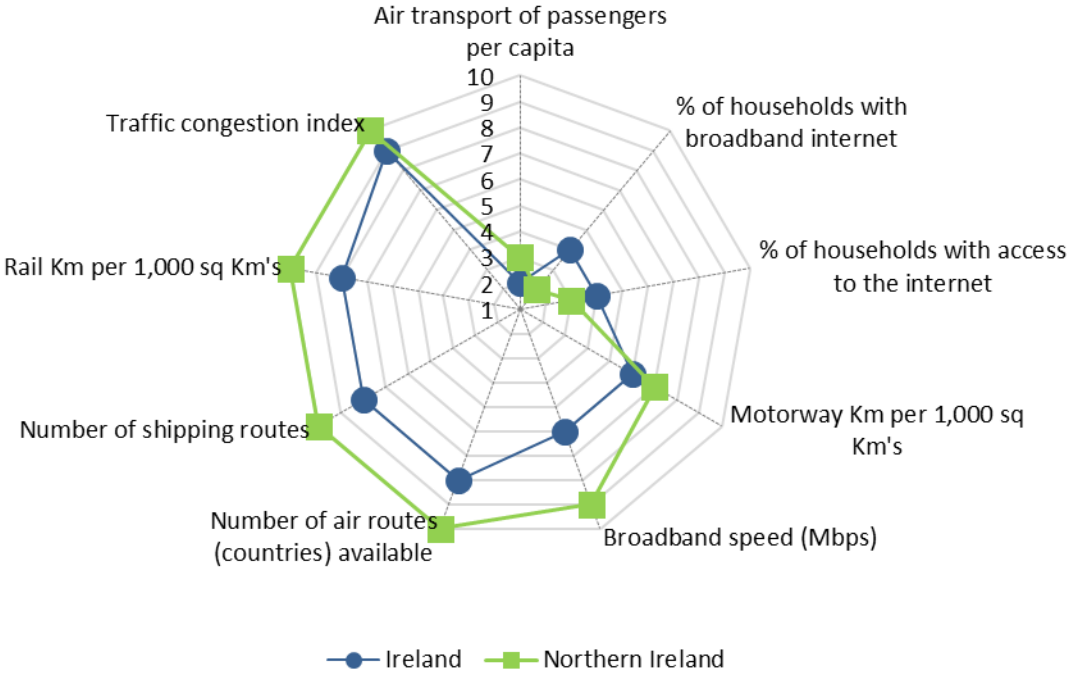
Ireland’s relatively stronger performance in the education and skills pillar may, in part, explain its relatively stronger performance in R&D&I. The investment in skills and qualifications especially at tertiary and PhD level and skilled immigration will help to fostering an environment that is conducive to creating, developing and marketing new products and processes. In addition, the wider policy framework and macroeconomic factors have a part to play as was as have Ireland’s 12.5% rate of Corporation Tax, larger FDI base, investment in the IFSC and a range of fiscal incentives help to create an environment that is conducive to innovation and the retention of profits.

3.3 Infrastructure

Infrastructure influences competitiveness as it impacts upon trade connections and the mobility of labour, as well as the attractiveness of a country as a place to invest, do business and live. This section focuses on two aspects of infrastructure: the provision of technological infrastructure (internet connectedness) and physical infrastructure (transport).

Figure 3.3 illustrates that Northern Ireland is stronger on internet access, although both are relatively competitive in an international context. Ireland is stronger across physical infrastructure indicators and broadband speeds, although both areas are relatively uncompetitive in international terms.

Figure 3.3: Infrastructure Indicators of International Competitiveness, Ireland & Northern Ireland



Sources: Various – see Annex B

Both economies face similar issues with regard to infrastructure as they are on the same island, next to Great Britain (GB) and on the western periphery of Europe. While both have their major shipping links into GB (for its own market and as the first leg of the land bridge to the EU), Ireland has begun to diversify both in response to Brexit and to the increasing scale of trade with the EU. Both have a relatively more developed and vibrant east coast and a more rural west and relatively low population densities. These factors combine to present obvious difficulties for both in terms of providing high quality infrastructure throughout the island, both to businesses and to residents. We now look at each set of indicators in turn.

3.3.1 Technological infrastructure

Both Ireland and Northern Ireland are relatively competitive on household access to internet and broadband but are weak in terms of internet speeds in their capital cities. Table 3.3.1 shows that Northern Ireland is ahead of Ireland and highly competitive in an international context with regard to broadband access, although broadband speeds (for households and business together) are currently much faster in Dublin than in Belfast. The metrics for broadband speed, which relate to 2019, are weak relative to international competitor cities.

Table 3.3.1: Technological Infrastructure Indicators of International Competitiveness, Ireland & Northern Ireland

Infrastructure - technological connectivity	Country	Rank	Direction of change	Change in decile
Proportion of households with access to the internet	Northern Ireland	6 / 29	↑	=
	Ireland	10 / 29	↑	↑
Proportion of households with broadband internet	Northern Ireland	5 / 29	↑	↑↑↑↑
	Ireland	9 / 29	↑	↑↑
Broadband speed (MBPS)	Belfast	24 / 28	n/a	n/a
	Ireland	16 / 28	n/a	n/a

Sources: Various – see Annex B

Northern Ireland's better performance on access reflects that NI Executive's significant investment in technological infrastructure through the Department for the Economy (and before that, through the Department for Enterprise, Trade and Investment), and OFCOM reports that 85% of premises in Northern Ireland now have access to superfast broadband (See OFCOM, 2017). Northern Ireland's better performance may also reflect its higher population density (70 persons per square km in Ireland and 137 in Northern Ireland⁵), so that a given expenditure on technology infrastructure is more effective with regard to reach and coverage. The delivery of Ireland's National Broadband Development Plan continues to be a challenge, with delays encountered due to complications in relation to the tendering process which are linked to escalated costs. Notwithstanding these complications, the government seems determined to make the planned investment in Broadband, though it is not likely to be supplied at the required pace or scale to allow Ireland to boost its international competitiveness in this arena in the short term.

3.3.2 Physical infrastructure

Both Ireland and Northern Ireland are relatively uncompetitive in respect of their physical infrastructure when measured against their competitors. Again, this may be the effect of the relatively low population densities in each and the population concentration in the East. In contrast to technological infrastructure, Ireland performs slightly better than Northern Ireland. This likely reflects significant structural fund investments in Irish physical infrastructure projects since the 1990s, which have improved both the quantity and quality of physical infrastructure.

Table 3.3.2 shows that, relative to population, air travel in both countries is relatively more important as a transport mode than in other competitor countries. This is partly a function of being an island economy. At the same time, access to shipping and air routes is weaker compared with other countries: Ireland and Northern Ireland ranked 15th and 19th of 19 countries for air routes and 9th and 11th out of 12 for sea routes respectively in 2016. Since then, the number of airlines serving Dublin has increased dramatically so the relative position of both economies on the island has improved since both Northern Ireland residents and enterprises are major users of Dublin airport. Furthermore, there have been significant investments in Irish ports, particularly Dublin.

Table 3.3.2: Physical Infrastructure indicators of International Competitiveness, Ireland & Northern Ireland

Infrastructure - physical connectivity	Country	Rank	Direction of change	Change in decile
Air transport, passengers per capita	Northern Ireland	7 / 29	↓	↓
	Ireland	4 / 29	↓	=
Number of air routes available (countries)	Northern Ireland	19 / 19	n/a	n/a
	Ireland	15 / 19	n/a	n/a
Number of shipping routes	Northern Ireland	11 / 12	n/a	n/a
	Ireland	9 / 12	n/a	n/a
Rail Km per 1,000 square Km's	Northern Ireland	23 / 25	=	↓
	Ireland	19 / 25	=	=
Motorway Km per 1,000 square Km's	Northern Ireland	17 / 26	↑	=
	Ireland	15 / 26	↑	↑↑
Traffic congestion index	Belfast	20 / 20	n/a	n/a
	Dublin	18 / 20	n/a	n/a

Sources: Various – see Annex B

⁵ Sources: Central Statistics Office Ireland (Census of Population, 2016) and the Northern Ireland Statistics and Research Agency (Mid-Year Population Estimates for 2016).

To the extent that any increase in the number of routes coming to the island represent a broadening of options, these metrics understate the true position of connectivity by air and sea. In the case of a small island, connectivity may be better assessed by the access to facilities on both parts of the island. If air routes are considered at an island level, the island would be ranked 9th of the 18 geographies (as opposed to 15th and 19th of 19 for Ireland and Northern Ireland respectively). Similarly, if sea routes are considered at an island level, it would be ranked 8th of the 11 geographies (as opposed to 9th and 12th of 12 for Ireland and Northern Ireland respectively). To the extent that a BREXIT outcome reduces these options, then the on-the-ground reality is likely to increase costs for those using routes outside their own economy. On the other hand, if there is some engagement with the merits of infrastructure planning that is whole island focused (as promoted by IBEC / CBI, 2018) and as reflected in the Irish government’s Ireland 2040 proposals, these may help offset some of the possible challenges to be faced.

In terms of land connectivity, Ireland has a better motorway system and rail network, but both are still in the lower half of the international comparisons. Furthermore, Ireland’s land infrastructure continued to improve, whereas Northern Ireland shows no relative improvement over the five-year period. Both Belfast and Dublin suffer from significant congestion at peak hours, which points towards the relatively low quality of available infrastructure, with Dublin and Belfast ranking 18th and 20th of 20. These congestion costs also impact on the cost of transit for goods via airports and ports.

3.3.3 Competitiveness summary for infrastructure

Both countries perform at a similar level with regard to technological infrastructure and Ireland is slightly ahead on physical infrastructure, having benefitted from significant infrastructural investments over the past two decades. In international terms, both post a similar performance and are faced with similar issues such as being on an island on the western periphery of Europe with low and dispersed population densities. When considered from an all-island perspective, international air connectivity is around mid-table and shipping is in the bottom fifth, as opposed to at the bottom. Therefore, it could be argued that international connectivity is relatively stronger on the island than the country metrics might suggest, and that rail and motorway connectivity are correspondingly more important to facilitate travel and trade through free movement of goods and people.

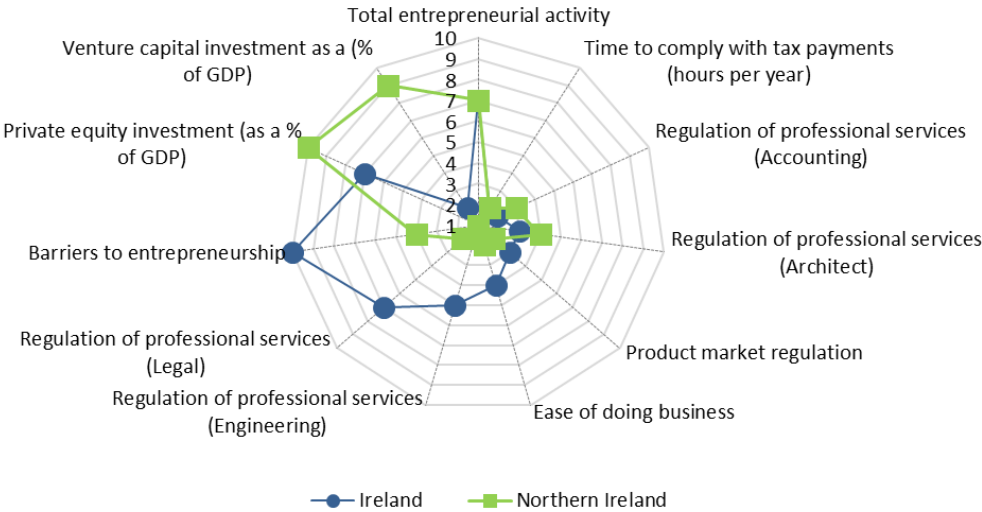
Technological infrastructure is an area where investment is required to maintain competitiveness in respect of coverage. Significant improvements in spends and rural connectivity are the key challenges for both. In rapidly changing environments, there could be late mover advantages, drawing on technologies and approaches being adopted with success elsewhere in the EU or OECD, particularly in Northern Europe.

3.4 Business environment

Ireland and Northern Ireland perform at a similar level in the business environment element of the scorecard, with Ireland only marginally ahead of Northern Ireland.

Figure 3.4 shows that while the Irish and Northern Irish performances are similar at an aggregate level, it is very much is a story of two parts. Northern Ireland’s performance is relatively stronger than Ireland’s on regulation and entrepreneurship and relatively weaker on investment. Both countries are internationally competitive on regulation, except for legal services and professional services in Ireland, which are mid-table.

Figure 3.4: Business Environment Indicators of International Competitiveness, Ireland & Northern Ireland



Sources: Various – see Annex B

Of the eleven business environment indicators in the scorecard, the majority focus on regulation, compliance and barriers to / ease of doing business which can be directly influenced by policy. We look separately at these policy-driven factors and then at entrepreneurial activity, venture capital investment and private equity investment, which while also indirectly influenced by policy, have a direct policy-independent impact on the state of the business environment.

3.4.1 Regulation

The robustness of regulatory requirements gives confidence to consumers but can also add to additional compliance costs and can act as a barrier to new entrants. Northern Ireland does not control its regulations, which are reserved matters and set by the UK government and administered across all four countries within the UK; these are more favourable than those in Ireland for engineering and legal services but less so for accounting and architects. Across OECD countries, the accounting and legal professions are generally the most heavily regulated.

Table 3.4.1: International Competitiveness in Business Environment – Regulation Indicators, Ireland & Northern Ireland

Business environment - regulation	Country	Rank	Direction of change	Change in decile
Ease of doing business	Northern Ireland	6 / 31	n/a	n/a
	Ireland	11 / 31	n/a	n/a
Product market regulation	Northern Ireland	2 / 19	↑	↓
	Ireland	4 / 19	↑	↑
Regulation of professional services (Accounting)	Northern Ireland	5 / 19	=	=
	Ireland	2 / 19	=	=
Regulation of professional services (Legal)	Northern Ireland	3 / 19	=	=
	Ireland	12 / 19	=	↓↓
Regulation of professional services (Architect)	Northern Ireland	6 / 19	=	=
	Ireland	4 / 19	=	=
Regulation of professional services (Engineering)	Northern Ireland	1 / 19	=	=
	Ireland	8 / 19	=	=
Time to comply with tax payments (hours per year)	Northern Ireland	5 / 28	=	=
	Ireland	3 / 28	↓	↓

Sources: Various – see Annex B

The regulation metrics show that Northern Ireland's performance, (i.e., the UK's performance) is strong and stable, close to the top of basket of comparator countries (averaging 4th). Regulation in Ireland is also competitive and stable by international standards, but slightly weaker than in Northern Ireland (averaging 6th). The regulation of legal services is an issue for Ireland and several of the Troika reports noted the high cost / lower efficiency of legal services, which continue to be a burden on competitiveness. Both Northern Ireland and Ireland register as competitive in terms of the time taken to comply with tax requirements.

3.4.2 Entrepreneurship and finance

Ireland's entrepreneurial performance is weaker than Northern Ireland's with regard to both metrics in Table 3.4.2. Furthermore, it has declined markedly over the past five years as barriers to entrepreneurship (measured by administrative burdens on start-ups, regulatory complexity and regulatory protection of incumbents) have increased and entrepreneurial activity (as defined by the proportion of 18-64's who are entrepreneurs of business owners) has declined. The OECD highlights that in Ireland the key barriers are costly regulation regarding commercial property and legal services and a high cost of failure. See OECD, 2018. Indeed, only Spain has higher barriers to entrepreneurship in the basket of countries considered.

Table 3.4.2: International Competitiveness in Business Environment – Entrepreneurship and Finance indicators, Ireland & Northern Ireland

Business environment - entrepreneurship & finance	Country	Rank	Direction of change	Change in decile
Barriers to entrepreneurship	Northern Ireland	6 / 19	↑	=
	Ireland	18 / 19	↑	↓↓↓
Total entrepreneurial activity	Northern Ireland	15 / 24	↑	↑
	Ireland	16 / 24	↓	↓↓↓↓
Venture capital investment as a % of GDP	Northern Ireland	28 / 32	↑	↑
	Ireland	4 / 32	↓	=
Private equity investment as a % of GDP	Northern Ireland	19 / 21	↑	=
	Ireland	14 / 21	↑	↑↑

Sources: Various – see Annex B

While Ireland scores poorly on entrepreneurship, its metrics for venture capital and private equity markets are more internationally competitive and improving. Ireland has a relatively favourable tax regime, including, for example, the Employment and Investment Incentive Scheme (EIIS)⁶ entitles investors to income tax relief of 30% on their investment, further increasing to 41% if, at the end of the holding period, certain targets relating to employment, wages, and R&D are met.⁷

In contrast, Northern Ireland has relatively lower barriers to entrepreneurship, but is still only at the mid-table level of entrepreneurial activity. This perhaps reflects its lower overall scale of business activity (the relatively larger scale of the public sector resulting in a less developed entrepreneurial ecosystem) and/or a more risk averse culture. Northern Ireland also lags Ireland and international competitors in venture capital and private equity activity. This may be the result of (i) Belfast's not being the UK's capital city, and therefore being less attractive to than Dublin for VC, (ii) the greater availability of finance in the form of subsidies and loans from Government in Northern Ireland, because of its 'assisted area status', and (iii) the reduction in scale of demand for VC and private equity in Northern Ireland due to the prolonged period of low levels of business activity in Northern Ireland.

3.4.3 Competitiveness summary for business environment

Both economies are in a similar position in that they have a relatively competitive business environment, although Ireland is marginally ahead of Northern Ireland.

Regulation in Northern Ireland performs very well within the framework designed and implemented by the UK Government, while Ireland's performance is also reasonably strong, apart from legal services regulation. The other competitor countries in Europe which perform well on regulation are Scandinavian countries, while globally, the world leaders are New Zealand and South Korea.

Entrepreneurship factors tend to be culturally sensitive as well as being driven by policy factors. Comparator countries with higher levels of entrepreneurial activity tend often to be those with more limited social security safety nets (such as Lithuania and Slovakia), which may act as push factors, while countries with low barriers to entrepreneurship internationally are New Zealand, Denmark and South Korea.

4. POSSIBLE IMPLICATIONS FOR POLICY ON THE ISLAND

The value of competitiveness benchmarking exercises is that they provide yardsticks with which to measure the relative national or regional position and progress relative to competitor economies. Areas of relative strength, weakness, progress, deterioration or synergy can be identified, providing information on where additional research will be productive. Such research could focus on: the potential for transferability of policy interventions, following localisation, from international leaders; exploration of the drivers of key outcomes, and the interaction between different indicator metrics; and identification of where additional resources should be directed in order to address weak performance. In the context of the shared space on this island, it is somewhat surprising that there has been no focus on the relative position of the two countries and potential for cooperation or transfer until very recently. Situating them within an international comparator framework provides an opportunity for the policy community to challenge current performance. This has been a feature of policy making in Ireland over two decades, and the UUEPC analysis points to the value of a similar type of approach being adopted in Northern Ireland.

This paper has focussed on four areas - Education & Skills, R&D&I, Infrastructure and the Business Environment – wherein policy makers can influence outputs and outcomes directly through policy choices. Education & Skills would appear to be the fulcrum, since global competitiveness with high living standards requires an educated and skilled workforce: (i) to carry out commercially successful R&D&I; (ii) to plan, build and operate a competitive infrastructure; and (iii) to generate a business environment engaged in producing for, and trading in, global markets. Investments in education and skills are long-term (unless appropriately skilled immigration is part of the policy solution). While an analysis of indicators does not provide enough evidence to draw policy conclusions, it does provide a framework for policy makers and points to where issues need to be addressed and further research undertaken. Furthermore, in some instances the structures in the Belfast/Good Friday Agreement may be useful in designing policies to address the issues that are common to both parts of the island. See D'Arcy and Ruane (2018). In this final section of the paper, we look at each of the four areas in turn from a policy consideration perspective.

4.1 Education and Skills

Northern Ireland has a relatively poor performance in Education and Skills. There is evidence of the 'brain drain' in Northern Ireland's indicators as workforce qualification levels are relatively poor and a significant proportion

⁶ This scheme replaced the Business Expansion Scheme in 2011.

⁷ See http://www.budget.gov.ie/budgets/2015/documents/eii_report_pub.pdf

of those entering Higher Education do so outside NI and fewer employment opportunities means that they often do not return. In addition, current investments in future education and skills are yielding literacy and numeracy outputs that will act as a brake on international competitiveness in the future. While some of these are beyond direct policy control, there are a range of policies that could be considered to boost Northern Ireland's performance, such as:

- **Review curriculum and assessment methodologies in numeracy, literacy, scientific ability and technological skills** to ascertain if these are related to the low results. Further research will be required to identify if this is a resource issue (which is unlikely as participation is high) or a content issue.
- **Stem the flow of early school leavers** by examining the underlying factors and the extent to which the flow is influenced by Training for Success and whether there is adequate provision of support for those who require more to succeed in the secondary education system.
- **Expand tertiary education places** by increasing the maximum allocation of student numbers (MASN) caps for both Universities, reducing the number of young people studying outside Northern Ireland. In this context, it would be timely to review the current policy whereby Northern Irish and Great Britain domiciled students are funded at different rates (currently £4,160 in Northern Ireland and £9,250 in GB).
- **Introduce returner support policies** targeted at high value jobs to retain skilled young people and attract skilled return emigrants and new immigrants. These could include higher rates of support for higher quality jobs and active consideration of the implementation of the 12.5% rate of Corporation Tax to attract Foreign Direct Investment.
- **Desegregate primary and secondary education** to free up resources for allocation to build the best skills base of the students, rather than by duplicating services in a segregated system. Socio economic status remains the largest determinant of educational outcomes and early interventions are required to supplement relatively poorer home learning environments.

In contrast, Ireland's performance in education and skills has been on positive trajectory and is reasonably competitive, having benefitted from significant investments in education in recent decades and from skilled immigration to take up quality employment opportunities. Nonetheless, there are policies that could be considered to boost Ireland's performance in this area, such as:

- **Review and extend early pre-school education** to ensure quality control in the newly-introduced Early Childhood Care and Education (ECCE) programmes, so that children develop in ways to maximise their potential. Resources should be provided to achieve the ambition for full participation rates for all children from age 3.
- **Develop a lifelong learning strategy** that is mainstreamed to take account of the changing needs of skills in the workplace. This could include additional supports (loans, grants, bursaries) information provision (e.g. additional wages accruing to specific qualifications etc), employer support (to allow employees to leave work to study part time or full time), etc.

Both Ireland and Northern Ireland could benefit from a range of policy interventions to prepare for a more globalised connected and automated economy of the future. These include:

- **Investment in innate "human" skills** as these are the most challenging to automate, are currently in demand from employers and will be in demand in the future as the fourth industrial revolution takes place. Changes are required to both the education system and to in-work training provision.
- **Address the lack of vocational pathways and image of Further Education** with the objective of increasing the supply of mid to level eight technical skills.

4.2 Research, Development and Innovation

Both Ireland and Northern Ireland could boost their competitiveness by investing more heavily in Higher Education R&D expenditure, increasing the number of researchers, supporting students in developing their technological and problem-solving abilities and reducing their reliance on small numbers of large firms for R&D. Policies that could be worth considering if there is a will to address these problems are:

- **Build HE research organisations of scale** on an all-island basis, focussing on the particular challenges faced by society, such as caring for aging populations, smart transport solutions, climate change and secure societies. Research organisations of scale and impact (like Science Foundation Ireland or like the UK's catapults) could focus on longer term challenges in a sustainably funded environment. These would also require increased collaboration between the private and public sector including funding and staff transfers.

- **Develop all-island based clusters** in higher education and business support to exploit the potential of existing networks across the island. Examples might include aerospace, agri-food and cyber security, building on existing networks.
- **Review HE curricula to focus more specifically on deep learning and creative skills**, incorporating additional technological and problem-solving skills in a creative learning environment. Such skills would support the current and future working environment which increasingly requires creativity, tenacity, ability to adapt to new and evolving technologies and deep learning, etc.

Both countries are mid-table on business R&D&I. This continues despite the availability of financial supports from Invest NI and Enterprise Ireland to assist R&D&I and R&D tax credits available to enterprises through HM Revenue and Customs / the Irish Revenue Commissioners. It may be timely to review critically the full sets of supports, especially in the light of the uncertainty created by Brexit in the last three years and on the evolving role of EU State Aid regulations.

- **Further research to identify the elements of R&D&I support that provide strong returns and consider additional differential supports for the future. ———**

Ireland has a strong base of innovative companies and Northern Ireland could consider some of the wider policy tools that have helped to develop an innovative enterprise base. Working together in the spirit of the Belfast/Good Friday Agreement, and in light of the open conversations about planning for the Island Economy, started by Ibec and the Confederation of British Industry in Northern Ireland (Ibec / CBI, 2018) both countries could look at the potential cooperation across a range of areas, including policies to support innovation. Furthermore, some of the North-South bodies set up under the North-South Ministerial Council could be used to foster networking engagements that would support innovation in both parts of the island.

4.3 Infrastructure

Both countries are challenged by their competitors in this domain, and by the geography of the island. An all-island approach to international connectivity facilitated by well-planned land-based investment and cooperation on air and sea routes could merit consideration. Technological connectedness is and will be increasingly important and both countries will benefit by working together to fully exploit economies of scale in investments. Policies that could be worth consideration are:

- **Boost motorway networks** across the island, including completing a motorway along the eastern economic corridor from Belfast to Dublin and the York Street interchange in the first instance; this would need to be done in such a way to not to support further suburban sprawl. In addition, it would be important to explore investment in a series of appropriately specified roads to complement the radial motorways across the country. This would increase connectivity, reduce journey times, boost productivity and assist integration, delivering upon one of the recommendations in Ibec / CBI (2018).
- **Invest in technological networks of the future** across the island by focussing on leading the way in 5G, increasing broadband coverage and significantly increasing speeds across the island. A strategic approach, especially in border areas, could explore how Monaghan might be served by a spur from Armagh and Letterkenny from Derry / Londonderry with a view to reducing costs.
- **Explore the addition of new air and sea destinations** and how airports and ports might enhance choices for businesses and consumers.

4.4 Business environment

Ireland could improve its competitive performance in relation to regulation. Given the similarities to the UK, in relation to legal services, for example, Ireland's legal services could be challenged to explain why they continue to be so much less competitive. Ireland also needs to explore what is driving the negative trajectory for Barriers to Entrepreneurship.

- **Review the regulation of legal services**, exploring the potential for policies and practices elsewhere, particularly in the UK, to reduce costs if applied to Ireland.
- **Examine the sources of the barriers to entrepreneurship** and how they differ across locations and entrepreneurs (perhaps by gender and ethnicity, see Humbert & Drew 2010). A programme of research would be required to establish the patterns and how they might be addressed.

Northern Ireland's main challenges are in terms of finance, with VC and private equity performance at very low levels. Research is needed to update the work done by the Economic Advisory Group published in 2013 and updated in 2015. See Economic Advisory Group, 2015. This would establish whether or not this is a genuine competitiveness challenge for Northern Ireland.

- **Undertake further research on demand and supply of private equity and venture capital funding** to establish whether there is unmet demand for these forms of finance from NI based enterprises, or alternatively if other forms of finance are meeting their needs and requirements.

4.5 Wider policy considerations

It is now three years since the NI competitiveness scorecard was published. Whilst the Northern Ireland Assembly is not functioning at this point in time, it is still important for Northern Ireland to monitor its relative competitive position and ensure that policy makers are informed of relative progress or deterioration. The National Competitiveness Council of Ireland has developed its methodology further and publishes competitiveness updates annually. Cooperation between NCC, working with the Department of Business, Enterprise and Innovation, and the relevant body in Northern Ireland (the Department for the Economy / EAG) would allow the production every two/three years of a competitiveness scorecard that would allow a continuing focus on competitiveness on the island of Ireland.

- **Consider the preparation of a report on competitiveness on the island of Ireland by the relevant bodies North and South every two to three years.**

Following on from an update of the overall competitiveness position for Northern Ireland, it is evident from this research that the Scandinavian, Northern European and advanced Asian economies are world leaders in competitiveness, with the result that standards of living, life expectancy and well-being of residents are high. The NCC routinely reviews the policy approaches and interventions adopted by other countries to improve their competitiveness and Northern Ireland would benefit from undertaking the type of research and analysis that would allow such an approach.

- **Maintain a research focus on competitiveness in Ireland, and expand that focus in Northern Ireland by investing in research that would allow Northern Ireland to have a real focus on competitiveness.**

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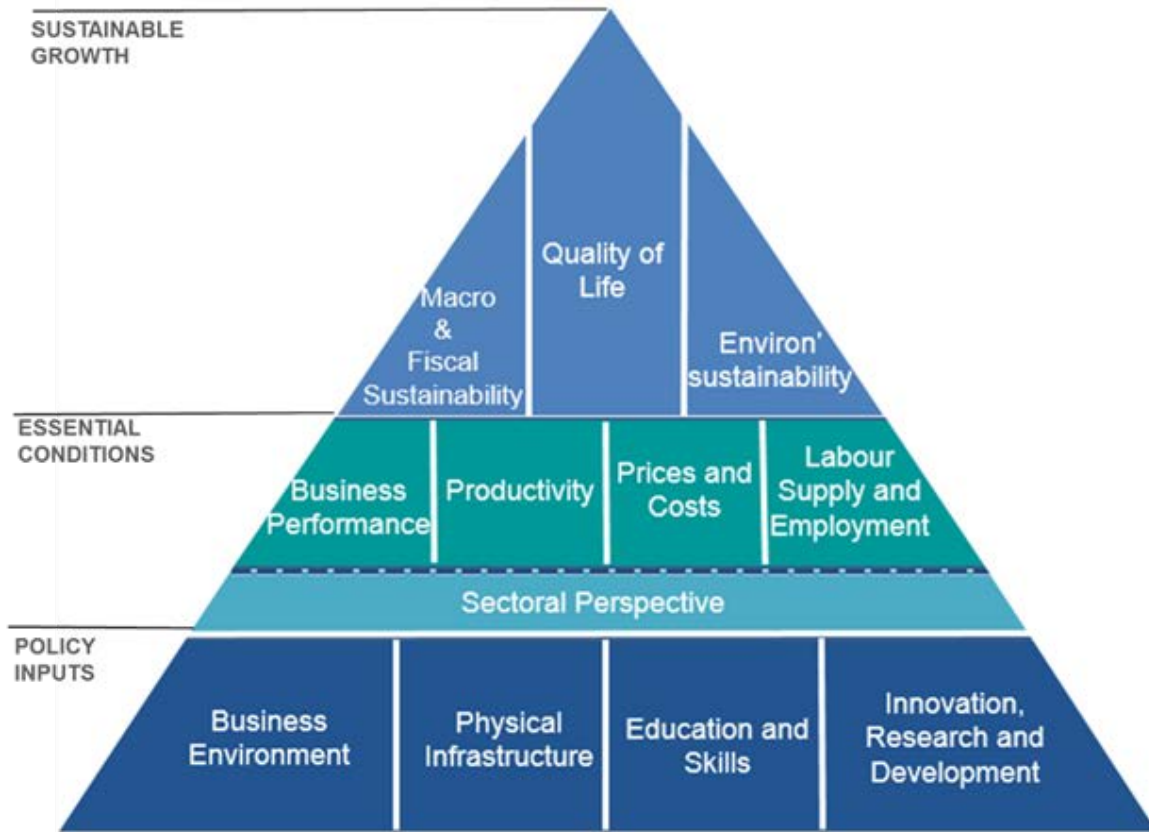
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Annex B: Data sources

Pillar	Indicator	Source
Education and skills	Population aged 30-34 that has at least third level education	Eurostat & OECD
	Population aged 25-64 that has at least third level education	
	% of students at level 6 on the mathematics scale	OECD's Programme for International Student Assessment (PISA) & National Foundation for Education Research (NFER)
	Mathematical literacy of 15-year olds	PISA
	Reading literacy of 15-year olds	
	Scientific literacy of 15-year olds	
	Proficiency in maths (16-65-year olds)	OECD
	Proficiency in reading (16-65-year olds)	
	Participants of 3 years olds in education (% of population age cohort)	Eurostat
	Participants of 4 years olds in education (% of population age cohort)	
	Highest level of education (pop aged 25-64) upper secondary and non-tertiary	
	Early school leavers as a % of population aged 18-24	
Lifelong learning (as a % of 25-64-year olds)		
Infrastructure	Number of air routes (countries) available	Skyscanner.com
	Number of shipping routes	Freightlink.com & aferryfreight.co.uk
	Traffic congestion index	Tom-Tom traffic congestion index
	Air transport of passengers per capita	Eurostat
	Motorway Km's per 1,000 square Km's	
	Proportion of households with access to the internet	
	Rail Km's per 1,000 square Km's	
	Proportion of households with broadband internet	Ookla
Broadband speed (MBPS)		
Business environment	Venture capital investment as a (% of GDP)	OECD, European Venture Capital Association & British Venture Capital Association
	Private equity investment (as a % of GDP)	
	Total entrepreneurial activity	Global Entrepreneurship Monitor
	Time to comply with tax payments (hours per year)	World Bank
	Ease of doing business	OECD
	Product market regulation	
	Regulation of professional services (Accounting)	
	Regulation of professional services (Legal)	
	Regulation of professional services (Architect)	
	Regulation of professional services (Engineering)	
Barriers to entrepreneurship		

Annex C: Structure of the Competitiveness Scorecard for Northern Ireland



Source: UUEPC