

# THE STRATEGIC INTEGRATION OF SKILLS & INNOVATION POLICY IN NORTHERN IRELAND: AN INTERNATIONAL SMALL ECONOMY PERSPECTIVE

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July 2019

EXECUTIVE SUMMARY	3
<b>I. International experience of skills and innovation policy</b>	<b>18</b>
1. Global dynamics	18
2. Themes in the international policy response	22
3. Concluding remarks	26
<b>II. The small economy context</b>	<b>27</b>
1. Small economy performance	28
2. Characteristics of small advanced economies	34
3. Implications	40
4. Benchmarking Northern Ireland	43
5. Concluding remarks	45
<b>III. Key small economy insights for Northern Ireland</b>	<b>46</b>
1. Key developments in skills and innovation policy	46
2. Strategic integration of skills and innovation policy in small advanced economies	54
3. Small economy insights into specific questions for Northern Ireland	60
4. Concluding remarks	69
<b>IV. Specific implications and recommendations for Northern Ireland</b>	<b>70</b>
1. Assessment of Northern Ireland's strategic direction	70
2. Skills policy and innovation policy	74
3. Strategic integration of skills and innovation policy	77
4. Concluding remarks	80
<b>Appendix: Small economy case studies</b>	<b>82</b>
Denmark	83
Estonia	90
Finland	93
Ireland	99
Israel	107
New Zealand	112
Scotland	119
Singapore	124
Switzerland	131

## EXECUTIVE SUMMARY

This report describes the way in which skills policy and innovation policy in small advanced economies is designed, and in particular the way in which skills and innovation policy is integrated. It draws on this international small economy experience to identify a series of policy implications for Northern Ireland.

### The global context

#### *Global dynamics*

Skills and innovation has long been at the core of economic growth in advanced economies. And looking forward, the importance of skills and innovation policy will continue to increase. The increasing pace and intensity of technological change and international competition are creating substantial new challenges and opportunities for the skills and innovation system in advanced economies. Skills and innovation capability will increasingly shape national economic performance. Consider four core drivers of change that will impact on skills and innovation outcomes and policy in advanced economies.

- *The impact of disruptive technologies on the future of work:* Labour markets around the world are expected to be disrupted by a range of new technologies, such as automation, 3D printing, artificial intelligence, and so on.
- *Skills biased technical change:* Highly-skilled people will likely benefit from new technologies, but people in the middle of the skills distribution with jobs that can be routinised are at risk from these technologies.
- *Changing nature of globalisation:* Trade growth is increasingly dominated by knowledge intensive sectors: advanced industries, commercial services, and so on. Higher capabilities in skills and innovation will lead to increased specialisation in advanced technology industries, which have tended to grow relatively quickly.
- *Intense global competition:* Advanced economies have dominated knowledge intensive industries. But innovation is increasingly global in nature, with more intense competition from China and other emerging markets.

#### *International policy responses*

There is significant policy activity in many advanced economies with respect to skills and innovation as governments seek to position their economies to capture opportunities and manage risks associated with these global dynamics. There are several common policy themes:

- *Increased focus on ongoing training:* The traditional linear model of education, where education is concentrated at the start of the career (school, university, or technical education) is seen to be insufficient given the rapid pace of change in technologies and business models. It is increasingly important for people to be able to acquire new or upgraded skills on an ongoing basis through their career.
- *Connecting skills and industry:* Despite unemployment in many countries, employers commonly report skills shortages. This indicates that the market is not working effectively in many economies to match skills supply and skills demand. Particularly with an increasing pace of technological and business model change, attempts are being made to better connect skills and industry.
- *Coordination of skills policy across multiple domains:* A whole of government approach is needed to coordinate education, training, labour market, migration, and other policies affecting the development and use of skills. For example, policy can address the risks associated with investing in skills through providing social insurance or active labour market policy.
- *Innovation:* Many governments (and firms) are increasing their commitment to R&D and innovation. As with skills, innovation requires a coordinated approach across government – and also required a strong link to industry; it cannot simply be research-led. And there are a growing number of efforts to increase economic dynamism and to help innovative companies to start and then to scale up.

## The small economy context

Intense global competition, disruptive technologies, and increasingly skill-biased technical change, mean that advanced economies need to upgrade in order to sustain a distinctive competitive position. The relationship between skills, innovation, and economic outcomes is even sharper for small advanced economies given their deep exposure to the global economy. However, the specific characteristics of small advanced economies shape the way in which small economies should develop and integrate skills and innovation policy.

The 13 small advanced economies used as the benchmark group in this analysis have generated strong economic performance over the past several decades. There are several key reasons for this.

- Active international engagement

The levels of international engagement (exports, FDI) by small advanced economies are substantially higher than in larger economies. There was an increase in the growth of international economic activity across the small economy group from the mid-late 1990s, partly reflecting strong global growth as well as a change in the export structure of small economies

towards higher growth, knowledge intensive export categories. It is this externally-driven growth that has been the foundation of strong economic performance by small advanced economies. This is because small economy productivity levels (and growth rates) are much higher in externally-oriented sectors (such as manufacturing) than in domestically-oriented sectors (such as retail or construction).

- Investing in innovation & human capital

Successful small advanced economies are characterised by heavy investments in knowledge, innovation and human capital. This focus on knowledge and human capital has been central to the way in which small advanced economies, from Switzerland to Singapore, have built distinctive international competitive positions.

- Strategic coherence

Successful small advanced economies consistently place an emphasis on skills and innovation in order to develop strength in externally-oriented sectors. However, there is no single policy template, and small countries choose to compete in a variety of ways. For example, the Nordic economic model is different approach than that in Ireland and Singapore.

Small economy performance is less about the policy specifics than the strategic coherence of policies. Although the policy specifics vary, the notion of a deliberate strategy to position their economies is a unifying theme across small countries. In many small economies, there is a clear sense of the national value proposition and how the economy is positioned to compete in the global economy.

#### *Characteristics of small advanced economies*

Skills and innovation are a central part of a coherent economic strategy for small advanced economies. But the specific characteristics of small advanced economies will shape the approach to skills and innovation policy: small advanced economies are not scaled-down versions of large economies. These characteristics mean that the approach of small advanced economies to skills and innovation policy should be different than in larger economies. Consider the following five specific small economy characteristics that shape the appropriate design of skills and innovation policy.

##### i. High skills requirement

The high share of externally-oriented sectors in small advanced economies generates a relatively high skills requirement. Skills and innovation matter everywhere, but the productivity bar for competitive success in externally-oriented sectors is much higher than in other sectors.

##### ii. Economic concentration

Small advanced economies tend to have relatively high concentrations of economic activity in a few sectors or clusters. Small economies can develop positions of world-class competitive strength in only a few parts of the economy. The implication is that deliberate choices are needed to ensure that the skills profile and innovation capabilities match the particular sectoral profile that the small economy has. For small advanced economies, skills policy is about more than building a strong base of general human capital; there is a greater need than in larger economies to develop specific human capital and innovation capability that maps onto the areas of strength in the national economic structure.

### iii. Innovation absorption

Most of the world's new ideas and innovation will be produced outside small advanced economies. One of the key functions of an innovation system in a small economy is to be able to absorb new ideas and practices from around the world. Given their scale, small economies need to over-invest to be close to the frontier of this thinking in order to be able to absorb the relevant new ideas. Small economies need to have a baseline level of skills and innovation capability before they can benefit from ideas and innovation happening elsewhere; small economies can't simply 'free ride'.

### iv. International factor mobility

Without high performing clusters, small economies are at risk of losing their skilled people and innovative firms. Small economies face competitive pressures from larger centres that are attractive to skilled people and high growth firms. Investing in increasing the supply of skills needs to be accompanied by demand-side policies that create opportunities. Some small advanced economies that have invested significantly in (highly mobile) human capital, without paying sufficient attention to investing in creating the opportunities for that talent to remain, have experienced significant outflows.

### v. Weaker incentives to invest in skills and innovation

There is a weaker incentive for firms and people to invest in skills and innovation in a small market, as the returns may be lower. This is particularly the case outside of externally-oriented sectors, because the investment can only be leveraged over a small market. Without policy support, small economies are at risk of being in a 'low wage, low skill, low investment equilibrium' as complementary investments are not made.

## Implications for small economies

Northern Ireland is exposed to these global dynamics, and can learn from the international small economy experience in responding. There are two broad implications that follow for skills and innovation policy in small advanced economies (and in Northern Ireland) from this international small economy context.

The first is the increasing centrality of skills and innovation policy in small advanced economies. The deep exposure of small advanced economies to the global economy means that most small advanced economies see skills and innovation policy as central aspects of their economic strategy. A deep pool of human capital is increasingly central to productivity and income growth, and to making a location 'sticky' for mobile labour and capital.

The centrality of this area of policy can be seen in terms of the policy and resourcing commitment directed to skills and innovation. The successful small advanced economies have a particularly strong policy emphasis on skills and innovation (Switzerland, Singapore) relative to less well-performing small economies. Skills and innovation is an intense area of policy activity and debate. Firms in small advanced economies are deeply involved too, understanding that being competitive in global markets means sustained investment in skills and innovation.

The second implication is the need for strategic coherence: a deliberate approach to integrating skills and innovation into a broader economic strategy in order to address the specific characteristics of small advanced economies. For example, the need to invest heavily in human capital, often in specific ways, and yet also need to guard against small economy exposure to the international mobility of this skilled labour; and the need to create the appropriate incentives to support the necessary investments in skills and innovation capability that is specific to industries and firms, which brings a higher risk profile. In addition, the task of aligning demand and supply of skills and innovation capability in a small economy requires a coordinating function, so that complementary investments are made appropriately.

This international small economy experience is instructive for Northern Ireland, as a small open economy. There are some important similarities between Northern Ireland and other small advanced economies in terms of their exposures and their underlying context. However, despite these similarities in context, Northern Ireland's skills and innovation performance is relatively modest compared to other small advanced economies (and to the rest of the UK).

## Small economy insights on skills policy & innovation policy

Based on a series of nine small economy case studies (Denmark, Estonia, Finland, Ireland, Israel, New Zealand, Scotland, Singapore, and Switzerland) as well as general small economy analysis, a series of insights for Northern Ireland are identified. There are several themes in terms of how small economies are responding to emerging challenges and opportunities in terms of skills and innovation policy.

### *Skills policy*

There is a broad-based commitment to upgrading the quality of the skills and education system. Small advanced economies already perform relatively well, but the more demanding competitive environment is creating pressure to do more. For example, there are reviews of vocational education in numerous countries, multiple assessments of the implications of the future of work, as well as additional investments being made in ongoing learning and active labour market policy.

- work-based and vocational education and training

Across several high-performing small advanced economy systems (such as Singapore), there is an increasing focus on vocational education – rebalancing from a dominant focus on academic credentials such as a university degree. There is an explicit notion of ‘multiple pathways’ in countries, recognising that not everyone needs a full degree to succeed in labour markets. There are efforts to raise the profile and status of vocational education, including stronger links and pathways to the tertiary sector. Systems that provide a blend of work-based learning and theoretical content allow for greater responsiveness to changing industry demand as well as providing a broad base of human capital.

- Aligning education and skills system with stakeholder demand

The link to industry is increasing important, ensuring that the skills are relevant. Stakeholder engagement is important, both at sector and firm level as well as at regional or local level in some circumstances. These skills will often need to be specialised, given the concentrated nature of small economy strengths. There is a risk of equipping people with overly general skills, as well as the wrong sort of specialist skills. There is also increased investment in skills mapping and forecasting.

- ongoing learning

There is a greater flexibility in acquiring skills, recognising that there is a greater pace of change in labour markets. Singapore’s recently introduced ‘Skills Future’ is an example: a voucher-based system to allow people to invest in acquiring new skills throughout their career.



### *Innovation policy*

Although there is not a single best practice model, there are some elements of good practice that seem common to innovation policy in high-performing small economies. Having a high-performing innovation system is a prerequisite for sustained strong economic performance; small economies that do not perform well on innovation tend not to generate strong overall economic performance.

- sustained investment

Over the past decade, there has been an increasing trajectory of R&D spending in the successful, innovative small advanced economies – whereas it tends to be flat in other small advanced economies. The implication is that investing in R&D (by government and by firms) is important to support economic transformation.

- business-led

Government-funded R&D is an important base for innovation capability in small advanced economies, but it needs to be supplemented by business-funded R&D. Innovation in the private sector is the ultimate driver of productivity growth. The implication is that creating an environment that is supportive of business investment in R&D (and in innovation more broadly) matters.

- organised around strategic clusters

To generate strong returns on innovation, the small economy experience suggests that the investment needs to be made in the context of deep clusters. Innovation often requires the presence of deep capabilities: complementary skills and human capital, large firms, supporting specialist firms and professional services, as well as specific capital. In addition, government investment in R&D (as well as funding of research institutions) will be complementary to private investment in these areas. To the extent that these are in related areas of economic activity, the returns are likely to be higher.

- research universities

An important way in which governments support innovation is through funding of research institutions, particularly universities. Strong research universities are important in small advanced economies for a few reasons: absorptive capacity for ideas and knowledge generated offshore, producing a pipeline of strong human capital, their research capabilities providing an anchor for clusters, attracting FDI, and so on. It is instructive that high-performing small advanced economies have a disproportionate number of top-ranked research universities.

- building an innovation ecosystem

In addition to funding R&D and innovation, small economy policy also ought to be directed at building a strong innovation ecosystem that supports the growth of innovative firms. High-performing small advanced economy governments have developed an array of initiatives to support firm growth and to better capture economic value from this process. For example, enterprise policy that is focused on supporting high-growth firms, the support of capital markets (venture capital, national investment banks), accelerators and incubators, and so on.

## **Strategic integration of skills and innovation policy in small advanced economies**

A key distinctive characteristic of the approach of small advanced economies to skills and innovation policy is strategic integration. This is because of the need to address the specific challenges and opportunities associated with the small economy context in a coherent, comprehensive way.

### *Elements of strategic integration of skills and innovation policy*

Three elements of effective strategic integration of skills and innovation policy can be identified from the international small economy experience.

First, a clear statement or understanding of the central role that skills and innovation plays in the overall competitive positioning of the economy – accompanied by a clear sense of the resourcing and policy implications that follow.

Second, the effective integration of skills and innovation policy needs a ‘whole of government’ policy approach to skills and innovation. Pushing on one element of skills and innovation policy without addressing the broader small economy strategic policy environment is unlikely to lead to better outcomes. High-performing small advanced economies have a deliberate, structured focus on aligning policies to generate the desired outcomes. For example, deliberate use of social insurance, labour market policy, immigration policy, and so on, to support skills and innovation policy.

Third, a common small economy approach to the strategic integration of skills and innovation policy is to organise the policy focus through strategic priority clusters that are seen to be the growth engines of the economy. In some cases, these priority clusters are explicitly identified. In other cases, the targeting is more implicit – this will often be the case in small economies where the key clusters have been developed and are self-sustaining. Because the investments are complementary, small economies need to focus their efforts in a limited number of economic areas. Without these strategic priority areas, the international small economy experience suggests that it is more difficult to sustain high levels of investment in skills and innovation – or to generate returns.

## Insights for Northern Ireland

- *Is 'government-facilitated clustering' a necessary/recommended feature of effective strategic collaboration on skills and innovation policy?*

The small advanced economy experience shows that identifying target clusters is central to the strategic integration of skills and innovation policy. Clusters are important because they better allow for value to be captured, as backward and forward linkages develop (supply chains, specialist capability, and so on), allowing for external scale economies, with knowledge diffusion. Small economies that have built deep competitive positions in clusters do better than those that have not.

However, although a focus on strategic clusters is common in high-performing small economies, this is not necessarily government facilitated. In some cases (such as Switzerland), the government's role is to follow – with the private sector taking the dominant lead role. This is particularly the case in more 'mature' or established small economies, where the clusters have developed over many decades and more; this has provided time for the supporting ecosystem also to develop.

Given the current position of Northern Ireland, deliberate government action to deliberately develop and support clusters is likely to be important in terms of delivering an effective integration of skills and innovation policy.

- *Would a regional, sectoral or hybrid approach be best suited to Northern Ireland*

Several small economies have strategies with a focus on secondary cities and regions (the Nordics, Ireland). However, this regional focus tends not be at the same level of strategic priority as the sector or cluster-based approach. And the reality is that the main city in small advanced economies tends to be dominant; often around a third of the national population, and more (~40%) of GDP. The economic contribution of the large city is particularly pronounced in small advanced economies.

There will likely be specific local needs with respect to skills and innovation policy for which region-specific responses may be appropriate (e.g. local tourism, agriculture). However, the risk with regional diversification in a small economy (particularly the size of Northern Ireland) is that the clusters do not fully develop. With a small population size, the risk is that unduly regional policy generates sub-scale fragmentation and complexity (something often pointed to in the Nordics).

- *How can SME interests be effectively and fairly represented in clusters?*

One of the characteristics of small economies is that the incentives, capabilities, and balance sheets, of small and medium-sized firms may not be sufficient to support investment in skills and innovation – such as work-based training, or to invest in research and development. In addition, the international evidence is clear that SMEs are less likely to export, to invest, and to undertake innovation, than larger firms – and tend to be less productive. Most SMEs do not grow substantially much beyond their establishment size. So the risk with a policy strategy that is heavily focused on SMEs is that it may be under-powered in terms of skills and innovation outcomes.

Indeed, the small economy experience is that large firms (MNCs) play a disproportionately important role in driving innovation, internationalisation, and productivity. That said, it is not appropriate to focus policy exclusively on large firms: SMEs also make an important contribution to clusters, even if they are not the primary engines of growth. And in many small advanced economies, there is increased policy focus on supporting high growth small firms – a relatively small proportion of the SME population.

- *Should clustering initiatives focus only on predetermined ‘priority’ sectors – for example those set out in Economy2030?*

The core economic policy focus in most successful small advanced economies is to strengthen performance in externally-oriented sectors. These are the areas in the economy in which sustained productivity growth is most likely to come, and should receive disproportionate policy and resourcing support. In Northern Ireland, the sectors selected in Economy 2030 are sensible – they are externally oriented, and are clusters in which Northern Ireland has a position on which to build.

However, this small economy priority sector focus is best seen as disproportionate rather than exclusive. Although priority sectors generate a disproportionate share of productivity, innovation, and so on, a meaningful share of national employment will be in ‘non-priority’ sectors or clusters. It is important that there is a broad base of skills and innovation capability throughout the economy, particularly given the intensity of the challenges that seem likely to emerge.

There are also trade-offs that should be recognised when determining the extent of policy focus with respect to strategic priority clusters. Although focus is required to develop the necessary critical mass in key parts of small advanced economies, this can also increase the risk exposure of small advanced economies.

- *Are there examples of how this approach has worked effectively to bolster the link between skills and innovation? If so, how has success been measured and how long after set up does it take for benefits to be realised?*

This approach of strategic integration between skills and innovation policy has worked well in many small advanced economies. In economies such as Ireland and Singapore, the explicit cluster-based policy, with a combination of strong human capital (local and foreign), together with a commitment to build innovative strength, has made these locations attractive for investment.

In small economies such as Denmark and Switzerland, with more implicit or informal strategic interaction, there is complementary investment by the public sector and private sector in skills and innovation in the context of deep clusters. For example, Denmark has specialist skills developed in sectors such as maritime, renewable energy, pharma – as well as being a locus of innovation in these sectors. Conversely, in small advanced economies where there has not been integration (such as New Zealand), there is much less evidence of deep clusters emerging and of strong outcomes.

The variation in the quality of the strategy and its implementation across small economies means that it is hard to be precise regarding the magnitude and timing of the causal impact. And a range of other factors also impact on outcomes in addition to the strategic interaction of skills and innovation policy.

Although there have been transformational episodes, where economies have explicitly developed major new policy agendas around skills and innovation (with a sectoral focus), such as Ireland and Singapore, in general these approaches are best seen as an ongoing, long-term process – rather than a specific policy event or decision, after which outcomes improve.

Economies like Finland provide useful guidance in terms of what is possible for Northern Ireland; sustained investment in human capital and innovation led to an economic transformation over the course of a decade.

- *What structural arrangements would be required to deliver effective strategic collaboration on skills and innovation policy?*

There are a wide range of institutional arrangements across small advanced economies, with no specific ‘best practice’ model that is consistently associated with good outcomes. Some governments decentralise significant decision-making responsibilities to regions, others are heavily centralised and coordinated. But despite these differences in models, there are several aspects of good practice that are instructive for Northern Ireland. Consider the following elements.

*Policy coordination:* For a small economy to implement a whole of government approach to a policy area, there needs to be deliberate policy coordination. It is important to have alignment behind an overarching economic strategy, with strong leadership from central agencies (or the lead economic agency). Singapore is a very good example of this. For example, the Committee for the Future Economy structure was intensively led by senior Ministers that were responsible for the key portfolios.

*Role for the private sector, and other stakeholders:* In some jurisdictions, formal tripartite arrangements are an important aspect of this stakeholder engagement (Nordics, Singapore, Ireland to an extent). In other cases, structured engagement with industry groups and others is important. There are also good examples of more episodic engagement on emerging demands on the skills and innovation system. Denmark's Production Council and the Disruption Council are good examples.

*Focus on outcomes and accountability:* There should be regular reporting against the key goals, as well as meaningful accountability on Ministers and agencies (and other stakeholders as appropriate) for progress towards the objectives. Ireland's Action Plan for Jobs is often cited as a good example of institutions structured around skills policy, anchored in a broader economic strategy.

## **Specific implications and recommendations for Northern Ireland**

### *Assessment of Northern Ireland's strategic direction*

Northern Ireland is moving in the right direction and has made some appropriate strategic choices with respect to policy focus. Skills policy and innovation policy are given a high priority, and are regarded as complementary policy areas, in the Innovation Strategy, the various skills strategies, and the Economy 2030 document. There is a willingness to nominate strategic priority clusters in order to more effectively align various policy instruments. These characteristics are consistent with small economy good practice.

There is no need to re-invent the wheel in terms of fundamentally revising the strategic direction for skills and innovation policy. However, drawing on the international small economy experience, there are some clear areas in which strengthening of the approach to skills and innovation policy should be considered.

First, the aspirations specified in the various economic, skills, and innovation strategy documents are a good start – but the scale and intensity of the challenges ahead needs a stronger response, of the type that is observed in high performing small advanced economies.

Second, the focus should be on execution of the strategy and getting the specific choices right. Although the strategic direction is appropriate, there is a gap in terms of translating this into specific programmes and initiatives with meaningful resource allocations. One reason for this is the absence of a functioning Executive that can take such strategic choices. However, there are also some elements on which progress should be made. In particular, to operationalise the strategy at the level of research funding, or skills initiatives, a greater level of precision in prioritisation will likely be required. This greater granularity is also important in terms of aligning a broad range of policy instruments to support growth.

And third, to be effective in driving changed behaviour, the strategic direction needs to be owned and well-understood outside the public sector. My sense is that the strategic choices are not well-understood outside the government, partly because Economy 2030 has not been formally approved. There are many separate, positive initiatives underway in the skills and innovation space, but the risk is that this is less coordinated and more fragmented than it could be if there was more intensive stakeholder engagement and communication.

### *Skills policy & innovation policy*

A comparison of Northern Ireland's current situation relative to the characteristics of high-performing small advanced economies suggests three priority areas for skills policy action. First, as Northern Ireland continues to invest in upgrading the quality of its human capital, there will be a need to better align demand and supply. One of the characteristics of small economies like Northern Ireland is the exposure to the international exit of skilled people. To the extent possible, ongoing investments in upgrading human capital should be linked to the emerging demand for skills. This approach will mitigate the risks of a 'wasted investment' in which an over-supply of skills leads to the outflow of trained people.

The second priority is investing in ongoing learning over a lifetime – as a response to the labour market impact of disruptive technologies and business models. Northern Ireland is exposed to these dynamics, and there is a need to start developing the platforms for upgrading and transition now with increased intensity and pace. If such investments are not made pro-actively, in a way seen in other small advanced economies, Northern Ireland is likely to face significant disruption. Some large firms are investing more in further education and ongoing learning in-house. But there is a need to make these efforts broad-based and systematic across the population.

The third priority relates to the structures around vocational and professional education (including apprenticeships). The situation in Northern Ireland, as in many other Anglo countries, is to draw a sharp divide between academic and vocational tracks. This contrasts with good practice in many small economies (such as the Nordics and Switzerland), as well as emerging good practice in economies like Singapore. One of the notable areas of policy focus is to make vocational education system more flexible and integrated, so that people can move between academic and vocational pathways more easily.

On innovation policy, increased funding is needed to support economic transformation. But as important is a greater degree of alignment across multiple organisations. There is much activity underway, including initiatives related to the Belfast Region City Deal. These initiatives look to have potential, but the risk with this activity is that it increases the extent of fragmentation in the system, and reduces the degree of coordination. Many of these initiatives and investments are not obviously grounded in the government's stated priorities for innovation (as stated in Economy 2030).

### *Strategic integration of skills and innovation policy*

A central lesson from successful small advanced economies is the importance of effective strategic integration between skills and innovation policy, in the context of a coherent overall economic strategy. Northern Ireland has made a solid start, with skills and innovation explicitly references in the various economic strategy documents and the choice of strategic priority areas. But institutions need to be developed in order to support effective strategic integration, and to move from strategy to execution.

Without high quality decision-making and accountability structures, it is difficult to make sustained progress – and with an ability to adapt and develop over time in response to changes in the environment. Leadership and governance is required to deliver sustained alignment and coherence across multiple policy areas without a structured set of institutions. The integration of skills policy within the Department for the Economy is a positive move in terms of supporting greater coordination.

The development of a standing economic institution, led by senior Ministers, with oversight, decision-making rights, and accountability across the economic policy domain – including skills and innovation – would be valuable. Another measure that can be taken (at officials level) is to create a 'Team NI' approach: a structured platform with the different economic policy and delivery agencies coming together on a regular basis to discuss various policy and operational issues – to support greater coordination and alignment across agencies and policy instruments in the context of an economic strategy.

### **Concluding remarks**

Northern Ireland has made some appropriate design choices in terms of its policy strategy documents that are consistent with good practice across the small advanced economy group. However, Northern Ireland's outcomes lag, and a significant step-up in policy commitment is needed. This imperative is reinforced by Northern Ireland's significant exposure to a range of fast-approaching global dynamics that will have disruptive effects on the skills and innovation system. As with other small advanced economies, Northern Ireland needs to move aggressively strengthen its skills and innovation policy – and in the context of a broader economic strategy that clearly describes how Northern Ireland will seek to position itself in the global economy.



There are particular priorities around upgrading vocational education and training, as well as a more structured approach to ongoing learning to make it more broadly accessible. But the key message from the small economy experience is the need for strategic integration between skills and innovation policy.

Part of this is already in progress, through the existing strategy documents. But supporting institutions are required to enable a move from strategy to effective execution. Skills and innovation policy needs to be embedded into supporting economic institutions to allow for alignment across agencies, appropriate resource allocation decisions, and to ensure accountability. Institutions are required to make strategic integration come alive: Ireland and Singapore provide good examples of this.

Lastly, as Northern Ireland takes these strategic discussions on skills and innovation policy forward, its small economy context should remain a central consideration. The way in which Northern Ireland develops and prioritises skills and innovation policy – and economic policy more broadly – should take its small economy characteristics seriously. Although much can be learned from the broader UK, and from other large economy experiences, small advanced economies provide more valuable insights.

## I. International experience of skills and innovation policy

### Introduction

Skills and innovation policy has long been understood to be central to the economic growth process as well as to stronger social outcomes. But skills and innovation policy is an increasingly active area of policy focus around the world, notably in advanced economies, in response to a series of emerging global dynamics. Forces such as intense global competition, the increasing impact of automation and other disruptive technologies, as well as ongoing skill-bias technical change, are placing significant pressure on labour markets and economies – and also creating powerful new opportunities.

This opening section describes the global dynamics that are impacting on skills and innovation policy and outcomes in advanced economies. It then turns to the implications of these emerging challenges and opportunities for skills and innovation policy in advanced economies: how can advanced economy governments respond, and what are the key dimensions of good practice in the policy response that is observed in the international experience?

This will provide a basis for the discussion in the next Part of this paper that considers the specific exposures of small advanced economies to these global forces; and the types of policy responses that are most likely to be effective in a small economy context in order to capture opportunities and to manage risks.

### 1. Global dynamics

Skills and innovation have been at the core of economic performance of advanced economies for centuries. The ability to generate and apply new ideas and knowledge has driven spectacular productivity growth, most notably since the Industrial Revolution. And over the past few decades, technological progress has driven skills-biased technical change, in which returns to skills have been increasing sharply. The IT revolution, for example, has advantaged skilled people relative to unskilled. This can be seen in the widening income distribution, as well as in the differences in trend productivity growth rates over the past few decades between countries with high and low levels of human capital.

Looking forward, there is reason to believe that these pressures will intensify across advanced economies. The pace and nature of technological change and international competition are increasing, in ways that create substantial new challenges and opportunities for the skills and innovation system in advanced economies. The implication is that education and skills are increasingly important for individuals and households, and that the overall level of human capital and innovation capability will increasingly shape national economic performance.

This discussion is structured around four core drivers of change that will impact on skills and innovation outcomes and policy in advanced economies: the impact of disruptive technologies (such as automation) on the future of work; ongoing skill-biased technical change; the changing nature of globalisation; and increasingly intense global competition.

### *i. The impact of disruptive technologies*

Labour markets around the world are expected to be disrupted by a range of new technologies, such as automation, 3D printing, artificial intelligence, and so on. These new technologies and the consequent effects on business models will lead to substantial and disruptive changes in the future of work over the coming decades – some of which are already becoming evident.

There is high potential for significant number of jobs to be replaced or otherwise changed as a consequence of automation or other technologies. Recent McKinsey Global Institute (MGI) research estimates that automation technologies (AI, machine learning, and robots) could lead to the automation of one third of activities for about 60% of occupations; and that about 14% of the global workforce (375 million people) ‘will likely need to transition to new occupational categories, and learn new skills, in the event of rapid automation adoption’.<sup>1</sup> And there are many other similar studies: specific details vary, but it is commonly estimated that about 50% of occupations are exposed to automation.<sup>2</sup>

There is a growing consensus that the impact of automation technologies is likely to increasingly impact on jobs in the services sector not just in manufacturing – as has generally been the case historically.<sup>3</sup> For individuals, firms, and economies to succeed in this changed world, significant adaptation will be required. However, there is significant uncertainty about the jobs that will exist in the future, and the pace of change is rapid.<sup>4</sup>

Although the disruptive effects of technology have been managed positively in the past – with more jobs created than destroyed – the concern is that this may not be the case now; in part because of the speed with which the process is happening, and also because aspects of these technologies seem more of a substitute for labour than complementary in nature.

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1 <https://www.csc.gov.sg/articles/supporting-job-growth-and-worker-prosperity-in-a-new-era-of-automation>;

2 The OECD’s *Employment Outlook 2019* contains an estimate that 45% of jobs are at high or significant risk of change from automation across the OECD countries.

3 Richard Baldwin, ‘*The Globotics Upheaval: Globalisation, Robotics, and the Future of Work*’, Weidenfeld & Nicolson, 2019.

4 There is a large and rapidly growing literature on these issues: Erik Brynjolfsson and Andrew McAfee ‘*The Second Machine Age. The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*’, WW Norton, 2016; Martin Ford ‘*Rise of the Robots*’, Basic Books, 2015; and the McKinsey Global Institute (MGI) have a series of report on technology and labour markets ([www.mckinsey.com/mgi/our-research/labor-markets](http://www.mckinsey.com/mgi/our-research/labor-markets)).

## *ii. Skills biased technical change*

The way in which technology has developed over the past few decades in particular has augmented the productive potential of skilled people. For example, ICT has enabled people with skills to become more productive and to earn higher incomes. ‘Skills biased technological change’ is an important driver of income inequality within economies.

There is active debate about the extent to which new technologies and business models will interact with skills profile. The rough consensus is that the highly-skilled will benefit from these technologies that make them even more productive; and that many ‘lower-skilled’ people will be resilient because of the ‘high touch’ nature of their jobs, which makes these tasks difficult to automate (nursing, old age care). It is people in the middle of the skills distribution with jobs that can be routinised that are at greatest risk from these technologies (and from global competition): for example, aspects of accountancy, manufacturing, and so on. Policy needs to be focused on addressing this risk of hollowing out of the middle of the income distribution, as pressure is placed on people with middle levels of skill.

The nature of the return to skills will change. And the type of skills that are valued in this new world will be different. It is not simply technical skills (e.g. STEM), some of which can be codified, but a whole range of tacit, soft skills – such as teamwork, communications, and creativity. The policy challenge is to equip people with the skills that they will need to prosper in this emerging world.

## *iii. Changing nature of globalisation*

There has been a process of intense globalisation over the past few decades, with exports and cross-border direct investment (FDI) growing very strongly. This has been supported by developments in communications and transportation technology, which have enabled the development of global value chains. Both emerging markets and advanced economies have benefited substantially from this process.

World trade growth has slowed over the past decade since the global financial crisis, for both cyclical reasons (weak global demand) as well as structural reasons, such as reconfigured global value chains. There are also recent concerns about the impact on world trade of emerging protectionism. But the recent headline data should not be over-interpreted: globalisation is not so much reversing as changing form. There are several categories of exports that continue to generate strong growth rates in an otherwise sluggish world trade environment. These tend to be knowledge intensive, such as advanced industries and commercial services.<sup>5</sup>

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<sup>5</sup> Landfall Strategy Group, ‘On changing globalisation & small economies’, *Insight*, 4 March 2019.

Analysis by the McKinsey Global Institute also notes that trade growth is dominated by these knowledge intensive sectors – and that most of incremental global value added has been generated in five knowledge intensive sectors over the past 20 years.<sup>6</sup> To prosper in world with more modest growth rates, being in knowledge intensive categories will make a difference. It will be hard for advanced economies to compete on the basis of cost structure, or other replicable factors.

The OECD argues strongly that skills and innovation are increasingly central to economic performance in this global context.<sup>7</sup> In particular, they note that skills are vital to successful participation in globalisation – and particularly global value chains. Economies with better skills profiles are more likely to have strong exports outcomes as well as employment and productivity growth.

The OECD provides evidence that higher skills lead to increased specialisation in advanced technology industries, which have tended to grow relatively quickly. Conversely, economies without a skills profile that meets the skills requirements of technologically advanced industries will find it more difficult to develop a specialisation in these valuable industries (particularly given the more intense global competition in knowledge-based activities, described below)

#### *iv. Intense global competition*

The advantage that advanced economies have had in terms of a high share of tertiary education graduates is eroding as education and skills levels increase rapidly in emerging markets: advanced economies will need to continue to upgrade in order to sustain a distinctive position of competitive advantage.

Advanced economies have been losing world market share in trade and GDP, but have continued to do well in terms of the commanding heights of knowledge-based activities. Advanced economies – and advanced economy MNCs – have dominated knowledge intensive industries, which have been powerful engines for globalisation and for GDP growth across advanced economies. Innovation and knowledge will be at the core of the ability of advanced economies to compete given that global value is moving to advanced industries as noted above.

Innovation is increasingly global in nature – the number of large global companies from China and other emerging markets has increased rapidly. And this is likely to continue. Note that large economies like the US and China are producing dominant platform companies (Amazon, Apple, Facebook, Alibaba, Tencent, and so on). The global economic geography of innovation is changing. China, for example, now accounts for a large share of global R&D and patent activity – with very substantial government support, including through strategies such as ‘Made in China 2025’.

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<sup>6</sup> McKinsey Global Institute, ‘Superstars’: The dynamics of firms, sectors, and cities leading the global economy’, October 2018.

<sup>7</sup> OECD, Skills Policy Outlook 2017. <http://www.oecd.org/newsroom/improving-adult-skills-can-help-countries-benefit-from-globalisation.htm>; [https://www.oecd-ilibrary.org/education/oecd-skills-outlook-2017\\_9789264273351-en](https://www.oecd-ilibrary.org/education/oecd-skills-outlook-2017_9789264273351-en)

In terms of competition over the location of economic activity (e.g. to be an attractive location for FDI), strong skills and innovation capability is also an asset. Skills and innovation capability makes make locations more sticky, anchoring knowledge intensity activity in the economy and reducing the likelihood that the activity moves elsewhere.

Even in a more weightless, intangible world, location is an increasingly important dimension of competitive advantage; tacit skills and innovation capability are often embedded in the specific cluster, and are hard to replicate elsewhere. The cost structure in advanced economies means that need to have these assets to remain an attractive location.

## 2. Themes in the international policy response

There is significant policy activity and debate in many advanced economies with respect to skills and innovation policy as governments seek to position their economies to capture opportunities and manage risks associated with these global dynamics. From looking across the specific national experiences of major advanced economies, as well as the analysis of international institutions such as the OECD, this discussion identifies several dimensions that are common areas of policy priority – either identified as policy recommendations or observed in the national level policy actions and debates.

At a general level, there is increasing priority on improving the quality of education and training. Broadening the skills base in an economy is an important element of the way in which to better position more people to participate fully in the labour market. People need skills to be productively engaged in the economy.

There is a sense that the economic and social importance of skills will continue to grow, and that knowledge and innovation will be a prerequisite for GDP growth in advanced economies.<sup>8</sup> And at the same time, there is a view that the traditional policy approaches to skills and innovation will need to be adapted in order to be effective. As one example, the OECD has a major research agenda underway on upgrading national skills strategies.<sup>9</sup> And there are multiple initiatives that are framed around the future of work.

Looking across advanced economies, and the work of institutions such as the OECD, there are several key dimensions of activity with respect to skills and innovation policy.

- *Increased focus on ongoing training*

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<sup>8</sup> Refer for example, Jonathan Haskel & Stian Westlake, 'Capitalism without capital', Princeton University Press, 2018.

<sup>9</sup> <https://www.oecd.org/skills/>

The traditional linear model of education, in which education is concentrated at the start of the career (school, university, or other technical education) is seen to be insufficient given the rapid pace of change in technologies and business models. It is increasingly likely that people will change jobs and occupations through their career, and will need to acquire new or upgraded skills on an ongoing basis. Schools and universities remain important, but there is an awareness that increased attention needs to be given to ongoing learning.

Ongoing education matters because most of the workforce over the next 10-20 years is already in the workforce. There is a need to provide ways in which this population to upgrade skills, not simply rely on the formal education system.

There are several elements here. First, governments, firms, and other stakeholders (unions, educational providers) will need to make ongoing skills development easier; providing platforms that allow people to acquire new skills on a part-time or short-course basis. The OECD note the importance of skills-intensive workplaces; unions and others have an important role to play in the regard. Workers also need to take personal responsibility for acquiring new skills – they are not simply passive actors: the OECD talk about the importance of creating a ‘learning culture’.

Second, there needs to be financial support to individuals, firms, and others, to provide an incentive to supply and participate in these training programmes.<sup>10</sup> Many people face financial constraints that prevent them from accessing important training opportunities; and flexibility in working arrangements may also be needed to allow for access. Similarly firms, particularly SMEs, may require financial support to finance the investments: individual firms may not have the incentive (or the means) to provide these opportunities.

And third, labour market policy needs to emphasis flexibility and providing platforms to support people transition to new jobs. Active labour market policy will become increasingly important, providing guidance on career transition and access to retaining and upgrading platforms.

- Connecting skills and industry

Although unemployment (and particularly youth unemployment) remains elevated in many countries, employers commonly report skills shortages. This indicates that the market is not working effectively in many economies to match skills supply and skills demand; there is a partial disconnect (or lags) between educational providers and employers. Particularly with an increasing pace of technological and business model change, it will be important to better connect skills and industry.

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<sup>10</sup> <http://oecdeducationtoday.blogspot.com/2017/05/how-to-surf-new-wave-of-globalisation.html>

The OECD note that ‘To improve this alignment, education and training systems needs to cooperate with the private sector, for example through vocational education and training with a strong work-based component; local initiatives to link education institutions to the private sector; and policies to focus interaction between the private sector, universities, and research institutions’.<sup>11</sup>

One element of this is increased focus on vocational education. Vocational and technical education has often been treated as less important than university education, but a rebalancing is underway. Many economies have initiatives underway to better support and promote vocational education, both in response to specific skills shortages that have emerged (e.g. in the trades) but also because of the advantages that this model offers in embedding education within a firm (so that people can work and learn within the firm).<sup>12</sup>

Another dimension is to broaden out the focus of the education system beyond technical skills. Employers commonly report the need for soft skills such as team-work, problem solving, and communication. The OECD note that ‘industries need workers with literacy, numeracy and problem solving skills, prowess in management and communication and a readiness to keep learning’. STEM skills are important, but also soft skills.

Equipping people with appropriate and relevant skills is not simply a task for the government. Firms have an important role to play here: indeed employers and industries investing in response, along with unions and other social partners.

- *Aligning demand and supply*

Many governments have had various skills agencies and processes to forecast the supply and demand of skills. This function also includes the provision of information about employment opportunities, to assist people to make informed decisions about investing in skills and education.<sup>13</sup>

However, the changing nature of work (and the increasing fluidity of occupations) means that new approaches are being used to ensure alignment – including active labour market policy to support people as they look for new work. This will become increasingly important as labour markets are further disrupted.

There are some interesting examples of the use of big data; including identifying adjacent areas in which skills can be used (often in different industries that may not be obvious).<sup>14</sup> This is early stage, and has not yet in the mainstream of policy, but it gives a sense of the changing ways in which governments are thinking about the demand and supply of skills.

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11 OECD Skills Outlook 2017.

12 <http://www.oecd.org/publications/seven-questions-about-apprenticeships-9789264306486-en.htm>; <https://oecdeducationtoday.blogspot.com/2018/10/apprenticeships-work-based-learning-cost-benefit-oecd.html>

13 Note initiatives like this: <https://www.oecdskillsforjobsdatabase.org/#UK/>

14 As just one example, see: <https://www.alphabeta.com/wp-content/uploads/2019/01/google-skills-report.pdf>



- *Coordination of skills policy across multiple domains*

A whole of government approach is needed to coordinate education, training, labour market, migration, and other policies affecting the development and use of skills. Making progress on skills is not simply about the education sector narrowly defined. For example, policy can address the risks associated with investing in skills – through providing social insurance, the design of healthcare, and so on. Similarly, the design of employment-protection legislation should provide flexibility to firms and security to workers. Active labour market policy can help the transition path of mid-career workers, supporting re-employment and upgrading or acquiring new skills.

- *Innovation*

There are two innovation policy dimensions that are observed across many advanced economies.

First, governments (and firms) are also increasing their commitment to R&D and other investments to support innovation, and particularly to capture value from new technologies. There is a concern in some advanced economies, notably in Europe, that they are lagging in terms of the strength of their positions in the next generation of technologies – and that this will compromise their economic performance over time. As with skills, innovation requires a coordinated approach across government – and also required a strong link to industry (cannot simply be research-led).

Second, there are a growing number of efforts to increase economic dynamism and to help innovative companies to start and then to scale up. There are also a variety of government initiatives: research institutions, funding vehicles, support (such as incubators), and so on. Again, there are concerns in Europe that, relative to the US, there are relatively few firms that have grown to real scale recently – many of the large firms in Europe can trace their history back over a century.

- *Overall coherence*

There are some attempts to apply a whole of government approach to specific areas of policy, such as skills policy (as described above). However, there is not much evidence in terms of meaningful strategic interaction between skills and innovation policy – at least in the large economy universe (it is much more common in small advanced economies, as will be discussed below). Indeed, one of the striking things reading through skills strategy reviews – as well as various documents on skills policy – is how little focus there is on integrating skills policy and innovation policy, and on linking skills policy to a broader economic strategy.

The closest examples in terms of integrating skills and innovation policies into an overall economic agenda is in terms of various national digital and 4IR strategies – which aim to strengthen digital capabilities in order to capture value from new disruptive technologies. These strategy statements acknowledge that developing capability in digital technologies involves an integrated set of policies – from education, research, enterprise policy, and so on. Germany is a good example of this (and note also that there are several small economy digital strategies, such as the Netherlands).<sup>15</sup>

### **3. Concluding remarks**

Advanced economy governments around the world are responding to intensifying pressure on the skills and innovation system: intense global competition, disruptive technologies, and increasingly skill-biased technical change, mean that individuals, firms and overall economies need to upgrade in order to sustain a distinctive competitive position. Although the exact shape of the labour force and economy of the future is not clear, policy-makers (and other stakeholders) can act to make the skills and innovation system more adaptive, flexible and resilient to change.

Northern Ireland is also exposed to these global dynamics as well, and can learn from the international experience. Indeed, the relationship between skills, innovation, and economic outcomes will be even more the case for small advanced economies given their deep exposure to the global economy.

However, as well be discussed in the next section, the specific characteristics of the economic structure and dynamics in small advanced economies will powerfully shape the way in which small advanced economies should approach skills policy and innovation policy. A large economy policy template will not be appropriate; the small economy context needs to be taken seriously. The case studies in the Appendix describe the way in which specific small advanced economies approach skills and innovation policy in a distinctive way – particularly the extent to which skills and innovation policy are integrated, and link to a broader economic strategy.

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<sup>15</sup> Federal Ministry for Economic Affairs & Energy, *Germany Digital Strategy 2025*

## II. The small economy context

### Introduction

This discussion in this Part of the document provides small economy context to the discussion of skills policy and innovation policy, and the way in which these should be integrated. Drawing on analysis of small advanced economies around the world, it describes why skills policy and innovation policy are both of particular importance in small advanced economies – and by extension, why is it important that these policies are strategically linked.

Small advanced economies are deeply exposed to the global dynamics that were described in Part I, but have particular characteristics which mean that different approaches to skills and innovation policy will be needed. In particular, the ‘strategic coherence’ of economic policy has played a central role in the success of small advanced economies over the past several decades.

Small advanced economies are a valuable comparator group for Northern Ireland, with similar exposures and constraints, and will provide insight into areas for focus with respect to Northern Ireland’s skills and innovation policy. This discussion is accompanied by some initial small economy benchmarking of Northern Ireland on relevant performance and policy measures relating to skills and innovation.

This Part of the document is structured as follows. First, it considers the factors that have supported the strong economic performance of small advanced economies over the past few decades, with a focus on the contribution of skills and innovation policy. Second, it looks at the specific characteristics associated with small advanced economies that bear on skills and innovation policy; small economies are not simply scaled-down versions of larger economies, but have distinctive properties that matter for skills and innovation policy. In this context, the third section draws out some of the key implications for skills and innovation policy in small advanced economies. Fourth, it presents some initial benchmarking of Northern Ireland against small advanced economies in order to highlight the similarities and differences between Northern Ireland and the international small economy experience. Section 5 concludes. The text is accompanied by a deck of supporting Exhibits.

## 1. Small economy performance

This opening section introduces the small advanced economy group, and describes some of the stylised facts of small country performance on a range of economic and social outcomes.

In this analysis, I define small advanced economies as IMF advanced economies with populations of more than 1 million and less than 20 million and with a per capita income above USD30,000. This generates a group of 13 small advanced economies: Austria, Belgium, Denmark, Finland, Hong Kong, Ireland, Israel, the Netherlands, New Zealand, Norway, Singapore, Sweden, and Switzerland. For some of the analysis in this paper, including the case studies in the Appendix, I also include Scotland and Estonia, two other small economies that are also of relevance to Northern Ireland.

I also construct a comparator group of 10 larger advanced economies; IMF advanced economies with populations of more than 20 million people.

The group of small advanced economies is a diverse group of countries that on the surface have many significant differences in economic approaches: Singapore has a different economic model from Denmark; Switzerland is very different from New Zealand; and so on. But there are some common elements that are shared across high performing small advanced economies.

Small advanced economies confront common challenges and opportunities, which stem from their acute exposure to the external environment. This external exposure has a profound influence on how small advanced economies approach economic policy: they are trying to respond to position themselves for competitive advantage in the global economy, although the specific ways in which they do so will vary according to local economic and political circumstances. And as I will describe in more detail below, there are a series of insights for Northern Ireland from these small advanced economies – despite the obvious differences in the constitutional situation.

### *Small advanced economy performance*

Small advanced economies have generated strong economic outcomes. They have relatively high levels of per capita income: the small economy average per capita income is about 30% higher than that of larger advanced economies, and a few small advanced economies have particularly high levels. Although there is broad distribution of income levels across the small advanced economies group, the top-performing small advanced economies dominate the per capita income rankings.

These strong per capita income measures are the result of strong small country GDP growth rates over the past few decades, and particularly over the past 25 years. There has been a distinctive edge in GDP growth, of around half a percentage point, in small advanced economies over the larger counterparts. This strong performance has continued through the post-crisis period despite external headwinds of sluggish world GDP and trade growth.

It is instructive to consider the decomposition of per capita income and GDP growth rates. In terms of the levels, small economies have higher levels of both labour productivity (GDP per hour worked) as well as in hours worked per capita. Conference Board data shows that the per capita income advantage that small advanced economies have over their larger counterparts is due to both higher levels of labour productivity (13% higher, or 8% higher without Norway) as well as stronger hours worked per capita (which are also about 8% higher on average).

And it is stronger labour market performance that has given small advanced economies the edge in terms of GDP growth over the past few decades.<sup>16</sup> Small economies do well at productively deploying a large share of the working age population. Growth in hours worked in small advanced economies has consistently run well ahead of larger economies over much of the past 25 years. In contrast, labour productivity growth rates have been approximately the same over this period between the small and large economy groups.

This relatively strong contribution from labour markets has strengthened further in the post-crisis period. Over the 2012-2018 period, growth in hours worked per capita accounted for over half of GDP growth in the advanced economies group, up from around one third in the post-2000 period. This was due to a combination of population growth (including migration), higher rates of participation, and reducing unemployment.

Small advanced economies have consistently lower unemployment rates and higher labour force participation rates. Taken together, the overall employment rate (the share of the working age population that is in employment) is higher in small economies than in larger economies. As will be discussed further below, a relatively high proportion of this employment is in externally-oriented sectors – with high levels of productivity, and frequently involved in knowledge and innovation intensive activity.

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<sup>16</sup> Landfall Strategy Group, 'Productivity is not everything', Insight, 6 November 2017.

These strong labour market outcomes are an important contributor to the strong inclusive growth outcomes that are generated by small economies, such as the relatively low Gini coefficient, but also on a range of other social outcomes.

### *Drivers of strong performance*

There are several reasons for this strong performance by small advanced economies. Although there is no single policy template for small economy success – New Zealand, Singapore, and the Nordics, for example, have clear differences in specific policy settings – there are some common factors. For example, small advanced economies tend to have strong policy foundations (fiscal discipline, efficient business environments, external balance, flexible labour and product markets, and so on) as well as strong intrinsics (high quality political institutions, high levels of social capital and trust) that support policy agility and responsiveness.

This discussion focuses on a few classes of factors that are particularly relevant to a discussion of skills and innovation outcomes in small advanced economies: active international engagement; strong, sustained investment in knowledge, innovation and human capital; as well as a strategic coherence in economic policy that effectively integrates these various policies.

### *Active international engagement*

The levels of international engagement by small advanced economies are substantially higher than in larger economies, and the growth in international economic activity has also been stronger. This is the case for both exports of goods and services as well as cross-border direct investment (FDI). There was an increase in the growth of international economic activity across the small economy group from the mid-late 1990s, partly reflecting strong global growth and the integration of emerging markets into the global economy, as well as a change in the nature of the export structure of small economies into higher growth export categories. The nature of the international engagement model in small advanced economies shifted over this period, with an increased focus on exports of knowledge intensive good, exports of services, and on outward direct investment.

It is this externally-driven growth that has been the foundation of strong economic performance by small advanced economies. This is because of the strong productivity gradient across sectors in small advanced economies: productivity levels (and growth rates) are higher in externally-oriented sectors (such as manufacturing) than in domestically-oriented sectors (such as retail or construction). This difference in productivity levels between domestic and externally oriented sectors is seen across all advanced economies, but is particularly marked for small advanced economies with a limited domestic market (reducing the potential for scale economies and leading to weaker competitive intensity).<sup>17</sup>

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<sup>17</sup> Landfall Strategy Group, 'Productivity trends in small economies', *Insight*, 30 July 2018.

For this reason, small economies need to develop a well-performing external sector in order to generate strong economic outcomes. Indeed, the intensity of engagement in externally-oriented sectors maps well onto productivity outcomes in small advanced economies. And episodes of meaningful income convergence by small advanced economies are due to growth in external sectors rather than domestic factors.<sup>18</sup> It is the small advanced economies that are more externally engaged tend to perform better in terms of GDP growth and proximity to the income frontier.

There are some relatively exogenous factors that support international economic performance, such as geography and regional integration, the strength of the global economy, resource endowments, and so on. But at least as important are whether the economy has a meaningful presence in high growth export categories – and the extent to which it can reallocate resources towards these sectors over time. Over the past couple of decades in particular, these export categories have had a high levels of skill and innovation embedded in them (e.g. advanced manufacturing, or professional and financial services). This dynamic seems set to continue, as discussed in Part I.

Many small economies have also benefited substantially from inward direct investment, notably Ireland and Singapore who have placed this at the centre of their respective economic strategies.

Large multinational firms play an important role in small advanced economies in driving international expansion, as well as contributing significantly to productivity and innovation.<sup>19</sup> Small advanced economies produce more large companies per million population than do their larger economy counterparts. The international activity of these small country firms is a central part of strong external engagement by small advanced economies.

### *Investing in innovation & human capital*

Successful small advanced economies are characterised by heavy investments in knowledge, innovation and human capital. It is commonly observed that small economies, because they have limited resources in an absolute sense, act to ensure that they make the most of their people. This focus on knowledge and human capital has been central to the way in which small advanced economies, from Switzerland to Singapore, have built distinctive international competitive positions. This capability is necessary to support the competitive positioning of high cost small advanced economies in the global economy.

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<sup>18</sup> Landfall Strategy Group, 'Income convergence by small advanced economies', Analysis, August 2018.

<sup>19</sup> Landfall Strategy Group, 'The importance of (firm) scale: Large firms in small advanced economies', Analysis, November 2018.

Many small advanced economies, notably economies like Finland and Israel, invest very heavily in R&D. However, there is variation across the small economy group (New Zealand has relatively low R&D intensity), as well as in the way in which innovation is undertaken (for example, Ireland and Singapore rely on R&D intensive MNCs).

The time series of R&D spending suggests an increased investment in R&D from the mid-late 1990s, which enabled small economies to transform the export structure (moving into higher value, higher growth categories). More recently, there has been an increasing track in R&D/GDP spending by the small advanced economy group. However, a gap is opening up between the high and low R&D spenders: the high R&D intensity small economies are growing R&D spending, while the low R&D intensity small economies have a relatively flat profile.

There are several other measures of the domestic innovative capacity of small advanced economies. For example, small advanced economies tend to perform well in the World Economic Forum's Global Competitiveness Index. But for advanced economies it is the performance on the innovation and business sophistication elements of the Index that are particularly relevant. Many of the high performing small economies, such as Switzerland and several Nordics, perform particularly well on this innovation measure. In contrast, economies such as Estonia and New Zealand perform less well.

A similar picture is seen in the Global Innovation Index, where small advanced economies take 8 of the top 10 places on the rankings. Interestingly, however, the innovation efficiency ratio – a measure of innovation outcomes normalised by innovation inputs, such as R&D spending – is lower in many small advanced economies in larger advanced economies (perhaps suggesting that greater investment effort is required in small advanced economies to generate strong innovation outcomes).

In addition to these substantial investments in innovation, small countries also prioritise investment in human capital. Consider the strong performance of small advanced economies on the World Economic Forum's Human Capital Index, a composite measure of multiple dimensions of human capital. This performance is due to a combination of strong formal education systems (note the relatively strong PISA scores in small economies), as well as technical/vocational training and high quality schools, universities, and research institutions. Many small economies are currently investing in initiatives to prepare their existing and future workforce for the workplace of the future, recognising that disruptive change is on the way. Singapore, Denmark and Ireland are good examples, as will be discussed in the case studies.

One measure of the strength of the skills system in small advanced economies is that they have been able to productively employ large shares of the population in externally-focused sectors, even in periods of competitive intensity and rapid change in technologies and business models. As noted above, a key dimension of the performance edge of small advanced economies over the past few decades is due to strong labour market performance.



### *Strategic coherence*

The discussion above notes the common policy themes in high-performing small advanced economies: in particular, successful small advanced economies consistently place an emphasis on skills and innovation in order to develop strength in externally-oriented sectors of the economy. However, there is no single policy template, and small countries choose to compete in a variety of ways. For example, the Nordics follow a markedly different approach than Ireland and Singapore. But although the policy specifics vary across small economies, there is a general pattern of strong economic performance.

So small country performance is less about the policy specifics than the way in which these policies are packaged together for the specific context – that is, it is about the strategic coherence of policies. Although the specific ways in which small countries compete vary according to context, the notion of a deliberate strategy to position their countries is a unifying theme across high-performing small advanced economies. In many small countries, there will be a clear sense of the national value proposition and the basis on which the country is positioned to compete in the global economy. For example, it is very clear how Singapore and Ireland are positioning themselves to compete.

One dimension of this positioning is a deliberate development of key strengths in the economy that provide a source of distinctive competitive advantage. These can be ‘horizontal’ factors, such as low tax rates, physical location, human capital, the innovation ecosystem, business environment, or infrastructure. For most small economies, skills and innovation are central to this competitive positioning.

Or the positioning could be more ‘vertical’ in nature, organised around key sectors.

Most successful small advanced economies will have a limited number of deep clusters with dense backward and forward linkages, and in which there is something distinctive about the country. Looking across successful small advanced economies, it is common for them to have only a few areas of real depth and critical mass (whereas a large economy is much less constrained in the number of high-performing clusters that it can have). These clusters of economic activity often provide the focus for a coordinated approach to policy. Small countries cannot be world class in everything, and there is a premium on developing distinctive competitive advantage in some areas.

This strategic coherence is likely to become increasingly important, as the international environment becomes more complex and challenging. Small economies have benefited from a more positive, supportive external environment over the past few decades: intense globalisation and an open, rules based system. Small economies have been able to prosper in this environment by making quality policy choices.

But looking forward, global growth and globalisation both face headwinds. And, as discussed in Part I, there is growing global competition in areas in which small advanced economies have developed positions of strength. And small advanced economies are also exposed to the increased importance of scale in the innovation system. There are strong agglomeration forces at work, with major hubs of innovation emerging (China, US) as well as the emergence of large platform-based companies.

In this more challenging and complex global economic environment, it will be more difficult to build deep positions of competitive advantage. Small advanced economies will need to work even more deliberately to align policies behind a distinctive competitive positioning.

## **2. Characteristics of small advanced economies**

The introductory discussion above noted the importance of skills and innovation for developing strong positions in externally-oriented sectors, which in turn lifts productivity growth across the economy. Skills and innovation are a central part of a coherent economic strategy for small advanced economies.

This section focuses on the ways in which the specific characteristics of small advanced economies shape the approach to skills and innovation policy. To set skills and innovation policy appropriately, it is important to understand the characteristics of small economies. Small advanced economies are not scaled-down versions of large economies; they have particular external exposures as well as specific domestic constraints, such as the challenges with respect to building critical mass in key parts of the economy. These properties mean that the approach of small advanced economies to skills and innovation policy will have some differences with respect to larger economies.

Deliberate policy efforts are needed in response, in ways that may not be familiar in larger economies. I discuss five specific small economy characteristics that shape the appropriate design of skills and innovation policy.

### *i. High skills requirement*

First, the high share of externally-oriented sectors in small advanced economies generates a relatively high skills requirement. Skills and innovation matter everywhere, but the productivity bar for competitive success in externally-oriented sectors is much higher than in other sectors. There is a relatively steep gradient between productivity in externally-oriented sectors and domestically-oriented sectors: productivity levels in the construction and retail sectors tend to be markedly lower than externally-oriented sectors such as manufacturing, where productivity has to be in line with international standards in order to compete.

Small economy GDP growth is importantly driven by growth in externally-oriented sectors, and so having high levels of skills and innovation is central to the economic performance of small economies. This makes skills and innovation a much more central component of economic success in small advanced economies than in larger advanced economies, which have larger shares of economic activity in domestic sectors. Deep skills and innovation capability is a core feature that makes small economies distinctive relative to other locations. Without this, it is difficult for small advanced economies to develop and sustain competitive positions, particularly given their high cost structures.

This tendency is reinforced by the characteristics of the high growth export sectors, which are increasingly knowledge intensive in nature; such as advanced manufacturing. To maintain a strong position in these sectors, small advanced economies will need to have high levels of skills and innovation. And to translate this into strong overall economic performance, small economies will need to ensure that a meaningful share of the population is able to be employed in these sectors.

To do this, small economies will need to lean against the experience across major advanced economies over the past few decades: almost all of the incremental employment growth has occurred in domestically-oriented sectors with below average levels of labour productivity (such as retail and other domestic services). A smaller share of people are directly exposed to the sectors in which the strong productivity growth is occurring. To push against this – and to deliver strong productivity outcomes – small advanced economies will need to invest heavily in skills and innovation.

This will likely become increasingly the case. For example, there is greater competitive intensity in knowledge-intensive activities in which small advanced economies have typically had strong positions, as emerging market firms develop a stronger presence. And there is rapid change in technologies (AI, automation) and business models, which will place an additional premium on skills and innovation capability.

The overall message is that skills and innovation matter for all advanced economies, but that this is even more important for small economies. Most small advanced economies recognise the vital importance of skills and innovation for economic success, and set policy accordingly. But increased intensity of policy action is likely to be required.

## *ii. Economic concentration*

The second relevant characteristic of small advanced economies is that they tend to have relatively high concentrations of economic activity in a few sectors or clusters. Small economies can develop positions of world-class competitive strength in only a few parts of the economy; limited amounts of resources (labour, capital, and so on) mean that critical mass can only be achieved in a limited number of externally-oriented sectors.

The implication is that deliberate choices are needed to ensure that the skills profile and innovation capabilities match the particular sectoral profile that the small economy has. For small advanced economies, skills policy is about more than building a strong base of general human capital; there is a greater need than in larger economies to develop specific human capital and innovation capability that maps onto the national economic structure.

Rather than relying on a broad policy focus on raising tertiary education participation rates or increasing R&D intensity across the economy, it is likely to be more effective to apply a sectoral focus that links to the areas of specific concentration. The focus of the skills and innovation system should be deliberately connected to the economic profile of the economy, and to the broader economic strategy. Specific examples of this will be included in the case studies, such as maritime in Denmark, advanced manufacturing and finance in Singapore, and so on.

In addition to a relatively high level of concentration in a limited number of clusters or sectors, it is often the case that small economies also have a concentrated economic exposure to a relatively small number of large firms. Small advanced economies produce more large companies per capita than do their larger economy counterparts, which often account for meaningful amounts of GDP.

Large multinational firms (both domestic and foreign) play an important role in small advanced economies in contributing significantly to productivity, innovation, and international expansion outcomes.<sup>20</sup> And in terms of skills, large firms play an important role in training and mentoring workers. Small economies without large firms may be at a disadvantage in terms of generating skills and innovation outcomes. There is a likely to be a tighter relationship between skills and innovation requirements and the nature of these key MNCs in a small economy context. It is important to understand the current and prospective skills and innovation requirements of these large firms.

As a consequence of this concentration, and the consequent absence of diversification, small advanced economies are particularly exposed to shocks. If there is a firm or sector-specific shock to an important area of the economy, this can have a substantial impact on a small economy. Finland is a well-known example of a small economy that was subject to an economic shock due to a material firm-specific event (Nokia). To the extent that specific skills and innovation capability is required in a small economy, policy attention also needs to be directed to the appropriate allocation of risk across individuals, firms, and the government. For example, providing resilience against these economic shocks can be supported through measures such as social insurance and active labour market policy to help people move between jobs and to acquire new skills.

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20 Landfall Strategy Group, 'The importance of (firm) scale: Large firms in small advanced economies', Analysis, November 2018.

### *iii. Innovation absorption*

By definition, most of the world's new ideas and innovation will be produced outside small advanced economies. As discussed above, this is likely to be particularly the case given the increasing returns to scale in developing some new technologies and business models: the US and China lead the development of a range of new technologies and business models.

One of the key functions of an innovation system in a small economy is to be able to absorb new ideas and practices from around the world, with a particular focus on the economic sectors and activities that are important to it. This absorption can occur through individuals, firms, or in academic and research institutions.

Given their scale, small economies need to over-invest to be close to the frontier of this thinking in order to be able to understand and absorb the relevant new ideas (and to have the relevant networks). Small economies need to have a baseline level of skills and innovation capability before they can benefit from ideas and innovation happening elsewhere; small economies can't simply 'free ride' on investments in knowledge made in other countries.

Note that previous waves of innovation were dominated by large firms in large countries (such as Microsoft) and were argued at the time to disadvantage small scale. However, small economies were able to prosper by positioning themselves to benefit from these technologies (as a consumer rather than as a producer). The same dynamic seems likely to be true in the context of capturing value from a new wave of disruptive technologies.<sup>21</sup> However, to do this, it will be important that small economies have strong capabilities in terms of skills and innovation to be able to effectively use these new technologies.

Again, this is likely to happen only in a limited number of cluster areas – and so an element of policy deliberateness will be required. There is a need to develop world-class expertise in a few areas of research or economic activity. This may need to be housed in a world-class institution. Indeed, one observation from across the small economy world (which will be further discussed in the case studies) is the deliberate action that is required by small economies to generate world-class universities and research institutions. Several small economies, such as Switzerland, the Netherlands, and Singapore, are particularly well represented in the worldwide university rankings.

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<sup>21</sup> Landfall Strategy Group, 'Disruptive technologies in small advanced economies', Analysis, February 2018.

#### *iv. International factor mobility*

The fourth specific characteristic that is distinctive of small advanced economies is their high level of exposure to international factor mobility. The agglomeration effect, in which economic forces create a gravitational pull of labour, capital and firms towards larger centres, is a major influence on small advanced economies. Without high performing clusters and sectors, small economies are at risk of losing their skilled people and innovative firms.

Small economies face competitive pressures from larger centres (particularly those offering higher wages) that are attractive to skilled people. This is particularly true for small economies that are proximate to larger, richer countries, and have common labour markets; New Zealand is a clear example of this dynamic, as was Ireland before its rapid economic development process began. Lower income small economies often have high proportions of their skilled populations in other countries.

The risk with skills strategies in small economies that focus too much on increasing the supply of human capital is that internationally mobile skilled people may subsequently leave if there are not attractive opportunities in the domestic market. Some small advanced economies that have invested significantly in (highly mobile) human capital, without paying sufficient attention to investing in creating the opportunities for that talent to remain in the home market, have experienced significant outflows.

So there are risks to small economies to over-investing on the supply-side of skills and innovation policy, without investing in a coordinated way on the demand side. Investing in skills that create international opportunities for the population may not generate domestic economic value unless there are complementary policies on the demand side. In small economies, skills and innovation policy needs to have a dual focus on demand and supply – and to be integrated into an overall economic strategy. Care should be taken not to over-invest so that supply of skills runs ahead of demand.

Of course, international labour flows can move in the other direction as well. Many small advanced economies have high rates of migration, and can import skills if these are shortages (as Singapore, New Zealand, Ireland, and others are doing). Migration can be an important supplement to the domestic skills profile of small advanced economies, and particularly for specific skills. But even so, small economies need to be thoughtful about the domestic demand and supply of skills. And note that high rates of inward migration can distort the investment incentives in small economies with respect to investing in human capital: some firms may prefer to buy skilled migrant labour rather than invest in upgrading the skills of the domestic workforce.

#### *v. Weaker incentives to invest in skills and innovation*

The limited domestic market size of small advanced economies, coupled with the relative weakness of competitive intensity, reduces the incentive for individuals and firms to invest in skills and innovation (and in productive capital more generally). This is particularly the case outside of externally-oriented sectors, because the investment can only be leveraged over a small market. And the absence of competitive pressure in domestic sectors further weakens the incentive to invest.

This is true for various types of investment, from physical capital to investment in R&D or knowledge or human capital. The implication is that relying on market forces to create strong incentives for investment in skills and innovation may not be sufficient in small advanced economies to generate the investment in the private sector that is required to support distinctive competitive positions. The implication is that there is a stronger case in small advanced economies for governments to play a role in supporting or funding these investments than is the case in larger economies.

SMEs operating in small economies may be particularly prone to these weak incentives. The combination of small firm size (and small balance sheets) combined with the limited potential of the small domestic market, may make these investments in skills and innovation more challenging and risky.

And note that investing in physical and human capital are often complementary investments: for some types of skills, the returns increase with the physical capital and technology that are available to work with. If firms are not investing in productive capital, it may not make sense for individuals to invest in complementary human capital. Similarly, unless firms are confident in the supply of appropriate human capital, they may be reluctant to invest in new technology and equipment. Small economy governments may need to step in to play a coordinating role to support the incentives to make these investments.

One of the particular risks in small advanced economies is that they get caught in a 'low wage, low skills, low investment equilibrium' because of the absence of investments to make complementary investments: firms don't want to invest in risky productive investment because of the small domestic market, amplified by uncertainty about the supply of skilled labour to work with the productive investment. Similarly, individuals can be reluctant to invest in specific human capital because of concerns that firms will not make the investments to allow them to make a return on their investment in skills (and there may be only a few firms that can do this).

There are some things that can be done to change incentives, e.g. migration policy, tax policy. But coordination into particular priority areas of the economy is likely to encourage investment by firms as well as greater investment in skills (because the return to skills increases). This requires a coherent economic strategy to shift the economy out of the equilibrium; for economies in this position, a change is unlikely to happen organically.

### **3. Implications**

These specific small economy characteristics have direct implications for how skills and innovation policy should be developed. This context matters: the policy approach to skills and innovation will be different in small advanced economies than in larger economies.

In particular, there are two broad implications that follow for skills and innovation policy in small advanced economies (and in Northern Ireland) from this consideration of the international small economy context. The first is the increasing centrality of skills and innovation policy in small advanced economies. The second is the need for strategic coherence: a deliberate approach to integrating skills and innovation into a broader economic strategy in order to address the specific characteristics of small advanced economies.

#### *The increasing centrality of skills and innovation*

The deep exposure of small advanced economies to the global economy means that most small advanced economies see skills and innovation policy as central aspects of their economic strategy. A deep pool of human capital is increasingly central to productivity and income growth, and to making a location 'sticky' for mobile labour and capital. This is particularly true given that small economies cannot rely on large domestic markets to support economic growth.

The centrality of this area of policy can be seen in terms of the policy and resourcing commitment directed to skills and innovation. The successful small advanced economies have a particularly strong policy emphasis on skills and innovation (Switzerland, Singapore) relative to less well-performing small economies (New Zealand, Belgium). Skills and innovation is an intense area of policy activity and debate in high-performing small economies. As will be discussed in more detail in the case studies, skills and innovation are an integral part of economic policy in small economies.

Firms in small advanced economies are deeply involved too, understanding that being competitive in global markets means sustained firm-level investment in skills and innovation.



The pace of technological change and the intensity of global competition mean that there are new demand on skills and innovation policy. This is reinforced by the changing nature of globalisation, which is increasingly driven by services and knowledge-intensive goods. Small advanced economies need to be investing even more in innovation and human capital in order to compete in a period of disruptive technological change and intense global competition

However, emerging technologies such as automation, 3D printing, and artificial intelligence, also provide new opportunities for small advanced economies. Small advanced economies tend to have relatively high manufacturing shares, and may benefit from this greater potential to grow manufacturing activity in relatively high cost economies – to the extent that they have the skills and innovation capability to leverage these technologies.<sup>22</sup>

Small advanced economies are adapting to emerging challenges and opportunities. And in general, small advanced economies are moving faster than larger economies. This is partly because small economies are more exposed to these developments, and need to respond faster and more aggressively.

#### *Strategic coherence: integrating skills and innovation into a broader economic strategy*

The specific small economy context has substantial implications for the design of skills and innovation policy – and the way in which it is integrated into broader economic strategy. In particular, these small economy characteristics mean that strategic coherence between skills and innovation policy is particularly important in order to deliver strong economic and other outcomes.

This strategic integration is important because there are some inherent tensions in designing skills and innovation policy for the specific characteristics of small advanced economies. For example, the need to invest heavily in human capital, as well as the need to guard against small economy exposure to the international mobility of this skilled labour; and the need to create the appropriate incentives to support the necessary investments in skills and innovation capability that is specific to industries and firms, which brings a higher risk profile. In addition, the task of aligning demand and supply of skills and innovation capability in a small economy requires a coordinating function, so that complementary investments are made appropriately by firms and individuals.

The best way of addressing these issues is through a coherent economic strategy, which acts to align and coordinate a broad range of government policies and actions. For example, social insurance and labour market policy to provide increased incentives for investment in specific assets; and focusing economic policy on growing demand in external sectors to accompany the investment in the supply of skills and innovation.

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22 Landfall Strategy Group, 'The impact of disruptive technology on small advanced economies', Analysis, February 2018.

This strategic integration is more important for delivering high quality outcomes in small economies than in larger economies, which have a much more diversified set of skills and innovation capabilities and requirements (reducing the risk profile and helping to address the coordination problem), and where the larger domestic market size creates the incentives to make invest more in skills and innovation.

The importance of strategic integration of the skills and innovation policy agenda is likely to increase. One of the distinctive edges that small advanced economies have demonstrated is in mobilising its population into the workforce in productive ways. However, there are big labour market challenges ahead, such as automation, AI, and new business models and platforms, which have the ability to displace a substantial share of the workforce – reaching increasingly far up the skills distribution. For example, a recent McKinsey study in Denmark noted that 40% of jobs could be automated with current technologies.<sup>23</sup> Similar estimates have been made in other small advanced economies, such as the Netherlands, Singapore, and elsewhere.

There will be a need to develop labour markets, education and skills policy, as well as social insurance in order to meet the disruptive challenges of new technologies and business models. Many small advanced economies have built positions of competitive advantage in knowledge-intensive activities, which are now exposed to a range of challenges: new sources of competition, new technologies disrupting business models, the potential headwinds of protectionism and other frictions on globalisation.

There are particular issues for small economies in this regard, given the relatively large size of their externally-oriented sectors, which tend to provide high wage, high productivity jobs – but where there is likely to be intense competitive pressure for upgrading and new technologies. A comprehensive whole of government policy response is required. The key policy levers include a combination of flexible, efficient labour markets (ease of hiring and firing, subject to basic safeguards); strong active labour market policy that aggressively works to ensure that people displaced from employment are able to regain high quality employment quickly; well-designed social insurance system that provides a financial buffer against unemployment and other shocks, without unduly compromising incentives; and strong investment in education and skills to ensure that people have the capabilities required to productively participate in the workforce.

As will be discussed in some more detail in the case studies in Part II, high-performing small economies have a tight relationship between skills policy, innovation policy, and overall economic strategy – which often includes a perspective on sectoral, cluster, and other priorities.

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<sup>23</sup> <https://www.mckinsey.com/denmark/our-insights/a-future-that-works-the-impact-of-automation-in-denmark>

## 4. Benchmarking Northern Ireland

This international small economy experience is instructive for Northern Ireland, as a small open economy. There are clearly differences between Northern Ireland and the comparator group of small advanced economies, most notably in terms of the differences in constitutional arrangements. But each other small economy has differences, and the insights come from the common themes in policy approaches and outcomes generated. Indeed, there are some important similarities between Northern Ireland and other small advanced economies in terms of their exposures and their underlying context.

For example, Northern Ireland's export sector accounts for a significant amount of GDP; exports of goods and services have been around 60% of GDP over the past several years, when exports to the rest of the UK are included. This export share is in line with the small economy average; and also with the export share of Scotland, which is in a similar constitutional position to Northern Ireland. This export sector is supported by inward FDI: about 25% of employment in Northern Ireland is estimated to come from firms owned outside Northern Ireland (about 10% from the rest of the UK, 2% from Ireland, and 11% from the rest of the world).

Northern Ireland has a range of important knowledge-based sectors, such as aerospace and transport, IT and software, medical devices, and so on. However, this part of the economy remains relatively small (although it is growing). Transforming the productivity performance of Northern Ireland – where it currently lags the UK average by a significant margin – will require growing these knowledge intensive externally-oriented sectors aggressively.

Northern Ireland also faces other exposures that are common across small advanced economies. For example, Northern Ireland's population change is sensitive to the relative strength of the economy. Northern Ireland seems to have a significant brain drain problem;<sup>24</sup> a common issue for small economies next to a richer adjacent market, particularly when they are English speaking. Exit of labour is easy to the rest of the UK, and to the Republic of Ireland, and the US is also an attractive location. As in New Zealand and elsewhere, these problems have become worse as a consequence of declining relative income levels in Northern Ireland compared to the Republic of Ireland and to the rest of the UK.

And on the other side, Northern Ireland has not been able to attract significant numbers of migrants – 95% of the population is either local (89%) or from the rest of the UK (4%) or Ireland (2%). This partly reflects the absence of well-paid career opportunities in Northern Ireland relative to other available locations.

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<sup>24</sup> <https://www.irishtimes.com/business/economy/brain-drain-in-northern-ireland-much-worse-than-in-the-republic-1.3794353>

So there are meaningful similarities between the respective contexts of Northern Ireland and other small advanced economies, which impact on skills and innovation policy. However, despite these similarities in context, in terms of policy focus and outcomes, there are some differences between Northern Ireland and the group of successful small advanced economies.

In terms of internationally comparable outcome measures, Northern Ireland is in the bottom half of the small economy rankings in terms of PISA scores (although slightly above Scotland); and has no universities that are ranked within the top 200 worldwide (Queens University is ranked from 201-250, and Ulster University from 601-800).

However, Northern Ireland's overall R&D spending ranks relatively well (1.9% of GDP in 2017), of which 1.3% comes from the business sector; a relatively high proportion. The business R&D spending has increased over the past decade, from 0.5% of GDP in 2005. This emphasis on business R&D spending is positive, and is a feature commonly seen in high-performing small economies. Overall, however, the skills, knowledge, and innovation intensity of the Northern Ireland economy is modest relative to the rest of the UK, and also to the small advanced economy group.

R&D spending and innovation activity is heavily concentrated in Northern Ireland: externally-owned firms account for 75% of business R&D spending (and much of the recent R&D growth has come from MNCs). It is positive that these MNCs are choosing to undertake this activity in Northern Ireland, but this does not necessarily translate into innovative capability in the Northern Ireland economy if it is contained within the boundaries of the firm. As with other small economies, large firms comprise the bulk of the business R&D spending (around two thirds), much of which is related to the manufacturing sector.

There is a need to upgrade skills and increase the intensity of research, innovation, skills, and so on. Northern Ireland can't build a competitive advantage on the basis of a lower cost structure. This is a point well-documented in many of the existing government strategy documents. Economy 2030 provides the basis of a coherent economic strategy, which includes a focus on skills and innovation; which includes goals of 'accelerating innovation and research' and 'enhancing education, skills and employability'.

The task ahead is to design and implement skills and innovation policy in a way that responds appropriately to the small economy context of Northern Ireland.

## 5. Concluding remarks

Small advanced economies are deeply exposed to the global dynamics described in Part I, which are impacting on skills and innovation policy and outcomes. But the characteristics of the small economy context have significant implications for the nature of the appropriate policy response. Simply following large economy examples or advice from multilateral institutions without responding to this small economy context is unlikely to improve productivity and labour market outcomes as much as can be the case. For example, there is likely limited upside if the supply of skills gets too far ahead of the demand of skills because of the higher risk of international exit in small economies.

And skills and innovation policy needs to be tightly integrated into an overall economic strategy in a small economy in order for it to deliver strong outcomes. For a start, multiple policies need to be integrated: education, labour markets, enterprise, FDI attraction, fiscal, and so on. Without all of these policy levers working together, the policy efforts are unlikely to be fully effective. Particularly in small economies, it is the 'strategic coherence' of the overall policy approach to unemployment that is critical to success, not simply well-designed policies in one specific domain.

Many of the issues facing skills and innovation policy in other small advanced economies are present in Northern Ireland. Northern Ireland needs to set policy in a way that takes seriously its small economy context: for example, the need to link the supply and demand for skills; to link skills and innovation into an overarching economic strategy with a clear focus on externally-oriented sectors; and to shape the incentives of individuals, firms, and sectors to support complementary investment into the appropriate specific skills.

Drawing on this analysis as well as a series of small economy case studies (presented in the Appendix), which provide some more specific policy examples on the ways in which high-performing small advanced economies design skills and innovation policy, the next Part draws out some implications for Northern Ireland on how to better integrate skills and innovation policy.

## III. Key small economy insights for Northern Ireland

### Introduction

This discussion pulls together the preceding analysis in order to draw out key insights from across the small advanced economy group on the strategic integration of skills and innovation policy – with a particular focus on those insights that are relevant for Northern Ireland. In the context of global dynamics with respect to skills and innovation (Part I), it will consider the general insights on the importance of integrating skills and innovation policy in a small economy context (Part II), as well as the lessons from the series of small economy case studies in terms of how small economies go about implementing this strategic integration (in the Appendix), in order to distil key insights for Northern Ireland.

This discussion will describe the important elements of high-performing skills and innovation systems across small advanced economies, and how these are effectively integrated. These ‘good practice’ insights are based on common elements that are observed in high-performing small economies; and that are less apparent in less well-performing small advanced economies. Because context matters a lot, there is no such thing as a single ‘best practice’ that can be replicated. But the key dimensions of good practice can be identified, which have insights into policy design in other contexts – including Northern Ireland.

The discussion is structured as follows. First, it identifies several key developments in skills and innovation policy in small advanced economies in response to a changing context – and the likely direction of travel looking forward. Second, it describes the key small economy themes in terms of the strategic integration of skills and innovation policy in the context of an overall national economic strategy. Third, it provides insights and perspectives on the specific questions on the integration of skills and innovation policy in Northern Ireland that were identified in the Terms of Reference. Finally, this Part closes with some concluding remarks. This discussion provides the basis for identifying specific recommendations for action that will follow in Part IV.

### 1. Key developments in skills and innovation policy

Around the world, small advanced economies are responding to a series of emerging challenges and opportunities, such as new technologies and intense global competition in advanced industries (as discussed in Part I). There are several key themes in terms of how small economies are responding in terms of skills and innovation policy, which reflect the specific characteristics of the small economy context discussed in Part II.

discussion starts by describing the specific 'good practice' themes with respect to skills and innovation policy approaches and developments from across the small advanced economy group, drawing on insights from the selected small economy case studies.

The first observation to make is that many of the small advanced economies have been moving quickly and with intensity on skills and innovation policy. Small economy governments are increasingly making skills and innovation policy a priority area, as is evident from the case studies. In significant measure, this is because of the acute exposure that small advanced economies have with respect to emerging global dynamics. The creativity and aggression of skills and innovation policy effort in small economies is more pronounced than in larger economies.

The following discussion identifies several features of good practice in small advanced economies with respect to skills and innovation policy, as well as some emerging developments and dynamics.

### *Skills policy*

Across the small advanced economy group, there is a commitment to upgrading the quality of the skills and education system. Most small advanced economies already perform relatively well, but the more demanding competitive environment is creating pressure to do more. More funding and policy attention is being placed on a wide range of dimensions of education and skills: the compulsory sector, vocational and technical training, the university sector, adult and ongoing learning, and so on.

There are numerous examples of small economies stepping up: see reviews of vocational education in numerous countries (New Zealand, Israel, Finland), multiple assessments of the implications of the future of work (Singapore, New Zealand, Finland, Denmark) with some initial policy responses being rolled out (Singapore), as well as additional investments being made in ongoing learning and active labour market policy.

Common themes in upgrading the skills and education system include strengthening the quality and quantity of the teaching population, and updating the general curriculum to reflect modern realities, in order to strengthen the skills profile of school and university leavers. The priority areas for upgrading are frequently informed by engagement with relevant stakeholders (such as employers) to better align the output of the educational system with the skills and competencies that are being demanded by enterprise. These skills are a combination of specific skills (e.g. in order to meet sector needs) as well as soft skills such as critical thinking.

Four common themes across skills policy in small advanced economies can be identified:

- Work-based and vocational education and training

Across several high-performing small advanced economy systems (such as Singapore), and across advanced economies more generally, there is an increasing focus on vocational education – rebalancing from a dominant focus on academic credentials such as a university degree. There is an explicit notion of ‘multiple pathways’, recognising that not everyone needs a degree to succeed in labour markets. There are efforts to raise the profile and status of vocational education, including stronger links and pathways to the tertiary sector.

Systems that provide a blend of work-based learning as well as theoretical content allow for greater responsiveness to changing industry demand, as well as ensuring that there is a broad base of human capital in the economy.

The Swiss professional and vocational education system is rightly held up as an exemplar of this, but many other economies are also increasing their investment in the vocational track. For example, Scotland, New Zealand, Denmark, Ireland, and others, are making efforts to upgrade their vocational education systems. This focus on work-based and vocational training sits well with the focus on alignment with industry demand. The Swiss, for example, note the responsiveness of their training system to variation in industry demand.

More broadly, there are policy efforts to encourage work-based learning: supporting firms to engage with workers on training and upgrading, often in the context of adopting new technology (Singapore, Denmark). There is a rebalancing away from focus on schools and universities as the primary vehicles for education. This often involves unions, employer groups, and others, as well – rather than simply being a relationship between a firm and an individual.

The international small economy experience also shows significant variation in how effective apprenticeship systems are. A focus on apprenticeship systems is commonly seen in high-performing systems; they work very well in economies like Switzerland. But these are embedded in the prevailing culture and norms, which supports the incentives on both the demand and supply side. Creating both the culture and financial incentives that are supportive of the supply and demand of vocational education remains an ongoing challenge in many small advanced economies.

- Ongoing learning

Small economy policy is working to support greater flexibility in acquiring skills, recognising that there is a greater pace of change in labour markets – and which will further intensify due to the disruptive effects of new technologies and business models as well as global competition. Governments, as well as other stakeholder such as unions, industry groups, and firms, are investing more in providing short-form, flexible courses for workers. One role for government is to integrate these ongoing learning platforms into active labour market policy, to support the retraining of workers who have been laid off.



Many governments and firms are already investing in this type of ongoing learning. But the priority is to create more structured platforms to make these ongoing learning opportunities broadly available across the population – including strengthening the incentives for participation.

Singapore is a good example of a small economy that is deliberately responding to some of the emerging issues around the pressures for ongoing learning, acting to ensure that workers are equipped with the right skills. For example, the Singapore government has recently established the SkillsFuture programme. A key element of this is the SkillsFuture Credit scheme, in which citizens aged 25 and older will receive \$500 a year to enrol in a wide range of courses to upgrade their skills. Other programmes include subsidies for workers and employers, when working adults switch careers. The aim is to ensure that workers have technical skills to get jobs and remain employable.

- Aligning education and skills system with stakeholder demand

The link to industry is increasingly important, ensuring that the skills are relevant. Stakeholder engagement is important, both at sector and firm level as well as at regional or local level in some circumstances. These skills will often need to be specialised, given the concentrated nature of small economy strengths. There is a risk of equipping people with overly general skills, or with the wrong sort of specialist skills.

This focus on specific skills to meet industry demand is not new. One of the interesting characteristics of small economies is the investment in specialist skills in areas of deep strength: for example, the maritime colleges in Denmark, and the agriculture colleges in New Zealand. And economies like Singapore are deliberately steering funding towards areas of emerging demand, such as STEM and digital.

Another key theme is responsiveness. It is difficult to predict what the future of work will be, so creating a system that is flexible and that creates incentives for upgrading skills, ongoing investment in innovation. Given the pace of change in technology, business models, and so on, there is a need for skills and education system to be adaptive and responsive. One of the common challenges across advanced economies is that business is often moving more quickly than the skills curriculum can be updated. Flexibility to respond to changing stakeholder demand also needs to be a key demand of the skills system in small advanced economies.

- Matching demand and supply of skills

One of the core themes in this work is the better matching of supply and demand with respect to skills, rebalancing away from a supply-heavy approach that emphasised heavy investment in skills. This emphasis on the demand side, and better engaging with industry, is a common theme across many small economies.

Employers increasingly report insufficient supply of skills even when unemployment rates are high. This indicates a failure of the skills system to be fully responsive to demand by employers. One response is to undertake better mapping of emerging demand for skills, which can be used to inform the focus and resourcing of the educational system. Countries like Ireland and Singapore are stepping up these skills mapping activities, developing structured skills strategies to provide a more robust basis for the investment of resources and the design of the system.

In addition, this information on current and prospective opportunities is often made public to better inform the educational choices that young people are making. Digital platforms are being increasingly used to communicate this information. Over time, the hope is that the demand and supply of skills should be better aligned. This alignment matters particularly in small economies where relatively small imbalances (in an absolute sense) between labour demand and supply can have a material impact.

### *Innovation policy*

Having a top-performing innovation system is a prerequisite for sustained strong economic performance; countries that do not perform well here tend not to do well overall. Innovation is a broad, expansive area of policy, with a wide range of specific policy approaches. Although there is not a best practice model, there are some elements of good practice that are common to high-performing small economies. Consider the following:

- sustained investment

R&D spending is an input measure, rather than an outcome in itself. But it contributes strongly to the outcomes that matter: small economies cannot become an innovation-intensive economy without investing. No low R&D spending economy has become a high productivity economy, perhaps with the partial exceptions of FDI-heavy Ireland and Singapore.

Over the past decade, there has been an increasing trajectory of R&D spending in the successful, innovative small advanced economies – whereas it tends to be flat in other small advanced economies. The implication is that investing in R&D (by government and also by firms) is important to support the transformation of the economy.

Of course, success in economic transformation is not just about increasing funding for R&D. There are several other characteristics that are important in innovation policy across small advanced economies, as described below.

- business-led

Government-funded R&D is an important base for innovation capability in small advanced economies (and all high-performing small advanced economies have substantial public R&D funding), but it needs to be supplemented by business-funded R&D that is focused on commercial application. Although publicly-funded R&D is important in providing a foundation and essential capabilities in research and innovation, innovation in the private sector is the ultimate driver of productivity growth.

The implication is that creating an environment that is supportive of business investment in R&D (and in innovation more broadly) matters. Note that the highest performing small advanced economies tend to have significant business shares of R&D spending (note Switzerland, Israel, and others). Over time, policy should be aiming to ‘crowd in’ private sector investment in innovation and R&D. This can take some time: for example, Singapore’s R&D spending still skews towards the public sector – with a gradual transition to a more innovation in the private sector.

- organised around strategic clusters

To generate strong returns on innovation, the experience of small advanced economies suggests that the investment needs to be made in the context of deep clusters. Innovation often requires the presence of deep capabilities: complementary skills and human capital, large firms, supporting specialist firms and professional services, as well as specific capital. In a small economy context, innovation often happens in and around existing areas of competitive advantage: consider Switzerland, Denmark, Finland, Singapore, and others.

In addition, government investment in R&D (as well as funding of research institutions) will be complementary to private investment in these areas (spillover of knowledge, and other external scale economies). To the extent that these are in the same or related areas of economic activity, the returns on the public and private investment are likely to be higher. These clusters are also a way to make the environment non-replicable, or ‘sticky’, which helps to attract and retain skilled people and innovative firms (Israel has done this well).

The implication is that the government should be deliberate about the types of research and innovation that it is directly funding. This analysis also has implications for the policy instruments that are used to encourage investment in R&D and innovation by firms. The tax system is commonly used to encourage R&D (e.g. tax credits for R&D), but this is an untargeted approach which is open to all firms that have offsetting tax liabilities. An alternative approach is to use direct grants/support, which can be focused more tightly on priority sectors and firms. Many small advanced economies will use a combination of both instruments.

- research universities

An important way in which governments can support innovation is through funding of research institutions, particularly universities. Strong research universities are important in small advanced economies for a few reasons: absorptive capacity for ideas and knowledge generated offshore, producing a pipeline of strong human capital, its research capabilities providing an anchor for clusters, attracting FDI, and so on.

It is instructive that high-performing small advanced economies have a disproportionate number of top-ranked research universities (for example, Sweden has 6 in the top 200, Switzerland has 7, and the Netherlands has 13). And many other small economies have at least 1-2 in the top 100. In a small economy context, this often requires deliberate choices on resource allocation. Note the difference, for example, between Singapore and New Zealand: Singapore has deliberately funded and set policy in a way to propel its universities towards the top of the rankings in a very short period of time. New Zealand, in contrast, operates an egalitarian system of funding – with funding following students – and only one university in the top 200.

- building an innovation ecosystem

In addition to funding R&D and innovation, small economy policy also ought to be directed at building a strong innovation ecosystem that supports the growth of innovative firms. As described in Part II, small advanced economies face particular challenges in terms of scaling up firms – these firms will frequently lack access to early stage risk capital and smaller firm may not have the management capabilities required to support firm growth. In addition, there is a tendency for high growth firms to relocate to larger markets as they grow (or to be sold to foreign firms) – which can diminish the extent of domestic value capture by small economies from the growth of these innovative firms.

To address these small economy issues, high-performing small advanced economy governments have developed an array of initiatives to support firm growth and to better capture economic value from this process. For example, enterprise policy that is focused on supporting high-growth firms, the support of capital markets (venture capital, national investment banks), accelerators and incubators, and so on. FDI can also play an important role in anchoring the innovation ecosystem.

One of the reasons for the success of the Israeli innovation ecosystem was strong commercial and capital markets capability – as well as research excellence. And in Singapore, there has been a recent focus on bringing in international VC funds together with experts with experience in scaling up innovative firms. Funding, and broader policy support matters, but the capability in the innovation ecosystem is a critical enabler of success.

An instructive experience for Northern Ireland is New Zealand, in which significant money and effort has been expended over many years to invest in supporting innovative firms, with relatively little upside in terms of innovation outcomes. Recognising this, there is now greater focus on attracting the right people into the New Zealand innovation ecosystem, with appropriate capabilities, and that have real experience in scaling up companies. The diagnosis was that there had not been a shortage of innovative ideas, but there was a lack of skill on the business and commercialisation side.

### **Overall perspectives on skills and innovation in small advanced economies**

Across the small advanced economy group, there is significant activity with respect to skills and innovation policy. From the international small economy experience described in the case studies (described in the Appendix), we can see the ways in which small economies are responding to the various challenges and opportunities due to the small economy context. Five specific small economy characteristics were identified in Part II, which shape their approach to skills and innovation policy.

#### *i. High skills requirement*

The high external share increases the requirement in terms of skills and innovation capability in order to be competitive. In response, we see *sustained investment in both skills and innovation across many small advanced economies* – the experiences and approaches of small economies like Finland, Singapore, and Switzerland, are particularly instructive. Characteristics include high levels of R&D spending, significant investment across the education and skills spectrum, as well as supportive immigration policy to bring in foreign talent.

Although skills and innovation policy are separable in theory, in practice those economies that perform well on one dimension also tend to perform well on the other (and vice versa). There are some exceptions such as Israel (weak on skills across the population) and New Zealand (relatively weak on innovation), but in general small economies invest heavily on both skills and innovation to sustain a position of competitive advantage.

#### *ii. Economic concentration*

Small economies tend to have a limited number of externally-oriented strengths, as they can only build critical mass in a few areas. One of the implications is that there is a requirement for skills and innovation capability that are specific to those areas. In response, small economy governments invest in specific skills (Denmark in maritime, New Zealand in agriculture, Singapore in a variety of strategic priority sectors). And there is commonly a strong cluster/sector focus in the way that skills and innovation policy is designed. These investments are also guided by industry, to ensure that the investments are responsive to changes in the competitive context. *There is a mixture of focus and agility in the focus of the investment in skills and innovation.*

### *iii. Knowledge absorption*

Small economies need to be adept at identifying and absorbing ideas and knowledge that is generated outside the domestic market. To do this, significant investment in skills and innovation is required to build relevant expertise and networks – it is not possible to simply free ride on investments made elsewhere, at least not on a sustained basis. In response, *investing in leading universities and research institutions* – as well as appropriate migration policies – are important policy instruments. Switzerland and Singapore are good examples of deliberate policy-making in this regard.

### *iv. International factor mobility*

Small advanced economies are heavily exposed to the exit of skilled people as well as high-growth firms. To respond to these forces of agglomeration, *small economies need to make complementary investments that make these mobile factors of production more productive in the small economy than elsewhere*. For economies like Denmark, Ireland, and Switzerland, this is about supporting deep clusters with high levels of investment and knowledge. These policy efforts make the small economy location stickier, and lean against the exit of people.

### *v. Weak incentives to invest*

The small domestic market reduces the incentive to invest in skills and innovation, and particularly when specific skills and innovation capability is required. *Small economy governments can support these investments by spreading the risk and also by providing financial incentives for these investments*. The active labour market policy and social insurance systems seen in Denmark and Finland support these investments.

## **2. Strategic integration of skills and innovation policy in small advanced economies**

A key distinctive characteristic of the approach of small advanced economies to skills and innovation policy is strategic integration. This is because of the need to address the specific challenges and opportunities associated with the small economy context, which were described in Part II of this document (and in the Box above). In contrast, discussions of skills policy and innovation policy in large economy governments tend to approach these as parallel policy issues, rather than as integrated.

This discussion above considered some of the ways in which small advanced economies are responding to the specific challenges and opportunities associated with the small economy context regarding skills and innovation. But to make real progress in the skills and innovation agenda, the international small economy experience suggests that deliberate strategic

integration is needed. Indeed, although there are some specific insights on elements of skills and innovation policy, the key insight from the international small economy experience is the importance of strategic integration.

It is not enough simply to make skills and innovation a priority, and to allocate more resources. In a small economy context, the specific characteristics of the small economy system need to be addressed in order to generate stronger outcomes on a sustained basis. The issues need to be addressed in a comprehensive, integrated manner because there are tensions between addressing each of the issues.

For small advanced economies, strategic integration is a powerful way to address the binding constraints associated with the incentives on investing in skills and innovation – as well as to increase the available returns from doing so. The economies that have more effective strategic integration tend to deliver better outcomes in terms of sustained productivity growth driven by skills and innovation. This will likely become even more important because of the emerging challenges to skills and innovation (disruptive technology, global competition) which will require an integrated approach.

This discussion considers the key ways in which skills and innovation policies are integrated together in the context of an overall economic policy agenda. It then identifies three archetypes of strategic integration in small advanced economies; some small economies are more purposeful in their strategic integration than others, and performance seems to vary with the extent of strategic integration.

### *Elements of strategic integration of skills and innovation policy*

Three elements of effective strategic integration of skills and innovation policy can be identified from the international small economy experience: a central role for skills and innovation in the overall economic strategy; a whole of government approach to skills and innovation policy; and strategic integration through priority clusters.

- Central role for skills and innovation in overall economic strategy

First, there is a clear statement or understanding of the role that skills and innovation plays in the overall competitive positioning of the economy – accompanied by a clear sense of the resourcing and policy implications that follow from this. Skills and innovation policy are increasingly central to overall economic strategy in high-performing small advanced economies, and a key part of the desired competitive positioning in the global economy. Examples of this include:

- Singapore and Ireland have used sustained investment in skills and innovation as a central part of attracting FDI, and moving into increasingly advanced activities. And there is ongoing upgrading of skills and innovation.

- Finland and Israel have transformed themselves into knowledge-intensive economies over the past few decades through sustained investments and policy support with respect to research and innovation.
- Denmark is in the process of upgrading its skills and innovation capability at the moment because of a concern that it is falling behind in the adoption of new technologies.

In contrast, small advanced economies that have not treated skills and innovation as an important policy priority have not transformed their economies in the same way. New Zealand and Scotland are examples; aspects of their skills and innovation system are strong, but there has been not been a coherent, sustained priority placed on world-class skills and innovation.

This variation in the commitment to skills and innovation is reflected in variation in the knowledge intensity of the export profiles of these economies. The increased investment in human capital and innovation from the mid-late 1990s in many small advanced economies supported a transition into increasingly knowledge intensive export categories – and which supported stronger export growth.

Indeed, the performance in terms of skills and innovation, and the quality of the supporting policies, are central to the economic success of small advanced economies. Outside of resource-rich small economies – such as the GCC states and Norway – economies do not get rich on the back of natural resources, but on the basis of knowledge and innovation.

One of the core elements of skills and innovation policy in small advanced economies is that they are mutually consistent and reinforcing. This is not because they are joint skills and innovation policy strategies, but because there is an overarching economic strategy that provides guidance and direction to the respective policy approaches.

This strategic integration – or coherence – is a distinctive part of small economy economic strategy, and is often designed to build strength and critical mass in key areas of the economy. Strategic coherence is much more important for small advanced economies than for larger economies; and also more feasible in a small economy context than in a larger, more complex jurisdiction.

As noted in Part II, the strong performance of small advanced economies over the past few decades is less due to policy specifics than to an ability to position economies effectively in response to the challenges and opportunities of globalisation. The successful small economies are those that have a clear sense of their specific competitive advantage, and invest deliberately behind it.

- Whole of government approach to skills and innovation policy



Second, the effective strategic integration of skills and innovation policy needs a broader policy focus than skills and innovation policy, narrowly defined. An integrated, ‘whole of government’ policy approach to skills and innovation is needed to generate strong outcomes in a small economy context. Pushing on one element of skills and innovation policy without addressing the broader small economy strategic policy environment may not lead to better outcomes: for example, investing in additional training opportunities without addressing the incentives that may constrain investment by workers.

High-performing skills and innovation systems have a deliberate, structured focus on aligning policies to generate the desired outcomes, particularly with respect to skills policy. For example, deliberate use of social insurance, labour market policy, immigration, and so on. Consider the contribution of the following policy areas:

- Labour market policy

Flexibility and security are key themes in labour market policy in small advanced economies. Labour markets need to be flexible and efficient in order to absorb new entrants into the workforce: for example, flexible provisions around hiring and firing (in order not to deter hiring), and with a minimum wage set appropriately. But security also needs to be provided to workers, in order to encourage investment in skills – particularly specific skills. For example, active labour market policy, where training and upgrading opportunities are provided to people that are displaced from their jobs to support their re-entry into new parts of the labour market. Denmark provides a good example.

- Social insurance

Another policy dimension that can shape the incentives for investment in human capital in small economies is the nature of the social insurance system (such as unemployment insurance, the nature of the public health system, and so on). Investing in specific skills in small open economies has a relatively high risk profile, and social insurance can support incentives to make risky investments in these contexts by buffering against financial risk.

- Migration

Many small advanced economies (such as Ireland, New Zealand, and Singapore) have had strong inflows of migrants, which have provided a valuable boost to the skills profile of the domestic population. Migration policy has often been designed to target people with specific skills, particularly in priority areas and in areas with skills shortages. This can also support investment in innovation, where skilled migrants have complementary skills and capabilities that strengthen the return on these investments.

However, care needs to be taken not to become overly reliant on foreign skills – particularly where this creates an incentive for employers to ‘buy in’ foreign skills rather than to train and develop the domestic workforce. Similarly, strong inflows of migrants can lead to lower wages (due to increased supply) which may depress the incentive to invest in human capital as well as physical capital.

Overall, the combination of labour market flexibility and active labour market policy, well-designed social insurance, and migration policy, has supported broad-based investment in skills and innovation capability in small advanced economies – and contributed to the strong outcomes.

Because a broad range of policy domains are involved, the substantive focus needs to be supported by institutional structure: clear senior leadership, with accountability. Policy coordination mechanisms matter for effective implementation. In economies like Ireland and Singapore, there are well-developed coordination and accountability mechanisms to ensure that a broad range of policies are aligned behind the skills and innovation agenda.

- Strategic integration through priority clusters

Third, a common small economy approach to the strategic integration of skills and innovation policy is to organise the policy focus through strategic priority sectors or clusters that are seen to be the growth engines of the economy. These priority sectors and clusters serve as the focal points for an integrated approach to skills and innovation.

In several cases, these priority sectors or clusters will be explicitly identified (Ireland, Singapore). In other cases, they are more implicit – this will often be the case in small economies that have long-established industrial economies, and where the key clusters have been developed and are self-sustaining (Switzerland, Denmark). Because the investments are complementary, small economies need to focus their efforts in a limited number of economic areas. Without these strategic priority areas, the international small economy experience suggests that it is more difficult to sustain high levels of investment in skills and innovation.

This cluster focus is a key insight coming out of the experience of high-performing small advanced economies (including in the case study work). This strategic focus is less evident in large economies (or in the international literature, e.g. by the OECD). For example, in the OECD skills strategy work, there is no direct link made explicitly between skills strategy and the broader economic strategy. The alignment between the demand and supply of skills that is emphasised is more operational than strategic.

### ***Archetypes of cluster-based strategic integration in small advanced economies***

The way in which strategic integration is generated is through being very clear on overall positioning. This can be provided through a high quality, published (or explicit) economic strategy, such as in Ireland or Singapore. However, in many small economies there is not a published economic strategy, just an underlying coherence with respect to policy focus (such as Switzerland or Finland).<sup>25</sup> Different countries do this in different ways; but there does seem to be a relationship between the sharpness or clarity of the positioning and the extent to which the economic agenda works.

My assessment is that the small advanced economies that have a coherent economic strategy that informs the shape of the skills and innovation strategies tend to have superior policy settings, and to be better positioned for emerging challenges and opportunities such as the impact of disruptive technologies.

The small advanced economy case studies provide the basis to make an assessment of the extent and quality of the strategic coherence of their skills and innovation strategy. Three distinct archetypes of strategic integration in small advanced economies can be identified.

#### ***Explicit economic strategies, strong cluster focus***

Singapore and Ireland have very deliberate, top-down approaches to economic strategy, organised around a clear sense of their overall value proposition as well as a clear, explicit sense of the target sectors and clusters. This is based around a strategy of attracting FDI, which requires a high level of focus – which firms and sectors policy is targeting, and the creation of a supporting environment that is attractive to these firms, including skills and innovation.

#### ***Informal economic strategies, with implicit government support of key clusters***

Switzerland also has a coherent, integrated approach, but this is bottom-up – with strong ownership and involvement by the private sector, with strong government policy support. Denmark and Finland also prioritise skills and innovation in their economic strategy, and there is some coherence around this even in the absence of a stand-alone economic strategy statement. In these economies, the skills and innovation approach is de facto arranged around existing strengths in the economy (such as IT, maritime, pharma, and so on).

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<sup>25</sup> Note that the existence of an explicit published strategy does not guarantee good outcomes. Numerous aspirational statements have been published by small economies in the Middle East – including target sectors and a focus on knowledge and innovation – that have not delivered. The integration needs to be grounded in economic reality and domestic capabilities.

This more ‘bottom-up’ approach to strategic integration is more appropriate in more ‘mature’ economies, where there are well-established clusters that can be supported. In such an environment, government support and resourcing is likely to flow to the key sectors without deliberate policy shaping.

Israel has a strong approach to innovation: it has a clear sense of where its external economic strengths are, and the government invests behind this. However, this is not integrated into a broader economic strategy – and skills policy lags. And the strategic focus applies to only one (high tech) cluster of the economy.

#### *Weak/limited economic strategies, limited integration*

New Zealand and Scotland are similar in the absence of a strategic approach. In Scotland’s case, this is partly due to Scotland’s historical absence of devolved powers. This is beginning to shift now, but it is early days. And although New Zealand looks integrated in some ways (e.g. an integrated tertiary education strategy and coordination across the relevant policy agencies), this is a bottom-up approach – that deliberately does not try to shape the overall policy approach to skills and innovation. New Zealand’s reluctance to make strategic choices constrains the integration of skills and innovation policy – and also outcomes in the skills and innovation space.

### **3. Small economy insights into specific questions for Northern Ireland**

The Terms of Reference identified several specific questions to be addressed. Drawing on the international small economy experience, this section provides insights and perspectives on these specific policy questions and issues.

*Is ‘government-facilitated clustering’ (either on a regional or sectoral basis) a necessary/recommended feature of effective strategic collaboration on skills and innovation policy?*

The small advanced economy experience shows that identifying target clusters is central to the process of the strategic integration of skills and innovation policy. Clusters are important because they better allow for value to be captured, as backward and forward linkages develop (supply chains, specialist capability, and so on), allowing for external scale economies, with knowledge diffusion.

In the context of skills and innovation policy, clusters matter because the returns to investing in skills and innovation will be higher when they are coordinated because they are complementary investments; the productivity of skilled labour is higher when there are firms, physical capital, and other capabilities. And the returns to innovation are higher when there is a deep pool of labour with the appropriate skills. It is the context of these clusters in which such attributes are likely.

But in a small economy context, such clusters can only be developed in a few parts of the economy – because there are limited resources. The risk with a broad-based approach is that policy supports clusters without the necessary critical mass and in which economic activity is too thinly spread.

In small economies, this clustering provides a useful platform for coordination of policy. Specific examples of this include Singapore’s Committee for the Future Economy and Economic Strategies Committee processes, together with supporting policy document (Smart Nation), that provide priority areas for government policy. Similarly, Ireland has a clear focus on priority sectors for supporting skills and innovation (as specified in the Enterprise Plan 2025).

Note also that the second archetype of strategic interaction that was described above (a more implicit or informal approach to strategic interaction) also allows for a clustering approach. In highly-developed economies like Denmark and Switzerland, this approach also works effectively. For example, Switzerland and Denmark have developed specialist skills capabilities around their core areas of competitive strength (university courses, apprenticeships, and vocational education, as well as research funding).

In contrast, small economies that do not pursue a clustering approach (such as New Zealand) have a weaker record in terms of the effective strategic integration of skills and innovation policy. The implication of this international small economy experience is that clustering is a recommended feature of effective strategic collaboration on skills and innovation policy. It is more difficult to achieve meaningful alignment of policy instruments without a priority cluster focus.

Given the current position of Northern Ireland, deliberate government action to deliberately develop and support clusters is likely to be important in terms of delivering an effective integration of skills and innovation policy.

The importance of clustering to support the integration of skills and innovation policy is much more prevalent in small economies than in large economies. In large economies, the integration of skills and innovation policy can occur through decentralised decision-making as firms and individuals respond to incentives – and governments can support these decisions in a relatively informal way.

However, although a focus on strategic clusters is common in high-performing small economies, this is not necessarily government facilitated. In some cases (Switzerland, the Netherlands), the government’s role is to follow rather than to develop – with the private sector taking the dominant lead role. This is particularly the case in more ‘mature’ or established small economies, where the clusters have developed over many decades and more; this has provided time for the supporting ecosystem also to develop.

Note also Israel, where the government was not deliberately involved in establishing the clusters that comprise the 'start up nation'. There was an element of luck in the establishment and success of this cluster. And although the government has provided important support for the 'start up nation' cluster, it remains heavily private sector led.

So successful clustering is not always 'government-facilitated'. Although the government has an important role, firms also need to be thinking about how they develop skills in the workplace and invest in innovation. And other stakeholders (unions, research institutions, and so on) also need to commit to a knowledge intensive approach, and make sustained investments. However, in the context of Northern Ireland's current situation, a strong role for the government is likely to be necessary.

*Would a regional, sectoral or hybrid approach be best suited to Northern Ireland and who should be included?*

The regional distribution of skills and innovation is a consideration in small economies, and several small economies have strategies with a focus on secondary cities and regions. For example, Ireland has local enterprise offices to support local firms; and the IDA has had a focus on attracting FDI into regions. Several of the Nordics have decentralised systems, in which municipalities have significant operational responsibilities. And New Zealand has recently established a Provincial Growth Fund, with an objective to support economic development in regional New Zealand.

However, this regional focus tends not be at the same level of strategic priority as the sector or cluster-based approach. There are many motivations for regional policy, which attempts to ensure that the economy does not become too regionally unbalanced. But the reality is that the main city in small advanced economies tends to be dominant; often around a third of the national population, and more (~40%) of GDP.<sup>26</sup> Agglomeration – and the economic contribution of the large city – seems particularly pronounced in small advanced economies.

And for many small advanced economies, the relevant clusters will be in the main city. Of course, there are some exceptions: notably where key clusters are related to sectors such as agriculture, energy, or tourism (New Zealand, Norway, and so on). There will likely be specific local needs with respect to skills and innovation policy for which region-specific responses may be appropriate (e.g. local tourism, agriculture).

However, the risk with regional diversification in a small economy (particularly the size of Northern Ireland) is that the cluster does not fully develop. With a small population size, the risk is that unduly regional policy generates sub-scale fragmentation and complexity (something often pointed to in the Nordics).

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<sup>26</sup> Landfall Strategy Group, 'Agglomeration and cities in small economies', Insight, 4 June 2018.

In sum, the approach should provide a measure of flexibility to local institutions to design appropriate skills policies; but the sectoral perspective should be the primary driver. Ireland is a good example of deliberate regional policy, but within the overall context of a well-articulated cluster-based approach.

### *How can SME interests be effectively and fairly represented in clusters?*

There are particular challenges in the design of skills and innovation policies for SMEs, particularly in a small economy context. As discussed in Part II, one of the characteristics of small economies is that the incentives, incentives, capabilities, and balance sheets, of small and medium-sized firms may not be sufficient to support investment in skills and innovation – such as apprenticeships or other work-based training, or to invest in research and development.

In addition, the international evidence is clear that SMEs are less likely to export, to invest, and to undertake innovation, than larger firms – and tend to be less productive.<sup>27</sup> Most SMEs do not grow substantially much beyond their establishment size. So the risk with a policy strategy that is heavily focused on SMEs is that it may be under-powered in terms of skills and innovation outcomes.

Indeed, the small economy experience is that large firms (MNCs) play a disproportionately important role in driving innovation, internationalisation, and productivity.<sup>28</sup> These large firms have resources and capabilities that smaller firms do not have. It is important that the clusters are supported by large firms, which can anchor the activity in the cluster – and also support skills and innovation by training people, funding innovation, seeding start-ups, and absorbing knowledge from overseas.

That said, it is not appropriate to focus policy exclusively on large firms: SMEs also make an important contribution to clusters, even if they are not the primary engines of growth. Smaller firms and high growth start-ups can also add significant value, including to the supply chains. There are strong synergies between small and large firms; they play different roles in the cluster (note the experience of Switzerland and the Nordics). And it is important that policy-makers understand the constraints on the growth of these smaller firms.

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27 For references on the dynamics of firm growth: Calvino, F., C. Criscuolo and C. Menon (2016), "No Country for Young Firms?: Start-up Dynamics and National Policies", OECD Science, Technology and Industry Policy Papers, No. 29, OECD; Criscuolo, C., P. N. Gal and C. Menon (2014), 'The Dynamics of Employment Growth: New Evidence from 18 Countries', OECD Science, Technology and Industry Policy Papers, No. 14, OECD; Haltiwanger John, Ron S. Jarmin, and Javier Miranda, 'Who Creates Jobs? Small vs. Large vs. Young', NBER Working Papers 16300, 2010

28 Landfall Strategy Group, 'The importance of (firm) scale: Large firms in small advanced economies', Analysis, November 2018.

In many small advanced economies, there is increased focus on supporting SMEs – and ensuring that they are well integrated into the overall cluster. For example, in Singapore and Ireland, there are policy efforts to address the relatively limited interaction between domestic and foreign firms (due to the stunted nature of local supply chains). Integrating SMEs into these supply chains will likely allow for more domestic value capture from the activities of MNCs in the priority clusters.

There is also growing focus on updating enterprise policy, which is shifting towards supporting high growth firms, through instruments such as capability building, access to advice and networks, and so on. The idea is to focus policy support on those limited number of SMEs that have the potential to grow strongly (for example, the ‘Focus 700’ programme of New Zealand Trade & Enterprise).

And many small economies are creating accelerators, incubators, deepening VC markets, and so on, to strengthen the R&D and innovation intensity in smaller firms. There are good recent examples of these activities in the Netherlands, Singapore, and the Netherlands. However, this should be kept in proportion: much of the innovation still happens in larger firms.

Although small economy economic strategy statements commonly reference SMEs, and smaller firms and start-ups are an important part of the innovation eco-system, policy-makers need to be realistic in terms of the overall impact of this part of the economy. An SME-heavy innovation strategy may be under-powered in terms of the materiality of the effect on GDP; for there to be a large impact, there needs to be a large number of innovative SMEs expanding rapidly into global markets. Israel is possibly the only small advanced economy example of this working at scale. For many other small advanced economies, it is a combination of working with large firms and with high growth potential smaller firms (which will account for only a small proportion of the overall SME population).

An indiscriminating focus on SMEs runs the risk of significant resource allocation without much improvement in the innovation outcomes. It is important to be clear about the transmission mechanism between supporting R&D and innovation and achieving the outcomes – and this often revolves around clusters of medium and large sized innovative firms (local and foreign) and fast growth smaller firms.

*Should clustering initiatives focus only on predetermined ‘priority’ sectors – for example those set out in Economy2030?*



The core economic policy focus in most successful small advanced economies is to strengthen performance in externally-oriented sectors. These are the areas in the economy in which sustained productivity growth is most likely to come, and building dense clusters in these areas is important. Small economies that have explicit statements of economic strategy (such as Singapore and Ireland) have such externally-oriented sectors as their priority sectors. These sectors receive disproportionate policy and resourcing support.

In Northern Ireland, the sectors selected in Economy 2030 seem sensible – they are externally oriented, and are clusters where Northern Ireland has a position on which to build.

However, this small economy priority sector focus is best seen as disproportionate rather than exclusive. Although priority sectors generate a disproportionate share of productivity, innovation, and so on, a meaningful share of national employment will be in ‘non-priority’ sectors or clusters. Given the material shares of the labour force and of GDP that are accounted for in domestically-oriented sectors, governments frequently take a broader focus in terms of skills and innovation policy. It is important that there is a broad base of skills and innovation capability throughout the economy, particularly given the intensity of the challenges that seem likely to emerge.

Consider, for example, the recommendations from Singapore’s Committee for the Future Economy, which had a focus on 23 specific sectors, organised into six clusters. For each of these sectors and clusters, detailed plans were prepared in terms of the priorities for raising productivity in these sectors – many of which related to skills and innovation. These sectors spanned the economy, including domestic sectors such as construction and retail (low productivity, domestic sectors that are material parts of the economy).

But from the perspective of sustained productivity growth, it is the few areas of the economy that are externally-oriented that need to be the priority. Acting to strengthen productivity performance in domestic sectors like construction or retail is a good thing to do, but there are limits on the upside – and in the case of most advanced economies (including Northern Ireland), it will not be sufficient to generate above trend productivity growth.

Innovation policy in particular should be focused on the priority sectors; skills policy should have a broader focus, but with a disproportionate focus on priority sectors.

There are also trade-offs that should be recognised when determining the extent of policy focus that is appropriate with respect to strategic priority clusters. Although focus is required to develop the necessary critical mass in key parts of small advanced economies, this can also increase the risk exposure of small advanced economies. If a sector-specific shock hits (on the demand or the supply side) this can have a material economic impact: note the example of Nokia in Finland. A balance needs to be struck between focus to build deep competitive advantage and the risk exposure that this focus generates. But an overly diversified approach

may be risky as well, raising the risk that the small economy does not develop positions of competitive advantage in its economy.

*Are there examples of how this approach has worked effectively to bolster the link between skills and innovation? If so, how has success been measured and how long after set up does it take for benefits to be realised?*

- Where has this worked effectively?

This approach of strategic integration between skills and innovation policy has worked well in many small advanced economies. The three archetypes of strategic integration described above provide a useful structure for describing this. There is evidence of the effective strategic integration of skills and innovation policy in archetype 1 and 2 small economies, with strong outcomes as a consequence. In contrast, archetype 3 small economies, which have much more limited strategic interaction, have generated weaker economic outcomes.

The archetype 1 small economies, such as Ireland and Singapore, have combination of strong human capital (local and foreign), together with a commitment to build innovative strength, has made these locations attractive for investment.

In archetype 2 small economies, with more implicit or informal strategic interaction, there is complementary investment in skills and innovation in the context of deep clusters. For example, Denmark has specialist skills developed in sectors such as maritime, renewable energy, pharma – as well as being a locus of innovation in these sectors. Similarly, Switzerland has very strong human capital and innovation capability in sectors such as advanced manufacturing, pharmaceuticals, and finance.

Conversely, in small advanced economies where there has not been such strategic integration (such as New Zealand), there is less evidence on deep clusters emerging and of strong outcomes being generated.

- On the timing between policy action and capturing of tangible economic benefits

The variation in the quality of the strategy and its implementation across small economies means that it is hard to be precise regarding the magnitude and timing of the causal impact. And of course, there are a range of other factors that impact on outcomes in addition to the strategic interaction of skills and innovation policy. However, some qualitative observations can be made.

It is useful to distinguish between different types of approach. First, instances where there have been transformational episodes, in which small economies have explicitly developed major new policy agendas around skills and innovation (with a sectoral focus), often aimed at attracting foreign capital. Ireland and Singapore provide good examples of this; the benefits can be clearly seen in terms of the export profile and the attraction of new firms and the growth of clusters through FDI inflows in relatively short order.

However, in terms of the link with strengthening domestic capability, it is harder to see transformational change. For example, the Global Innovation Index efficiency measure is very low for Singapore, suggesting that there are lags from the investment in skills and innovation – it takes a while for these investments to build domestic capability. And Ireland is still working to integrate the activities of MNCs with other parts of the domestic economy.

Second, the experiences of more mature small economies in which the process of integrating skills and innovation policy with a broader economic strategy has been a more incremental process (for example, the Nordics). Even in these economies though, the increase in R&D spending in several small advanced economies from the mid-1990s showed up quickly in the export profile of these small economies.

This integration process is best seen as an ongoing, long-term process – rather than a specific policy event or decision, after which outcomes improve. Finland is a good example, where the strategic focus on skills and innovation from the early 1990s translated into a transformed economy over the course of a decade or so. This is not something that will likely be transformational in a matter of a few years. The investment in innovation and skills yields stronger returns when building on existing strengths and capabilities.

#### *What structural arrangements would be required to deliver effective strategic collaboration on skills and innovation policy?*

There are a wide range of institutional arrangements across small advanced economies, with no specific ‘best practice’ model that is consistently associated with good outcomes. Some governments decentralise significant decision-making responsibilities to regions, others are heavily centralised and coordinated. And as noted, some rely more heavily on the private sector to drive the skills and innovation agenda, with the government playing more of a supporting role (e.g. Switzerland).

But despite these differences in models, there are several aspects of good practice that are instructive for Northern Ireland as it develops its policy approach. There is a need for a whole of government institutional approach in both the diagnostic and design phases, as well as in terms of implementation and monitoring. Senior leadership on these initiatives with appropriate accountability is critical to an ambitious agenda.

There are several elements of good institutional design:

- Policy leadership and coordination

Given the range of policy domains surrounding the skills and innovation agenda, it is difficult to have a single agency with all of the relevant policy levers. But for a small economy that is looking to implement a whole of government approach to a policy area, there needs to be some deliberate coordination and prioritisation to ensure that the policies are effective.

It is important to have alignment behind an economic strategy, with strong leadership from central agencies (or the lead economic agency). Singapore is a very good example of this, with strong alignment across relevant Ministers and agencies in terms of the objectives and policy direction. For example, the Committee for the Future Economy structure was intensively led by senior Ministers that were responsible for the key portfolios (including skills and innovation).

The Committee had a clear mandate, access to the appropriate decision-making levers, and the right capability. This has now transitioned into a new organisational structure, but with many of the same attributes. The formal governance and accountability matters, but even more important is the culture or norms; a shared understanding of what matters and what you are trying to do.

Another good small economy example is Ireland's Action Plan for Jobs (and the related Enterprise Plan), developed after the global financial crisis to focus policy effort on reducing unemployment. This involved all of the key Ministers and agencies, and was also able to respond to changing circumstances with regular updates.

It is also possible to deliver similar outcomes in a more informal way, with teams of Ministers and agencies that are working together outside of a formal structure, as long as there is a clear direction with appropriate decision-making rights and monitoring of outcomes.

- Role for the private sector, and other stakeholders

There is a need to ensure that there is an active, ongoing role for non-government parties, with a degree of institutional structure around this engagement. In some jurisdictions, formal tripartite arrangements are an important aspect of this stakeholder engagement (Nordics, Singapore, Ireland to an extent). In other cases, structured engagement with industry groups and others is important.

There are also good examples of more episodic engagement on emerging demands on the skills and innovation system. Denmark's Production Council and the Disruption Council are good examples of this, as is the way in which the New Zealand Productivity Commission is engaging with relevant stakeholders on the future of work.

- Focus on outcomes and accountability

It is important to have a clear, explicit view on the outcomes that the strategy is trying to achieve, and to report against these goals on a regular basis (even if some of the objectives are long-term in nature). In addition to transparency, there should be meaningful accountability on Ministers and agencies (and other stakeholders as appropriate) for progress towards the objectives.

Ireland's Action Plan for Jobs is often cited as a good example of institutions structured around skills policy, anchored in a broader economic strategy. This was a very successful exercise, but this was delivered in a crisis and with a very explicit focus on employment. The subsequent institutional design is perhaps more instructive, as it has moved into Future Jobs Ireland – as well as the Enterprise Plan.

#### **4. Concluding remarks**

The domestic and international context in which Northern Ireland is operating is changing in a structural sense, and these changes will place many new demands on the skills and innovation system in Northern Ireland – as is the case for small advanced economies around the world. This section has identified a series of strategic policy implications for Northern Ireland, drawing from the international small economy experience.

In particular, skills and innovation policy is central to the task of building competitive strengths in externally-oriented sectors in Northern Ireland's economy. This is the basis on which Northern Ireland needs to compete. The international small economy experience also offers an encouraging message for Northern Ireland. Small advanced economies from Estonia and Israel to Finland and Singapore have used a sustained focus on skills and innovation to transform their economies, and to generate strong rates of GDP growth.

Northern Ireland has made a good start, in terms of Economy 2030 and other related strategy documents. However, given the scale of the challenge, more is required.

There are some constraints due to the limits on devolved powers. For example, it is challenging to implement a fully whole of government approach, as described in this discussion, given that areas like migration, social insurance, and aspects of skills and innovation policy, are reserved to London. But progress can be made within the context of the policy levers that the government has available.

The next Part of the document will provide more detailed descriptions of these priority areas together with specific recommendations for Northern Ireland.

## IV. Specific implications and recommendations for Northern Ireland

### Introduction

This closing section will combine the international small economy analysis with the specific Northern Ireland context to identify a series of priority areas for the strategic integration of skills and innovation policy, and make recommendations for action. This section also incorporates the insights from engagement with government officials and other stakeholders in Northern Ireland.

This discussion will identify specific aspects of small economy skills policy and innovation policy that are relevant and valuable for Northern Ireland, together with a perspective on how best to integrate skills and innovation policy together in a coherent way in the Northern Ireland context. This discussion will be framed with a view to contributing to the preparation of the new skills strategy in 2020, as well as any future updates to other economic strategy documents (such as Economy 2030).

This discussion is structured as follows. It commences with an overall assessment of the current skills and innovation policy approach, with some suggestions for ways in which this can be strengthened. The second section then considers the specific priorities for improvements in skills policy and in innovation policy, including some thoughts on prioritisation and sequencing. The third section then turns to options for strengthening the strategic integration of skills policy and of innovation policy. The final section offers some concluding remarks.

### 1. Assessment of Northern Ireland's strategic direction

This section draws on the small economy insights summarised in Part III to provide an assessment of Northern Ireland's approach to the strategic integration of skills and innovation policy. This assessment focuses on documents such as Economy 2030, the Draft Programme for Government Framework 2016-2021, the Innovation Strategy, the existing skills strategy ('Success through Skills – Transforming Futures'), and various other strategy documents (such as the Further Education strategy).

As discussed in Part II, there is a need for stronger economic outcomes in Northern Ireland – which currently lag the rest of the UK and other small advanced economies. Skills and innovation will be central to this. Northern Ireland's skills and innovation outcomes are relatively modest, compared to other small advanced economies and relative to the rest of the UK. Although there have been some positive developments in terms of skills and innovation, much more will need to be done to transform the Northern Ireland economy. As with other small advanced economies, Northern Ireland's competitive advantage will need to be built on developing strong growth sectors through investing in skills and innovation.

### *Current policy statements*

This discussion provides an initial assessment of the existing strategy documents that relate to skills and innovation, and the extent to which these are integrated. I make three observations.

First, recent documents such as the Innovation Strategy and the Economy 2030 document are consistent in their direction and feel. The innovative capability of the Northern Ireland economy is stated to be the foundation of its ability to achieve the target outcomes that it has specified. Skills and innovation policy are listed in the five policy priority themes in Economy 2030. Similarly, the Innovation Strategy is clear that the objective for innovation policy is improved economic outcomes.

Economy 2030 has an appropriate emphasis on the importance of strategic coherence across a wide range of policy domains to deliver improved economic performance. The five policy themes in the Framework for Growth are well-chosen and integrated. And the issues identified in the various skills strategies identify many of the issues that are on the agenda across high-performing small advanced economies; the importance of vocational and ongoing education, the disruptive effects of technology, and so on.

Second, Economy 2030 and the Innovation Strategy are aligned in terms of the importance of focus on strategic priority clusters in order for the various policy initiatives to generate strong returns. The international small economy experience is clear that disproportionate focus on priority sectors is central to strategic integration of skills and innovation policy, and to delivering strong economic outcomes.

The Innovation Strategy draws on ‘smart specialisation’ thinking to identify five priority sectors: agrifood tech; sustainable energy; ICT; advanced manufacturing and materials; and life and health sciences. This is a similar list to that presented in Economy 2030, which identifies six clusters: Financial, Business and Professional Services; Digital and Creative Technologies; Advanced Manufacturing, Materials, and Engineering; Life and Health Sciences; Agrifood; and Construction and Materials Handling. Although there is considerable overlap, these target sectors are not fully aligned – and further work will be required in this regard, a topic picked up in the discussion below.

The willingness to explicitly identify priority areas provides a good foundation for the integration of skills and innovation policy. This willingness to focus manages the risk that skills and innovation investment is too thinly spread in small economies, not getting to a position of critical mass in which competitive advantage can be developed. This deliberate, focused action is particularly important given Northern Ireland’s starting point.

Third, the increasing focus on benchmarking policy and outcomes against other small advanced economies, particularly evident in Economy 2030, is a positive – increasing the likelihood that the design of skills policy and innovation policy will be appropriate for the small economy context, rather than simply adapted from the large economy context of the broader UK or other large economy perspectives.

### *Priorities for action*

Overall, this assessment suggests that Northern Ireland is moving in the right direction and has made some appropriate strategic choices with respect to policy focus. The current policy posture articulated in these various economic statements is consistent with good practice from across the small advanced economy experience. And given the amount of time and resource that has gone into developing these documents, there is little value in re-inventing the wheel in terms of fundamentally revising the strategic direction for skills and innovation policy.

However, drawing on the international small economy experience, there are some areas in which strengthening of the approach to skills and innovation policy should be considered. I identify three areas in particular.

First, the aspirations specified in the various economic, skills, and innovation strategy documents are a good start – but the scale and intensity of the challenges ahead merits a stronger policy response, of the type that is observed in high performing small advanced economies.

As with other small advanced economies, Northern Ireland is deeply exposed to global economic dynamics, as are other small advanced economies, with exports and FDI as meaningful shares of its economy. And yet Northern Ireland is currently more like New Zealand and Scotland than Ireland or Finland in its approach to skills and innovation policy.

For Northern Ireland to transform its economy, a greater commitment to skills and innovation is needed. In a structural sense, the episodes of transformational change are instructive: consider small economies like Finland from the early 1990s, as well as the rapid development processes of Ireland and Singapore. A sustained, heavy commitment to investment in skills and innovation was evident in all of these economies. The acid test for seriousness of strategic purpose is reflected in committed resource allocation: some more explicit targets should be specified for government resourcing of skills and innovation.

And recent observations across the leading small advanced economies provides a sense of the step up that is required in order to respond to the changes that are coming to the future of work, intense global competition, and so on (as discussed in Part I). The level of intensity in Northern Ireland in response to these emerging global dynamics is not what is observed elsewhere. A more forward-leaning stance to position for these changes is important:



economies like Singapore, Finland, Denmark, and Ireland, are instructive in terms of what this could look like. In the forthcoming skills strategy – and any further updates of the economic strategy documents – I recommend greater focus on the challenges and opportunities and the strategic priority actions in order to respond to these global dynamics.

Second, there should be a greater focus on execution of the strategy and getting the specific choices right. Although the strategic direction is appropriate, there is a gap in terms of translating this into specific programmes and initiatives with meaningful resource allocations. An important reason for this, of course, is the absence of a functioning Executive that can take such strategic choices. However, there are also some elements on which progress should be made.

In particular, although it is positive to have strategic priority clusters nominated, to operationalise the strategy at the level of research funding, or skills initiatives, a greater level of precision will likely be required. For example, identifying the ‘digital and creative’ cluster does not provide sufficient sharpness around the focus of policy and resourcing attention: what are the 2-3 specific domains in which a competitive position can be developed – for example, cyber-security, data analytics, and so on? This greater granularity is also important in terms of aligning a broad range of policy instruments to support growth.

Developing this sharpness will require close engagement with the private sector, research institutions, and other relevant stakeholders. Institutions will need to be developed for this purpose, so that this is an ongoing process of engagement rather than episodic. This will also help to ensure that the agenda is owned by both the government, but also by the private sector and other social partners. This engagement is a characteristic of high-performing small economies.

There also needs to be a structured process that supports ongoing adaptation of these choices to changes in the competitive context – as well as in the performance of these priority clusters. The international experience around successful industry policy suggests that the issue is often not with problems in the governments picking winners but in killing losers (clusters or sectors that do not generate strong growth performance). There should be a structured, disciplined process for reviewing the portfolio on an ongoing basis, supported by appropriate data and analysis, rather than periodically as the strategy document is formally updated every several years.

Third, to be effective in driving changed behaviour across the economy, the strategic direction – and the strategic priority clusters – need to be owned and well-understood outside the public sector. My sense is that the strategic choices are not currently well-understood outside the government, partly because Economy 2030 has not been formally approved – and so it has not been converted into resourcing choices or other policy initiatives. This is obviously complicated by the absence of a functioning Executive; and meaningful progress cannot be expected until the political situation in Northern Ireland is normalised.

But in the absence of observed (or understood) progress, it is likely that there will be an ongoing range of other initiatives that will all make other various choices with respect to priorities: for example, the Belfast Region City Deal, or the decisions made by universities or other institutions such as Catalyst. My sense is that there is a lot of movement being made, but the risk is that this is less coordinated and more fragmented than it could be if there was more intensive stakeholder engagement and communication.

The remainder of the discussion in this section proceeds on the basis of this overall assessment: the current analysis and strategic direction are appropriate, but there are several aspects in which the prioritisation and focus of the strategic approach to skills policy and innovation policy needs to be sharpened and strengthened. The international small economy experience provides valuable guidance in terms of the policy and institutional priorities for action to support the effective strategic integration of skills and innovation policy – as well as areas of specific good practice in skills policy and innovation policy.

## **2. Skills policy and innovation policy**

This section provides some thoughts and recommendations in terms of the way in which skills policy and innovation policy can be further strengthened.

### *Skills policy*

A comparison of Northern Ireland's current situation relative to the characteristics of high-performing small advanced economies suggests three priority areas for skills policy action.

First, as Northern Ireland continues to invest in upgrading the quality of its human capital, there will be a growing need to align demand and supply in a way that generates sustained economic value for the Northern Ireland economy. The importance of a much stronger skills base in Northern Ireland's economy to support economic transformation is well-understood. Although there are good levels of achievement at the top of the skills spectrum, there is a long tail of under-achievement in the education system: this needs to be addressed in order to develop a strong position as a knowledge and innovation intensive economy.

Some of this constrained by available public funding. Without a meaningful commitment of resourcing to upgrading the skills profile, progress will not be made. However, the increased funding should be provided in tandem with measures to increase the demand for skills. One of the characteristics of small advanced economies is their exposure to international factor mobility – and many have experienced the international exit of skilled people. Northern Ireland also has experience with exporting talent.

To the extent possible, ongoing investments in upgrading human capital should be linked to the emerging demand for skills (including from the growth in strategic priority clusters). This approach will mitigate the risks of a 'wasted investment' to the extent that an over-supply of skills in particular areas leads to the outflow of skilled people. The development of a broad base of skills in the population should be done in a way that is responsive to emerging demand and the nature of the skills gaps.

The second priority is investing in ongoing learning over a lifetime. These investments are seen clearly across high-performing small advanced economies, and this is an area that is also directly relevant to Northern Ireland. From Singapore to Denmark, there is a lot of policy activity in support ongoing learning across the small advanced economy group. The motivation for this policy activity is frequently around the impact of disruptive technologies and business models, and a recognition that many changes will need to be made. For example, note the recent processes that have been run in Denmark (the Disruption Council) and Singapore (the Committee for the Future Economy); and the assessments of the future of work in economies such as New Zealand and Finland.

Northern Ireland is also exposed to the impact of automation and other disruptive technologies. There is a need to start developing the platforms for upgrading and transition now with increased intensity and pace; this should be approached as a central part of the skills agenda, not as an optional extra. If such investments are not made pro-actively, in a way seen in other small advanced economies, Northern Ireland is likely to face significant disruption from emerging technology and competition – perhaps in a similar way to deindustrialisation in the 1980s.

Some large firms are investing more in further education and ongoing learning in-house. But there is a need to make these efforts broad-based and systematic across the population, to extend it beyond large firms with internal resources. To do this will require creating new structured platforms, funding mechanisms to provide support for mid-career upgrading and training,<sup>29</sup> as well as changing the norms/culture around ongoing learning. Industry groups will likely be an important part of the solution. This should also be supported by active labour market policy so that workers displaced from their existing jobs can receive advice and support to help them transition to new opportunities.

The third priority relates to the structures around vocational and professional education (including apprenticeships). This is a priority area around small economies, and is an important part of aligning education and skills acquisition with industry. An undue focus on university education has led to skills gaps in parts of the economy; there is a need, for example, to increase the supply of 'middle skills' through vocational education. In addition to raising the status and profile of apprenticeships, there are some structural issues that need to be

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<sup>29</sup> For example, one area for consideration is to lift the age cap (25 years) on government grants for apprenticeships – so that mid-career people can also participate in these programmes on a subsidised basis.

addressed in the Northern Ireland context (drawing on the international small economy experience).

The situation in Northern Ireland, as in many other Anglo countries, is to draw a sharp divide between academic and vocational tracks. My sense is that there is friction in the interface between the secondary school system and vocational education options in Northern Ireland, with schools not encouraging vocational education. This contrasts with good practice in many small economies (such as the Nordics and Switzerland), as well as emerging good practice in economies like Singapore.

One of the notable areas of policy focus is to make vocational education system more flexible and integrated, so that people can move between academic and vocational pathways more easily (accumulating credits and qualifications on the way though). Finland's reformed system provides a good example of this. And the European model in which vocational streams can be chosen through secondary schooling provides a good model for Northern Ireland as well (so that secondary education and vocational education are integrated). This may require greater coordination between the Department for Education and the Department for the Economy.

The financial incentives facing both individuals and firms to invest in this type of training also need to be addressed; this training can be costly for individuals, the education providers, as well as firms – particularly smaller firms. In this regard, the treatment of the apprenticeship levy – which is charged to employers, but returned to Northern Ireland as part of the block grant – should be addressed (when a Minister is in place). In the rest of the UK, the levy is used to support workplace training – and is reported to be working well. Without this change, employers are likely to be less willing to invest in workplace-based training.

### *Innovation policy*

Increased funding for research and innovation is an important priority in building Northern Ireland's competitive strength. The experience of high-performing small advanced economies is that they make sustained investments in research and innovation. Northern Ireland's R&D/GDP spend is currently around the small economy average, but there is scope to do more – particularly in terms of directed funding for research and innovation institutions as well as direct financial support for high growth, innovative firms.

There are fiscal constraints of course, and several important funding and policy instruments for innovation are UK-wide, and so there are limits on what can be currently done in Northern Ireland. But even so, there are some changes that can be made.

To be most effective, this spending should have a focus on developing strong, dynamic and resilient clusters of activity. By building clusters with specialised human capital, supply chains, research capability, know-how, and so on, the ‘stickiness’ of the Northern Ireland economy will be enhanced. This will also reduce the concentration risk that Northern Ireland is currently subject to, where a relatively large share of the private sector commitment to research and innovation is undertaken in a relatively small number of firms (including foreign MNCs).

There are a range of research and innovation institutions and initiatives (from universities, to Catalyst, and InvestNI) that all play important roles in the innovation ecosystem. Many of these institutions are investing and acting behind new initiatives, including participating in the Belfast Region City Deal. These initiatives look to have potential, but the risk with this activity is that it increased the extent of fragmentation in the system, and reduces the degree of coordination. Many of these initiatives and investments are not obviously grounded in the government’s stated priorities for innovation (as stated in Economy 2030).

As it stands, there are a lot of moving parts in the innovation system in Northern Ireland. Although the individual responsiveness and autonomy of these institutions is valuable, there is also value in developing a sense of shared purpose and understanding across these various institutions of strategic priority areas for the overall economy. This will support the better alignment of the various activities and support for innovation, and reduce the risk of fragmentation in a small economy context.

### **3. Strategic integration of skills and innovation policy**

A central lesson from successful small advanced economies is the importance of effective strategic integration between skills policy and innovation policy, in the context of a coherent overall economic strategy. Part III identified three core elements of effective strategic integration: a high level of priority given to skills and innovation; a whole of government approach, using multiple policy instruments to support the skills and innovation agenda; and coordination through the use of strategic priority clusters. This provides a useful structure for assessing the Northern Ireland situation.

- Priority to skills and innovation

Northern Ireland has a clear statement of the centrality of skills and innovation in its economic strategy. However, although the intent and wording are in place, this has not yet been supported by resourcing (of course, this is partly because of the absence of a functioning Executive – the Economy 2030 document has not yet been formally approved). But this at least provides a good basis on which to build.

As the new skills strategy is written, it is important that this references the contribution of skills to the broader economic agenda – and that it reflects the intensity and pace of change in the operating environment. This also needs to be supported by institutional structures (to be discussed further below).

- Whole of government policy approach

The constraints on Northern Ireland's policy autonomy make a 'whole of government' policy approach to skills and innovation more challenging. But the basic argument goes through.

And there are some policy levers and institutions over which Northern Ireland can exert influence. As one example, skills policy can be better aligned with the inward FDI attraction activities of InvestNI: for example, the success in attracting digital FDI to Northern Ireland has created skills shortages (even with the Assured Skills programme) with instances of foreign firms competing away talent, often developed by local firms. Similarly, there is a need to integrate and align skills and innovation policy priorities with other initiatives such as the Belfast Region City Deal.

Sustaining a whole of government policy approach requires a strong institutional structure, which will be discussed further below.

- Strategic priority clusters

Northern Ireland has explicitly nominated priority clusters in Economy 2030. The decision to do so is an important one, supporting the development of world class strengths in the Northern Ireland economy – as well as supporting the alignment of policy across multiple domains.

Having done this, there are a few outstanding priorities for action as noted previously in this section. First, there is a need for increased granularity. At the level of a strategic document, the priority clusters should be general, but in order to be able to implement, more specific resourcing and policy choices are required. And second, there is a need for greater external communication and engagement: at the moment, the nature of the cluster prioritisation does not seem widely understood outside of government.

### *Governance and institutions*

The international small economy experience shows clearly that high quality institutions are central to effective strategic integration of skills and innovation policy (and also across other policy domains). Without high quality decision-making and accountability structures, it is difficult to make sustained progress – and with an ability to adapt and develop over time in response to changes in the environment.

Leadership and governance is required to deliver on an integrated, whole of government agenda, because of the number of relevant organisations and initiatives. It is difficult to deliver sustained alignment and coherence across multiple policy areas without a structured set of institutions. Otherwise the likelihood is that the outcome is a fragmented set of bottom-up initiatives, and the returns from the effort and investments are likely to be lower. The integration of skills policy within the Department for the Economy is a positive move in terms of supporting greater policy coordination, but the international small economy experience suggests that more can be done (as discussed in Part III).

There are obvious constraints in Northern Ireland, with the absence of fully devolved powers as well as the current absence of a functioning Executive. And the way in which portfolios are allocated to different political parties also constrains full policy coordination. But there are some small economy models of good institutional design, such as Ireland and Singapore, aspects of which are relevant to the Northern Ireland context (discussed in more detail in Part III, and in the small economy case studies in the Appendix).

Some of the key institutional design features include:

- The creation of a structured decision-making body to implement and update the economic strategy, led by senior Ministers (with decision-making rights, and clear accountability). The Strategic Oversight Group for Skills is a good initiative to bring together the multiple agencies involved in skills policy and delivery, but it needs to be broadened to oversight of broader economic strategy.
- A central place for the skills and innovation agenda within this economic policy institution
- An ability to link the economic strategy (and other strategies, such as the skills strategy) to resource allocation
- Regular reporting against target outcomes.
- An ability to engage with external stakeholders

A standing institution will also allow for ongoing change and adaptation to aspects of the strategy as the context changes: writing these strategies every several years is inadequate given the likely pace of change. Formal reprioritisation should be infrequent, but the pace of change means that a standing institution matters.

Another measure that can be taken (at officials level) is to create a 'Team NI' approach: a structured platform with the different economic policy and delivery agencies coming together on a regular basis to discuss various policy and operational issues – to support greater coordination and alignment across agencies and policy instruments in the context of an economic strategy. These types of approaches are seen in economies such as Singapore, Finland, and New Zealand.

One other specific idea is to develop some discrete processes around emerging challenges and opportunities regarding skills and innovation. There are some international small economy lessons in terms of these types of processes to contribute to the development of skills and innovation policy: for example, the Disruption Council in Denmark, the Committee for the Future Economy in Singapore, the Productivity Commission work in New Zealand. These processes can support the development of the substantive content of the skills strategy, and will also help with a broader ownership of the document among stakeholders (such as firms and employers, industry groups, universities and research institutions, and so on) – as well as in the communications process.

Some suggestions on relevant themes include the impact of disruptive technologies on the future of work and emerging skills, the specific nature of the target sectors (where Northern Ireland has competitive strength), and so on.

#### **4. Concluding remarks**

Northern Ireland has strengths to build on in terms of its skills and innovation capability, and it has also made some appropriate design choices in terms of its policy strategy documents. In general, the thrust of these documents – and the willingness to make choices with respect to priority areas of the economy – is consistent with good practice across the small advanced economy group.

However, Northern Ireland's outcomes lag its small economy peers – as well as other regions of the UK – on a range of economic, skills and innovation measures. To move towards the performance levels of successful small advanced economies, a significant step-up in policy (and business) commitment is required.

This imperative is reinforced by Northern Ireland's significant exposure to a range of fast-approaching global dynamics that will have disruptive effects on the skills and innovation system. The impact of disruptive technologies and more intense global competition will place substantial pressure on Northern Ireland's economic model. As with other small advanced economies, Northern Ireland needs to move aggressively strengthen its skills and innovation policy – and in the context of a broader economic strategy that clearly describes how Northern Ireland will seek to position itself in the global economy. The risks associated with Brexit also place additional pressure on Northern Ireland to strengthen its competitive advantage, given the potential loss of market access to the EU; having a relatively low cost platform is an asset, but will not be enough. If changes are not made, Northern Ireland is likely to be exposed to meaningful economic risks.



Drawing on the international small economy experience, there are several specific implications for skills and innovation policy. Although there are constraints in terms of available funding as well as full access to the necessary policy instruments (and the current absence of a functioning Executive), there are some things that can be done – and some policy priorities that can be clearly established.

For example, there are particular priorities around upgrading vocational and professional education and training, and making this a flexible, well-integrated part of the education system. And there is a need for a more structured approach to ongoing learning to make it more broadly accessible – as a response to the emerging pressures from disruptive technologies and business models. Higher levels of resourcing for research and innovation is also part of delivering economic transformation in Northern Ireland, together with tighter alignment across agencies and other institutions.

But the central message from the small economy experience is the need for strategic integration between skills and innovation policy. This is even more so in Northern Ireland given the relatively limited fiscal resources and other policy constraints; the policy and resourcing commitment needs to be tightly focused and coordinated in order to deliver strong returns.

Part of this is already in progress, through the existing strategy documents (such as Economy 2030). But supporting institutions are required to enable a move from strategy to effective execution. Skills and innovation policy needs to be embedded into supporting economic institutions to allow for alignment across agencies, appropriate resource allocation decisions, and to ensure accountability. Institutions are required to make strategic integration come alive: Ireland and Singapore provide good examples of what this might look like.

Lastly, as Northern Ireland takes these strategic discussions on skills and innovation policy forward, its small economy context should remain a central consideration. The way in which Northern Ireland develops and prioritises skills and innovation policy – and economic policy more broadly – should take its small economy characteristics seriously. Although much can be learned from the broader UK, and from other large economy experiences, it is other small advanced economies that are the more useful group of economies from which to learn.

## APPENDIX: Small economy case studies

### Introduction

This section contains case studies on skills and innovation policy in several small advanced economies. Eight small economies were nominated as ‘best in class’ in Economy 2030. A slightly amended list of case study small economies is developed for this exercise, based on their approach to skills and innovation policy.

Full case studies will be presented on Finland, Denmark, the Republic of Ireland, New Zealand, Scotland, Singapore, and Switzerland. These economies have direct relevance to the Northern Ireland context, and many have high quality approaches to skills and innovation policy as well as good outcomes on the relevant dimensions. Less detailed descriptions of Israel and Estonia are also included; small economies that have interesting elements of their skills and innovation policy.

The purpose of these case studies is to provide specific examples of skills policy and innovation policy in small advanced economies, and the ways in which these policies are integrated. It will also look for instances of rapid improvement in the science and innovation systems.

These specific case studies will support the process of identifying key insights and implications for policy and action in Northern Ireland. In addition to the descriptive content in each of the case studies, an assessment will be offered of the strengths and weaknesses of the respective national policy approaches. This will provide a foundation for identifying common themes in skills and innovation strategy across high-performing small advanced economies, and to the task of providing advice and recommendations for Northern Ireland.

Each of the main case studies will contain the following core elements:

- An overview of the performance of each of the small economies on economic, skills, and innovation outcomes, including those described in the accompanying Exhibits
- A description of the statements of skills policy and innovation policy, as well as the actual policy settings. The case studies will consider the supporting institutions around skills and innovation policy, and the extent to which skills and innovation policy are effectively integrated – as well as the extent to which they fit within an overarching economic strategy.
- A discussion of the policy debates underway with respect to skills and innovation as small advanced economies respond to emerging challenges and opportunities.
- An overall assessment of the strengths and weaknesses of the system, together with a perspective on the key take-aways from the case study economy.

## DENMARK

### Outcomes

Denmark is a high income, high productivity small economy. However, Denmark's GDP growth rates have lagged many of its small advanced economy peers since the 1970s. Growth picked up in the 1990s, as Denmark took advantage of European economic integration and intense globalisation. However, Denmark has had relatively low growth since 2000, and has struggled to generate strong GDP growth rates in the post-crisis period. This is partly because Denmark's population and labour force growth has been relatively modest compared to other advanced economies. Denmark is above average in terms of labour productivity levels, which compensates for below average hours worked per capita, but productivity growth has slowed over the past decade.

The basis for Denmark's economic strength is the many well-established firms that are operating in deep clusters.<sup>30</sup> Firms in shipping (Maersk), pharma (Novo-Nordisk), renewable energy (Vestas), brewing (Carlsberg), as well as Lego, Grundfos, and others, have taken advantage of the opportunities presented by globalisation. These firms, and other surrounding firms, also displayed an ability to innovate and to expand into global markets.

These internationally-oriented firms are sophisticated and dynamic. Denmark reports high levels of R&D spending (about 3% of GDP) and scores well in terms of survey measures of innovation and business sophistication. Denmark's successful firms are operating at the productivity frontier; business R&D spending (1.7% of GDP) is among the highest in the small advanced economy group.

Denmark does not perform as well on other measures of economic dynamism. Its rates of start-up behaviour are about average, but have been falling over time. And the level of VC activity is also low.<sup>31</sup> Compared to some of its neighbours (such as Sweden and Finland), Denmark is lagging in producing new firms that grow aggressively.

On skills, Denmark ranks well on various measures of human capital – such as PISA scores and the Human Capital Index. Technical skills and soft skills (including language skills) are both very strong. And Denmark has three universities in the top 200 worldwide.

Denmark has not had a sustained active industrial policy that focuses explicitly on developing deep clusters. However, Denmark invests heavily in human capital and innovation, with good educational and research institutions. As with other small advanced economies, Denmark is assessed to be exposed to the disruptive effects of automation.<sup>32</sup>

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30 *Creating Economic Growth in Denmark Through Competition*, McKinsey & Company, November 2010.

31 *Science, Technology & Industry Scoreboard 2015*, OECD; OECD, *Economic Survey: Denmark, 2014*.

32 McKinsey & Company, 'A future that works: the impact of automation in Denmark', April 2017; McKinsey & Company, 'Danish manufacturing – winning in the next decade', 2016.

## Skills policy

There is no formal skills policy strategy, but there is a well-structured skills system (albeit with multiple agencies responsible for different aspects).<sup>33</sup> The Ministry for Children, Education and Gender Equality (and the National Agency for Quality and Supervision) is responsible for education up to the upper-secondary level, as well as vocational education and continuing learning.<sup>34</sup> The Ministry of Higher Education and Sciences (and the Danish Agency for Higher Education) is responsible for the higher education sector.<sup>35</sup> All higher education institutions (colleges and universities) are self-governing and autonomous, allowing them to tailor their offerings to demand.

There are several types of higher education institutions: research universities that offer a broad range of academic degrees; business academies and university colleges that offer professionally-oriented bachelor's degrees; and specialised maritime education and training institutions that also offer professionally-oriented bachelor's degrees.

Funding is allocated in block grants to institutions based on the number of students and the specified rate for the course. The (self-governing) institution is able to use this funding in the way that they want. Note that regional partners are commonly involved in the governance of local institutions.

There are a large number of vocational education programmes, which are offered from upper secondary level. These courses tend to last from 3-4 years, and are offered at vocational/technical schools. Theoretical and practical education at a vocational college alternates with practical training in an approved company or organisation.<sup>36</sup>

The vocational education system was reformed extensively in 2015 to encourage participation, and to make them more attractive for employers. Among other things this created an option 'for unskilled adults to enrol in vocational education for up to two years and receive compensation at 80% of unemployment insurance benefits'. But uptake has been low, which could reflect strong labour markets (low unemployment) as well as 'some resistance towards formal education within this group'.<sup>37</sup>

The Colleges deliver the theoretical content of vocational education. There are several types of colleges: business, technical, agriculture, basic healthcare, as well as specialist institutions. There has been some consolidation in the number of institutions that provide vocational education – but an emphasis on local provision has been maintained.

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33 [https://eacea.ec.europa.eu/national-policies/eurydice/content/denmark\\_en](https://eacea.ec.europa.eu/national-policies/eurydice/content/denmark_en)

34 [www.eng.uvm.dk](http://www.eng.uvm.dk)

35 [www.ufm.dk/en](http://www.ufm.dk/en)

36 [https://eacea.ec.europa.eu/national-policies/eurydice/content/upper-secondary-and-post-secondary-non-tertiary-education-8\\_en](https://eacea.ec.europa.eu/national-policies/eurydice/content/upper-secondary-and-post-secondary-non-tertiary-education-8_en); <http://eng.uvm.dk/upper-secondary-education/vocational-education-and-training-in-denmark>

37 OECD, *Economic Survey: Denmark*, January 2019.

The OECD report a relatively low number of STEM graduates from Danish institutions, and there are industry concerns with respect to skills shortages.<sup>38</sup> This suggests that progress needs to be made in aligning the supply and demand of qualifications and skills.

An emphasis on lifelong learning is long-established in Denmark, and the aim is for everyone to participate in lifelong learning. The government notes that *'most people participate in education: adult education and continuing training, on-the-job competence development and liberal adult education activities in their leisure time. Both public and private investments in the development of new qualifications and competences are among the highest in Europe. A considerable proportion of overall learning and competence development takes place in connection with the job, and it has long been an established practice for provision to be made for the employees' competence development and educational planning in the enterprises in the collective agreements between the social partners'*.<sup>39</sup>

The OECD also notes that: *'A tripartite agreement between the social partners and the Government was reached in 2017 with the aim to make adult education, training and upskilling more flexible and accessible. Initiatives include resources to facilitate reallocation and to ensure basic skills for all, higher compensation during training and a one-stop entry to programmes facilitated by a digital platform'*.

There is also a strong emphasis on active labour market policy, providing guidance and opportunities for retraining when workers are displaced. Denmark's spending on active labour market policy (~2% of GDP) is among the highest in the OECD. This is funded through a block grant to municipalities, with significant flexibility in terms of how it is used (with some minimum standards and requirements).

## Innovation policy

The Ministry of Higher Education and Science, together with the Ministry of Industry, Business and Financial Affairs (the lead economic development agency), is primarily responsible for the innovation system in Denmark.<sup>40</sup>

There are several key institution and agencies in the Danish innovation system. For example, Innovation Fund Denmark was established in 2014 following a broad party-political agreement to consolidate three existing national funding bodies within a single new entity.<sup>41</sup> *'Innovation Fund Denmark shall have the purpose of funding advances in science and technology, including advanced technology, in order thereby to boost research and facilitate innovative solutions for the benefit of growth and employment in Denmark... shall focus on funding solutions to specific societal challenges and strengthen private sector research and innovation initiatives in small and medium-sized enterprises'*.

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38 OECD, *Economic Survey: Denmark, January 2019*.

39 <http://eng.uvm.dk/general-overview/lifelong-learning>

40 <https://eng.em.dk/>; [www.ufm.dk/en](http://www.ufm.dk/en)

41 <https://innovationsfonden.dk/en>

Innovation Fund Denmark funds major projects in research, technology, development and commercialisation; as well as investments in SMEs; and specific researchers. It has identified priority research areas: bioresources, food and lifestyle; energy, climate and the environment; production materials, digitisation and ICT; infrastructure; and biotech, medico and health.

The Ministry of Higher Education and Science funds 17 Innovation Networks (in 2019/20) which offer companies access to the latest research and innovation trends within their field.<sup>42</sup> *'The national Innovation Networks offer companies access to the latest research and innovation trends within their respective fields of expertise just as they provide inspiration on tendencies within new technology, product innovation and innovation methods. The Innovation Networks can also assist in finding new partners for collaboration on both small- or large-scale research and innovation projects between private companies, researchers, the public sector, technological service providers and other partners – in Denmark and abroad.'*

The Danish Technological Institute works with Danish firms to convert technology and knowledge into commercial value. They have particular expertise in production, materials, life science, business, energy, agro technology, and meat research. They have more than 1000 specialists to work with Danish firms.<sup>43</sup>

Private foundations also play an important role in funding research in Denmark; for example, the Novo Nordisk Foundation (€228 million in grants in 2018) and the Carlsberg Foundation.<sup>44</sup>

The Danish Growth Fund is the Danish state's investment fund: *'We strive to improve access to risk capital to enable Danish businesses to innovate, and to generate growth and new jobs. In close collaboration with banks and domestic and international private investors, we finance companies from all sectors nation-wide. We can accompany you for the entire journey – from your company's infancy through growth phases to expansion abroad and even to an initial public offering.'*<sup>45</sup> Since 1992, it has co-financed more than 7,900 Danish companies with a total commitment of more than DKK 24.9 billion. This included equity investment as well as loans and guarantees.

One of the interesting features of Denmark's science and innovation system is the amount of formal assessment that the policy agencies undertake on the effectiveness of the various instruments and initiatives.

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42 <https://ufm.dk/en/research-and-innovation/cooperation-between-research-and-innovation/collaboration-between-research-and-industry/innovation-networks-denmark>

43 <https://www.dti.dk/about>

44 <https://novonordiskfonden.dk/en/>; <https://www.carlsbergfondet.dk/en>

45 <https://vf.dk/en/>

## Strategic integration

There is a clear sense as to the importance of skills and innovation for the Danish economy, but not an overall statement of economic strategy that ties these policy domains together. At different points in time, there has been a sectoral focus on priority growth clusters, although the emphasis on this varies by government. The coalition government arrangements, and the frequent changes in portfolio, make sustained strategic policy integration more challenging.

Note also that there is a strong regional flavour to decision-making, even if the funding comes largely from the centre. Municipalities are important actors in the Danish system. This can lead to greater tailoring to local demand and context, but it also increases the likelihood of fragmentation of the system – and complicates the task of strategic integration. There has been some recent work to clarify and streamline these relationships in areas of enterprise development policy, but this remains a complex area.

However, there are some positive developments in terms of strategic integration of skills and innovation. The recommendations arising from two recent processes provide a sense of strategic direction. The Production Council, followed by the Disruption Council, were focused on developing a structured response to the challenges and opportunities associated with disruptive technology. Among other things, the debates and recommendations associated with this process note the importance of a broad-based policy response to the challenges and opportunities facing skills and innovation policy.

The Production Council was comprised of a range of stakeholders (business, unions, officials, academics, and others), with a mandate to strengthen the environment for production in Denmark.<sup>46</sup> It reported in 2015. It identified issues with weak investment in productive process, the need for strengthened R&D in advanced industries, and more skilled employees in production (both advanced qualifications as well as vocational training). It made a coherent series of recommendations for the government in terms of an integrated response to these issues, many of which touched on skills and innovation.

This process then led to the establishment of the Disruption Council, again comprised of a broad set of stakeholders. It has recently reported.<sup>47</sup> They note that *'By being ahead of technological developments, citizens and businesses will benefit even more from the possibilities of the future. This requires that we have an ambition to be global leaders in education, research, entrepreneurship and innovation'*. Four priority themes for action were identified: a prosperous welfare state with only small social divisions; future education in a digital world; competitive companies that are digital frontrunners; and a robust, safe and flexible labour market.

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<sup>46</sup> Production Council, 'Good Jobs - The Production Council's recommendations to the Danish Government for strengthening production in Denmark', April 2015. <https://www.evm.dk/english/publications/2015/15-05-27-production-councils-summary>

<sup>47</sup> The Danish Government, 'Prepared for the future of work: Follow up on the Danish Disruption Council', February 2019.

The government is acting in many of these areas, from vocational education to science and innovation. The response to the emerging challenges and opportunities of disruptive technology and globalisation is leading to a more integrated approach to skills and innovation policy.

## Current issues

The Danish Government has asked the EU to undertake a review of the Danish innovation system; this work is currently in progress.<sup>48</sup> The Danish Government notes that although it performs strongly in terms of a variety of innovation outcomes, there are some concerning developments: the number of R&D active companies is reducing, the growth profile of Danish start-ups is limited, exports of technology-intensive products are lagging, and technology adoption is also lagging.

The Danish self-assessment also notes that *'there is currently no central coordination or strategic choice of public research priorities that aim to increase innovation. There may be an uneven balance between accumulated public research priorities and the needs of companies – and maybe an uneven balance between research and innovation priorities that promote existing industrial strengths v new emerging industries'*.

## Key insights

Denmark generates strong economic outcomes, as well as skills and innovation outcomes, on the basis of significant, sustained investment in skills and innovation. Over the past several decades (and beyond), Denmark has developed deep strengths in several clusters, from maritime to renewable energy and pharmaceuticals among others. Denmark's large firms are the primary drivers here: although there is concern about the number of dynamic start-up companies, Denmark's innovative large firms continue to make a strong contribution.

Denmark is also instructive in terms of its forward looking approach to responding to the challenges and opportunities posed by disruptive technology. The themes and recommendations arising from the Production Council and the Disruption Council are likely to lead to a more integrated approach to skills and innovation. Denmark is already deliberate in terms of the strategic direction of its various innovation agencies, and this is likely to continue.

There are two other elements of the Danish experience that are instructive.

First, there is a focus on engagement with stakeholders in developing skills and innovation policy (and on broader economic issues as well). This is built on Denmark's long-standing tripartite tradition. This can be seen in the Production Council and Disruption Council processes, as well as the way in which the various innovation agencies operate.

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48 <https://rio.jrc.ec.europa.eu/en/policy-support-facility/peer-review-danish-research-innovation-system>



Second, the importance of taking a comprehensive, whole of government approach to skills and innovation: flexicurity and the way in which social insurance and active labour market policy is integrated is important for driving key outcomes. Flexicurity and social insurance create an incentive for individuals to make risky investments (in human capital) because they have greater resilience against shocks.

## ESTONIA

### Outcomes

Estonia has a level of per capita income that is well below the small advanced economy group, but it has been converging rapidly over the past 20 years. Its GDP per capita has moved from 40% to 66% of the EU 15 per capita income average since 2000 (in PPP terms). Although Estonia suffered a very deep crisis experience (GDP reduced by more than 15% in 2009, the deepest in the Baltics), Estonia has averaged 4% growth since 2000. It has benefited from strong catch-up growth, supported by rapid integration into the EU.

Indeed, almost all of Estonia's GDP growth has been due to labour productivity growth, with a modest contribution from growth in the workforce. Population growth has been relatively weak, partly because of a significant brain drain as its citizens move elsewhere in the EU – as well as weak domestic demographics. Estonia has one of the smallest populations in the OECD at 1.3 million, exacerbating some of the challenges associated with small economic size. Labour productivity growth is a particular imperative, reinforced by an aging population.

These factors mean that the export sector is particularly important. Exports have grown to 80% of GDP, largely due to Estonia's integration into the Single Market. Many of these exports are not very knowledge intensive (e.g. forestry) but this is changing, and there has been big growth in digital services as well as in the offshore expansion of Estonian firms.

This is a partial case study, relative to the main case studies, and will focus on two instructive aspects of the Estonian experience. The two notable features that are of particular interest are the broad base of human capital as well as the characteristics of the innovation ecosystem. Other than that, Estonia is still developing in terms of skills and innovation policy.

### Skills policy<sup>49</sup>

Estonia's relatively strong economic performance over the past few decades since its independence has been supported by strong performance on human capital and innovation.

Estonia leads its Baltic neighbours on most measures of skills and human capital: its PISA scores are higher, it has strong results from the OECD's Survey of Adult Skills (PIAAC), as well as ranking strongly on measures created by the World Economic Forum (such as the Human Capital Index and the Global Competitiveness Index). As one specific example, Estonia ranks 4<sup>th</sup> in the OECD in the percentage of 25-64 year-olds whose highest education level is a master's or equivalent tertiary education degree (20.4 % in 2017).

Lifelong learning levels are also strong, in the top half of the OECD and EU 28 groups – and well

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49 For more general background on Estonia's education and skills system, refer: [https://eacea.ec.europa.eu/national-policies/eurydice/content/estonia\\_en](https://eacea.ec.europa.eu/national-policies/eurydice/content/estonia_en)

above other economies at similar levels of development. However, there is significant inequality across the population in skills outcomes, and there are reported skills shortages in the economy.

These measures also compare well with other central and eastern European economies, which have higher levels of per capita income than Estonia (for example, the Czech Republic, Slovakia, and others). For its level of development, Estonia generates strong skills outcomes – which should support future economic performance.

Human capital has been at the core of the Estonian economic strategy for some time. After independence from the Soviet Union in 1989, they had limited resources and a limited industrial base. So investing in skills and innovation has been a core focus of the government's economic policy approach (there are some similarities with the experience of Finland, to be discussed below). There is particular strength in ICT (and related) disciplines. These attributes have been important in supporting growth in the external sectors, including through regional integration.

## **Innovation policy**

Estonia is a world leader in introducing digital into the public sector: for example, e-residency, online public services, and so on. This is becoming an export industry, as well as building innovation capability across the economy (and strengthening the productivity of the broader Estonian economy).<sup>50</sup>

Estonia has an impressive record in terms of start-ups – particularly in the digital innovation space.<sup>51</sup> Estonia has four 'unicorns', companies that are valued at over USD1b: Skype, Playtech (gambling software), TransferWise (money transfer service), and Taxify (a ride-hailing app). This is a remarkable number for a country of Estonia's size. The innovation ecosystem is developing, and more high growth firms are likely. However, one of the challenges is that these firms tend to relocate once they get to a scale – and require access to capital markets, talent, and so on. Of Estonia's unicorns, only Taxify is still based in Estonia.

At this stage, the private sector innovation base is relatively narrow. The OECD note that Estonia lags in terms of investment in knowledge-based capital and has a relatively low share of innovative firms. And the use of ICT by Estonian firms is limited, despite leadership in the public sector. Over time, the priority will be to support the spillover of knowledge and productivity from export-oriented firms to the rest of the economy.

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50 Ministry of Economic Affairs & Communications, *Digital Agenda 2020 for Estonia*.

51 <https://www.theguardian.com/world/2018/jun/29/estonia-unicorns-president-kersti-kaljulaid-delight>

Estonia's research, development and innovation strategy is aimed to make the structure of the economy more knowledge-intensive.<sup>52</sup> It *'follows the 'smart specialisation method' to encourage the development of growth areas at heightened pace. The share of knowledge-intensive entrepreneurship in the economy and the added value of exports will increase significantly'*. Three growth areas have been selected:

- Information and communication technology (ICT), horizontally through other sectors; use of ICT in industry (incl. automation and robotics), cybersecurity, software development
- Health technologies and services; biotechnology, e-health (use of IT for the development of medical services and products)
- More effective use of resources; materials science and industry, innovative construction, i.e. "smart house", health promoting food, chemical industry (more effective use of oil shale)

## Key insights

Estonia shows that even in very small economies, it is possible to develop externally-oriented strengths in innovation-heavy activities. There are some challenges associated with value capture from innovation, with relatively small capital markets – and the forces of agglomeration (successful start-ups tend to move offshore).

Aside from regarding skills and innovation as a priority, there is not currently a high level of strategic integration between skills and innovation policy (other than that which would be expected in a very small jurisdiction). However, the ongoing growth in the target sectors may support a higher level of integration over time.

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52 <https://www.mkm.ee/en/objectives-activities/economic-development/entrepreneurship-and-innovation>

## FINLAND

### Outcomes

Finland has grown strongly since a deep recession in the early 1990s, converging towards the income frontier. Finland is currently around the middle of the per capita income rankings among the small advanced economy group. The strong growth over the past 25 years was based on integration into the EU, and the development of several new strengths in the economy – notably around Nokia and other IT firms.

GDP growth rates have been lower over the past decade, due to a combination of the global financial crisis coinciding with several idiosyncratic shocks – most notably the weakening of Nokia, the decline in pulp and paper prices, and depressed demand from Russia. However, the government responded well to these shocks, and Finland’s growth has now returned.

Finland is an open economy, with strong exporting and outward direct investment performance, with contributions from several large MNCs (such as Nokia, Kone, etc). Many of these firms are operating in advanced industries. In addition, there is a thriving start-up culture with a number of firms growing strongly out of Finland: Finland has produced two unicorns, Rovio and Supercell.

Human capital and innovation is at the core of Finland’s economic strategy; a deliberate decision was taken after the deep economic crisis of the early 1990s to emphasise skills and innovation. This was the way in which they thought that they could build a distinctive competitive position. In terms of skills, Finland consistently ranks at the top of the relevant rankings: PISA scores are among the highest in the advanced economy group, with good scores on the human capital index and other relevant measures. Finland also has 3 universities in the top 200, in the middle of the small economy group on a per capita basis.

In terms of innovation, Finland’s R&D spending is one of the highest in the advanced economy group – with a significant proportion of this from business R&D spending. Finland also ranks well on other measures of innovation, such as the global innovation index.

### Skills policy

Finland has a very broad, strong base of human capital. Finland is world-renowned for the quality of its compulsory education system. The system is world-leading and innovative, and is the subject of much interest around the world: it is a regular destination for foreign government study trips.<sup>53</sup> There are many reasons for this, such as the qualifications and status of teachers, the flexible nature of the curriculum, high levels of autonomy granted to teachers and schools, and so on.<sup>54</sup>

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53 [https://eacea.ec.europa.eu/national-policies/eurydice/content/finland\\_en](https://eacea.ec.europa.eu/national-policies/eurydice/content/finland_en); <http://www.oecd.org/education/highlightsfinland.htm>

54 For a general discussion, refer: <https://www.weforum.org/agenda/2019/02/how-does-finland-s-top-ranking-education-system-work>

The Ministry of Education and Culture is responsible for the public education system in Finland, including university education and vocational education and training.<sup>55</sup> The Finnish National Board of Education is responsible for the compulsory education system, and up to vocational upper-secondary education as well as adult education.<sup>56</sup> Finland has 14 universities; and 24 universities of applied sciences that provide education in response to labour market demands.

There are 26 National Education and Training Committees (organised around sectors), that shape vocational education to ensure that it is aligned to industry demands from the specific sectors. These committees comprise a range of stakeholders from the sectors; advise on developments, propose content to the Ministry of Education and Culture and the National Board of Education; and also propose initiatives to higher education institutions.

There are also 18 Regional Councils (organised around municipalities) that are responsible for regional development, including on issues of education, skills and innovation. Finland operates a decentralised skills and education system, with relatively little scope for shaping from the centre.

The government's Strategic Programme for 2014-2019 specifies a range of priority areas, several of which relate to vocational education and training as well as work-based learning.<sup>57</sup> The government's stated 10 year objective is: *'Finland is a country that encourages people to continuously learn something new. Skills and education levels in Finland have risen, promoting the renewal of Finnish society and equal opportunities. Finland is in the vanguard of education, skills and modern learning techniques'*.

The specific objectives during the government's current term include:

- Learning environments have been modernised and the opportunities offered by digitalisation and new pedagogical approaches are grasped in learning.
- Reform of upper secondary vocational education: The number of young people who have dropped out of education or working life has fallen. The drop-out rate in education has declined.
- Dialogue between educational institutions and working life is more active.
- The quality and effectiveness of research and innovation have begun to improve.
- Education and research have become more international and obstacles to education exports have been removed.

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55 [www.minedu.fi](http://www.minedu.fi)

56 [www.oph.fi](http://www.oph.fi)

57 Prime Minister's Office, 'Finland, a land of solution: Strategic Programme of Prime Minister Juha Sipilä's Government', 29 May 2015; 'Finland, a land of solutions: Government Action Plan 2018-2019'.

Vocational education has been reformed recently, in line with this Programme. Vocational education from upper secondary level has always been designed in a flexible way, so that this pathway allows for entrance into university. This approach has been further strengthened.

There has also been constructive engagement between employers, unions and government on responding to emerging technological dynamics and the future of work; an increased focus on life-long learning (note discussion below on current debates and issues).

## **Innovation policy**

The peak body is the Research and Innovation Council, chaired by the Prime Minister. The Council is responsible for policy on science, technology, and innovation.<sup>58</sup> The two lead government agencies are the Ministry of Education and Culture and the Ministry of Economic Affairs and Employment.<sup>59</sup>

There are two key funding agencies in Finland for research and innovation. The first is Business Finland, created after a 2018 merger of Tekes (the Finnish Funding Agency for Technology and Innovation) and Finpro, Finland's trade promotion agency.<sup>60</sup> Business Finland funds applied research and innovation in universities, research institutes, and in companies – with a view to generating economic value.

The second is the Academy of Finland, which is focused on research. For example, it funds Centres of Excellence (which can also receive funding from external sources) as well as Strategic Centres for Science, Technology, and Innovation – which bring together academic and company researchers to develop innovative products and technologies.<sup>61</sup>

The heavy investment in R&D and innovation (both by the government and by firms), dating from the early-1990s, led to a significant change in Finland's export structure towards knowledge intensive categories. But Finland became very dependent on Nokia; Nokia's market capitalisation was over 50% of Finland's GDP in 2007. Finland now has a more diversified innovation ecosystem, with many more start-ups and smaller firms, often with the involvement of Nokia alumni. Many of these firms have a highly research and technology intensive.

In a 2017 review of Finland's innovation policy, the OECD argues that many of the reforms to science and innovation since 2006 have 'lacked coherence and a unified vision or strategy'. They propose coordination and specialisation to develop strength and reduce fragmentation; need a greater focus on applied research. Similarly, a recent (2018) assessment of government research institutions and funding raised concerns about the extent of strategic coherence across institutions.

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58 <https://valtioneuvosto.fi/en/research-and-innovation-council>

59 [www.minedu.fi](http://www.minedu.fi); [www.tem.fi/en](http://www.tem.fi/en)

60 <https://www.businessfinland.fi/en/>

61 [www.aka.fi/en](http://www.aka.fi/en)

The OECD note that *'Although Finland achieved a widely acclaimed transformation to become a leading knowledge-based economy in the late 20th century, the 2009 recession and disruptive change contributing to a deep restructuring of the information and communication technology (ICT) industry and the downsizing of traditional sectors have weighed on the economy, productivity growth and international competitiveness. Numerous policy reforms have since been undertaken, and public and private investment, especially in applied R&D, has been cut back. Strengthening and lifting Finland's innovation system out of a period of uncertainty requires a coherent and unified new vision for science, technology and innovation (STI), renewed investment and policy instruments. This vision should be oriented towards renewal tackling societal challenges and developing new knowledge-based competitive advantages at global scale. Success calls for better co-ordination and co-operation among policy actors and national and regional-levels, and further internationalisation'*.<sup>62</sup>

In terms of enterprise development, there is a whole of government 'Team Finland' approach to supporting Finnish firms expand into global markets.<sup>63</sup>

There is a strong focus on building the broader innovation ecosystem: for example, the Slush conferences, which now have a global franchise: 'the world's leading start-up event'.<sup>64</sup>

## **Strategic Integration**

Finland has an economic strategy that places significant weight on skills and innovation. This was a deliberate strategic policy decision, and was core to the economic transformation of Finland. The sustained public investment in R&D, and education and training, was a deliberate choice. However, there is no explicit economic strategy.<sup>65</sup>

There is a degree of sectoral focus, particularly around IT as well as other clusters that have developed (some manufacturing as well as forestry, pulp and paper). Again, however, there are no nominated strategic priority clusters; this spending on skills and innovation follows the sectors – rather than deliberately shaping the sectoral structure. Indeed, one of the themes in the policy debate is around diversification, in response to the concentration that had developed around Nokia.

Government agencies work together well in this space, but there is no formal institutional integration. There is a National Economic Council in the Prime Minister's Office, that provides a platform for policy coordination, but this is relatively light touch.<sup>65</sup> Several of the issues recently discussed in the Council relate to skills and innovation.

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62 <https://www.oecd.org/finland/oecd-reviews-of-innovation-policy-finland-2017-9789264276369-en.htm>

63 <https://www.team-finland.fi/en/>

64 <https://www.slush.org/>

65 <https://vnk.fi/en/economic-council>



However, one of the notable aspects of the Finnish policy-making structure is the extent of focus on futures thinking (or foresight).<sup>66</sup> Once during each electoral period, the Government submits to Parliament a report on the future focusing on long-term perspectives. Each report is restricted to key strategic issues relative to policy decisions to be taken in a 10-20 year period.<sup>67</sup> The objective is to develop a shared public understanding of these issues, including in Parliament, to support a consensus on the future strategic direction.

The strategic issue selected by Prime Minister Juha Sipilä's Government was 'A shared understanding of the transformation of work'. Two reports were issued in 2017 and 2018 on the Transformation of Work. The main observations of this publication were: *'the forms of working and employment relationships will become more varied, which will require changes, for instance, in legislation and social security. Work will be less anchored to certain times and locations, but the change is not equally strong or synchronous in all sectors. Education highlights continuous learning, and Finland needs a high-quality model for lifelong learning for all population groups. Flexibility is increasing on the labour market and in working life, and issues pertaining to income are emphasised'*.

Other forward-looking work is produced by SITRA, an independent think-tank, which the government partly funds.<sup>68</sup> It has a mandate to discuss emerging strategic issues. It has recently released a substantive report on lifelong learning.<sup>69</sup>

And, as with Denmark, the emergence of a series of new challenges is likely to lead to a more integrated, coherent approach. There seems to be a recognition that reforms are required. The government's Strategic Programme specified an objective of *'Cooperation between higher education institutions and business life will be strengthened to bring innovations to the market. More effective use will be made of the resources of science and research. The effectiveness and commercialisation of research results will be strengthened. The profiles and respective responsibilities of higher education institutions and research institutes will be clarified and cooperation between them will be increased. Knowledge and expertise will be pooled in competitive centres of excellence.*

*Higher education institutions and research institutes will be required to produce a proposal on their respective responsibilities and faculties' and research units' closer cooperation. Regional centres of excellence and powerful hubs representing specific fields will be provided with financial support. Account will be taken of the effectiveness and commercialisation of research results in the steering of public research, development and innovation funding, as well as in incentives channelled towards research institutes and higher education institutions'.*

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66 <https://vnk.fi/en/foresight>; <https://vnk.fi/en/ministries-joint-foresight-activities>

67 <https://vnk.fi/en/government-report-on-the-future>

68 [www.sitra.fi](http://www.sitra.fi)

69 <https://www.sitra.fi/en/news/lifelong-learning-answer-finland-debate-challenges-required/>

## Current issues

Finland is actively debating how to reconfigure policy for the future of work (e.g. the universal basic income experiment).<sup>70</sup> And more broadly, there is a sense that policy creativity will be required in order to respond to a series of emerging challenges.

For example, one of the proposals from the Future of Work analysis was to ‘Reduce efforts to steer education by anticipating the need for skills.’<sup>71</sup> Instead, the focus of education is shifted more to basic skills and metaskills.’ They note that specific skills will continue to be needed in some sectors; but suggest a more general approach so that people can be flexible through a career: ‘In a world where technology is rapidly evolving and most people work in several occupations during their lifetime, it is important to support people’s preparedness to learn new things’. Skills such as digital and maths are cited as general skills that will be required.

This report also proposes creating a career account or a training voucher for people over 35 years of age (perhaps similar to the Skills Future programme in Singapore).

## Key insights

Finland is an encouraging account of the transformation of a small economy on the periphery of Europe, with a relatively commodity-based export structure (such as wood products) and reliant on the former USSR as its major export partner. But through strategic, sustained investment in skills and innovation, it has been able to develop strong positions of competitive advantage in knowledge-intensive areas of the economy – and to spur faster rates of GDP growth.

Finland also shows some of the risks from being heavily concentrated in a particular sector (and firm) that is hit by an idiosyncratic shock. Nokia became such a material part of Finland’s economy that the firm-specific shock had a meaningful aggregate economic impact. But the surrounding IT cluster turned out to be an engine of growth, and the skills and capabilities that had been developed were able to be used elsewhere.

Finland also shows that heavy investment in R&D is not sufficient to generate sustained strong outcomes. Now the priority is to develop coherence and integration across the skills and innovation system in order to drive better economic outcomes.

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70 <https://www.bloomberg.com/opinion/articles/2019-02-09/universal-basic-income-in-finland-money-can-buy-you-happiness>

71 Prime Minister’s Office, ‘Government Report on the Future, Part 2: Solutions to the Transformation of Work’, October 2018.

## IRELAND

### Outcomes

Ireland has been one of the stand-out performers among the small advanced economies over the past few decades, converging rapidly towards the per capita income frontier. This economic transformation has been built on a particular economic model, relying heavily on attracting FDI into Ireland; drawing on access to the EU Single Market, low corporate tax rates, and a deep pool of human capital and innovation capability.

The global financial crisis hit Ireland hard, but it has recovered strongly – and over the past several years, its GDP growth rates have consistently been at the top of the small advanced economy group. Unemployment rates have reduced from around 16% in 2011 to around 5% today.

Ireland is a strongly externally-oriented economy, with exports/GDP at 120% and inward FDI/GDP at about 260%. This international exposure has implications for its approach to skills and innovation policy.

In terms of skills outcomes, Ireland scores reasonably well on the PISA scores (particularly on reading); although less well on adult skills, where it is towards the bottom of the advanced economy group. It has one university in the top 200 (Trinity College Dublin), and has relatively low levels of public spending on education.

Ireland has been subject at various points to significant brain drain movements. But as its income levels have risen – and with the opportunities now available with the MNCs present in Ireland – it has become a magnet for skills, with strong inflows of migration. This is a valuable supplement for the domestic supply of skills. Indeed, the pool of human capital is commonly cited as a reason for inward flows of FDI into Ireland.

In terms of innovation, Ireland is a mixed picture. Ireland is home to many innovative, technology-intensive firms (and increasingly so, with significant FDI inflows in this space). Ireland's export structure is also dominated by knowledge intensive goods and services; and Ireland has a high level of economic complexity. But much of this is due to the activity of foreign MNCs rather than domestic firms. Science Foundation Ireland note that 72% of Ireland's business R&D expenditure is by foreign-owned firms.

And Ireland scores relatively poorly on standard measures of innovation: modest levels of R&D spending (including business R&D spending), and it is mid-ranking on various international rankings such as the Global Innovation Index, the World Economic Forum's Global Competitiveness Index.

## Skills policy

Organisational responsibility for various elements of skills policy is split between a range of policy and operational agencies. The lead government agency for education and skills is the Department for Education and Skills.<sup>72</sup> The Higher Education Authority is the policy and funding agency for all higher education (universities, technology institutes, and so on).<sup>73</sup> The Further Education and Training Authority (also known as SOLAS) is responsible for the apprenticeship system, along with other further education and training.<sup>74</sup> There are 16 Education and Training Boards, which are responsible for administering some secondary education and most adult education on a regional basis.<sup>75</sup> The Department for Business, Enterprise and Innovation is also involved in many aspects of skills and training policy, and participates in many of the committees and processes.<sup>76</sup>

There have been several strategies that relate to skills and labour markets over the past period. For example, the Action Plan for Jobs, launched in 2012, was a strategy designed to generate 100,000 new jobs by 2016 and to reduce Ireland's high level of unemployment after the crisis.<sup>77</sup> This was led by the Taoiseach, with specific accountabilities for hundreds of actions and initiatives. The programme has delivered on its targets - reducing unemployment approximately back to pre-crisis levels - and is recognised to have been well-designed.

Now that Ireland is out of crisis mode, Ireland is focusing on a more structural approach to skills policy. There are several relevant strategy documents. First, there is a National Skills Strategy 2025 (published in 2016).<sup>78</sup> The objectives of the Skills Strategy are:

- Education and training providers will place a stronger focus on providing skills development opportunities that are relevant to the needs of learners, society and the economy.
- Employers will participate actively in the development of skills and make effective use of skills in their organisations to improve productivity and competitiveness.
- The quality of teaching and learning at all stages of education will be continually enhanced and evaluated.
- People across Ireland will engage more in lifelong learning.
- There will be a specific focus on active inclusion to support participation in education and training and the labour market.

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72 [www.education.ie](http://www.education.ie)

73 [www.heai.ie](http://www.heai.ie)

74 [www.solas.ie](http://www.solas.ie)

75 <https://www.etbi.ie/>

76 <https://dbei.gov.ie/en/>

77 The initial Action Plan for Jobs: [www.dbei.gov.ie/en/Publications/Action-Plan-for-Jobs-2012.html](http://www.dbei.gov.ie/en/Publications/Action-Plan-for-Jobs-2012.html) Subsequent reporting and updates: [www.dbei.gov.ie/en/What-We-Do/Business-Sectoral-Initiatives/Action-Plan-for-Jobs/](http://www.dbei.gov.ie/en/What-We-Do/Business-Sectoral-Initiatives/Action-Plan-for-Jobs/)

78 [www.education.ie/en/Schools-Colleges/Services/National-Skills-Strategy/](http://www.education.ie/en/Schools-Colleges/Services/National-Skills-Strategy/)

- We will support an increase in the supply of skills to the labour market.

Second, Future Jobs Ireland was published in March 2019. This is ‘a framework of focused ambitions which will form a key part of Ireland’s future economic agenda over the medium term’.<sup>79</sup> Future Jobs Ireland focuses on five pillars:

- Embracing Innovation and Technological Change
- Improving SME Productivity
- Enhancing Skills and Developing and Attracting Talent
- Increasing Participation in the Labour Force
- Transitioning to a Low Carbon Economy

Alongside this strategy, sits a range of efforts to assess emerging skills demand and identify gaps with the supply of skills. For example, several sector specific strategies, together with individual Expert Group on Future Skills Needs (EGSFN), have quantified the specific skills requirements in a number of sectors.<sup>80</sup>

A National Skills Council was established in 2017 to provide oversight on forecasting skills supply and demand; this includes representatives from employers, policy agencies, as well as the education and training agencies.<sup>81</sup> ‘The purpose of the National Skills Council (NSC) is to make Ireland a leader in anticipating and responding to the rapidly changing skills needs across all sectors’. The goal is to better align the education system with the likely future demand for skills.

There are also 9 Regional Skills Fora that have been established in order to support engagement between employers and educational institutions to ‘match identified needs with sustainable provision in each region, thereby optimising the return on Irish investment in education and training’.

There is a growing focus on vocational and work based learning. A ‘Further Education & Training Strategy 2014-2019’ is an attempt to provide additional coordination in a system that was subject to fragmentation.<sup>82</sup> The Apprenticeship Council was established in 2014, after a review of apprenticeship training to identify where there is need for apprentices, where they can make a difference. This is led by business, with unions, education agencies, and the government.

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79 [www.dbei.gov.ie/en/What-We-Do/Business-Sectoral-Initiatives/Future-Jobs/](http://www.dbei.gov.ie/en/What-We-Do/Business-Sectoral-Initiatives/Future-Jobs/)

80 [www.skillsireland.ie](http://www.skillsireland.ie)

81 <https://www.education.ie/en/Press-Events/Press-Releases/2017-Press-Releases/PR2017-27-04.html>

82 <https://www.education.ie/en/Publications/Policy-Reports/Further-Education-and-Training-Strategy-2014-2019.pdf>

A National Strategy for Higher Education was published in 2011.<sup>83</sup> There is a reconfiguration of the institutional landscape, including the establishment of Technological Universities and the formation of regional clusters of higher education institutions.

## Innovation policy

The lead policy agency is the Department for Business, Enterprise and Innovation.<sup>84</sup> The guiding statement of policy strategy is Innovation 2020.<sup>85</sup> The objective was for Ireland to become a 'Global Innovation Leader', with the following action areas:

- Excellent research in strategically important areas that has relevance and impact for the economy and society.
- A strong innovative and internationally competitive enterprise base, growing employment, sales and exports.
- A renowned pool of talent both in Ireland's public research system and in industry that maximises exchange of talent and knowledge.
- A coherent joined-up innovation ecosystem, responsive to emerging opportunities, delivering enhanced impact through the creation and application of knowledge.
- An internationally competitive research system that acts as a magnet and catalyst for talent and industry.

There is a very clear, direct link between science and innovation and economic policy.

Science Foundation Ireland is the lead research funding agency in Ireland, funding 'oriented basic and applied research in the areas of science, technology, engineering and mathematics'.<sup>86</sup> There is a dual focus: funding is allocated on the basis of both scientific excellence as well as economic impact.<sup>87</sup>

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83 <https://hea.ie/resources/publications/national-strategy-for-higher-education-2030/>

84 <https://dbei.gov.ie/en/>

85 <https://dbei.gov.ie/en/What-We-Do/Innovation-Research-Development/Innovation-2020/>

86 [www.sfi.ie/](http://www.sfi.ie/) Refer 'SFI Agenda 2020: Excellence and Impact'.

87 There are other research funding agencies (Irish Research Council, Health Research Board, as well as the Higher Education Authority), that have more narrowly focused funding mandates.

The SFI remit is: *'Our research promotes and assists the development and competitiveness of industry, enterprise and employment in Ireland. Oriented basic research is research that is carried out with the expectation that it will produce a broad base of knowledge that is likely to form the background to the solution of recognised, or expected, current or future problems or possibilities.'*

SFI's mission is to *'build and strengthen scientific and engineering research and its infrastructure in the areas of greatest strategic value to Ireland's long-term competitiveness and development.'* SFI are explicit about the importance of strengthening the overall ecosystem, and that this will require engaging with a broad range of stakeholders. Innovation is not about funding research, but building a broad range of strengths and capabilities.

There is also clear strategic prioritisation involved. SFI note that *'We must focus on Ireland's unique opportunities – whether they be geographical (such as renewable energy), size (a small high-tech country can be used as a test bed), or existing concentration of expertise or academic excellence (ICT, medical devices, pharmaceutical manufacturing)... Ireland does not have the resources to be world-leading in every area in which it invests. It is therefore sensible to invest strategically in concentrations of excellence that can achieve the scale and impact required to be truly world-leading. SFI will focus on achieving international research leadership in a small number of research fields.'* SFI investment will be steered to these areas, with updates as appropriate.

This is guided by regular research prioritisation exercises, which were established by Innovation 2020. Research Prioritisation was introduced by the Government in 2012, with an initial list of priorities for 2012-2017. The second cycle released in 2018, covers the 2018-2023 period, with some updates to reflect changing technologies and other developments. The majority of competitively awarded public investment will be made into research within six themes (with 14 specific priority areas within these themes).<sup>88</sup>

In terms of the broader innovation ecosystem, Enterprise Ireland works closely with Irish businesses looking to expand, particularly into offshore markets.<sup>89</sup> They are also charged with funding a number of key aspects of innovation and knowledge exchange, including commercialisation, technology transfer and university/industry collaboration. Ireland has also established a strategic investment fund to accelerate the growth of domestic firms, and reformed enterprise and innovation policy.<sup>90</sup>

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88 <https://dbei.gov.ie/en/Publications/Research-Priority-Areas-2018-to-2023.html>

89 <https://www.enterprise-ireland.com/en/>

90 <https://isif.ie/>

## Strategic integration

Ireland is conspicuous in terms of the number of published strategy documents that it has; Enterprise Plan 2025 (and updates), Future Jobs Ireland, Innovation 2020, National Skills Strategy, and various others (as well as the many sector-specific strategies). And the other conspicuous feature of the skills and innovation policy space in Ireland is the degree of consistency, and the underlying strategic coherence with national economic strategy.

Ireland has approached skills and innovation policy through the lens of economic strategy. The strong pool of human capital (both foreign and domestic), and deep innovation capability, is a core part of Ireland's value proposition to inward investment. There is an increasingly tight link between skills policy, innovation policy, and overall economic strategy.

As one example, the Action Plan for Jobs (described above) was a comprehensive, whole of government approach to employment generation. For example, the IDA explicitly targeted FDI in sectors that were employment rich.

However, the Action Plan for Jobs was a crisis-era response, with a heavy focus on the demand side – creating jobs to reduce unemployment. As the Action Plan evolved (regular updates were prepared to report on outcomes and to identify revisions to the priority policy areas), there was an increasing supply side focus on skills and innovation – and on developing strengths in priority areas of the economy. For example, the Action Plan was undertaken in parallel with the 2016 National Skills Strategy, which included systematic skills mapping.

And the integration of skills and innovation with overall economic strategy has become increasingly prominent. Irish policy is focused much more on building skills that are relevant to a new environment; and linked to the likely growth sectors in the economy.

Ireland has a highly structured, integrated approach to priority clusters. The Enterprise Plan 2025 is the overall statement of economic strategy, together with several other accompanying and supporting strategy documents.<sup>91</sup> There is a very high degree of consistency across these documents, with substantial cross-referencing.

The Enterprise Plan 2025 sets out the enterprise sectors in which Ireland has competitive advantage and that contribute the greater proportion toward exports. These sectors include ICT (hardware and software), Health Lifesciences (including pharma, biopharma and medical technologies), International Financial Services, Internationally Traded Services, Engineering/Industrial Products and Agri-Food. There is significant overlap with the Innovation Strategy, and the latest Research Prioritisation exercise.

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<sup>91</sup> [www.dbei.gov.ie/en/Publications/Enterprise-2025.html](http://www.dbei.gov.ie/en/Publications/Enterprise-2025.html)



Similarly, the Skills Strategy notes that *'This Strategy forms an integral part of the Government's long term economic plan to restore full employment and build a sustainable economy. It is closely aligned with broader Government policy including Enterprise 2025, Pathways to work 2016 – 2020 and the Action Plan for Jobs. Indeed given the importance of the skills agenda to the Government's overall economic plan it is no exaggeration to say that this strategy forms the keystone of Ireland's strategy to deliver long term sustainable growth'*.

## Current issues

There are two themes/issues that are worth calling out, both are which are commonly referred to explicitly in the various strategy documents.

First, skills and innovation are at the core of competitiveness. Skills and innovation will need to be an increasingly important component of Ireland's value proposition, because the cost structure has increased. In previous periods (the early 2000s), footloose capital moved from Ireland to lower cost jurisdictions in response to rising relative costs (for example, the relocation of Dell from Limerick to Poland around 2006). A focus on skills and innovation makes the FDI stickier because it is more difficult to replicate these capabilities elsewhere.

The Irish government has been acting to better develop Ireland's capabilities and strengths, to integrate domestic and foreign firm activities, so that foreign firms are more likely to stay in Ireland rather than relocate in response to lower tax rates and lower cost structures elsewhere. An important part of this policy response is to develop deep clusters, with supporting firms and capabilities, which are distinctive to Ireland.

Second, there is a need to build deep capabilities in domestic firms (in priority clusters) so that the productivity gap with MNCs is closed. The substantial productivity gap between the MNC dominated sectors and other parts of the economy, with relatively limited interaction between these respective clusters of activity, creates significant issues with respect to the extent of domestic value generation and capture in the Irish economy. So one focus area is providing more support for innovation among indigenous enterprises; for example, building out innovation capability across the economy, beyond the MNC sector.

There have been many serious efforts to better integrate the operations of domestic and foreign firms, and to build deep clusters in Ireland around these activities. However, in general the activities of foreign firms remain relatively separate from the rest of the Irish economy – this constrains dynamism, and also reduces resilience, as these activities are not deeply embedded into the Irish economy.<sup>92</sup> SME capability building is an important element of this, and there are numerous initiatives through agencies such as Enterprise Ireland to make this happen.

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92 Neave O'Cleary, 'A Tale of Two Clusters: Economic Complexity in Ireland since 1995', paper prepared for DJEI, 2015; Mattia Di Ubaldoa, Martina Lawlessa, and Iulia Siedschlag, 'Productivity spillovers from multinational activity to indigenous firms in Ireland', ESRI Working Paper 587, March 2018.

## Key insights

A central part of the transformation of the Irish economy over the past few decades has been increasing its knowledge intensity. Ongoing investment in skills and innovation has been a core part of this. But MNCs have been disproportionately important, with many other parts of the local Irish economy lagging behind – with lower firm innovation and productivity, and uneven skills outcomes.

The second instructive aspect of the Irish experience is the institutional structure that is put around these strategy documents. There are explicit statements of what matters at a strategy level, detailed listing of associated initiatives, key targets and goals specified in KPIs, regular public reporting, and senior Ministerial accountability. This supports alignment of effort across multiple agencies, as well as relevant stakeholders, and broader public understanding of the priority areas. There are very clear links between skills and innovation policy and the overall economic strategy.

Third, Ireland has very deliberately nominated strategic priority clusters for the overall economy and in terms of allocation of investment funding. Similarly, there is a deliberate focus on linking to demand – and emerging demand (new technologies) – much of which will be related to these sectors. Because Ireland can only be world-class in a limited number of areas, deliberate focus is placed on investing behind these strengths.

## ISRAEL

### Outcomes

Israel is at the bottom of the per capita income rankings among small advanced economies, but has grown strongly over the past few decades. The strong headline GDP growth has also been supported by strong population growth: Israel's population has grown from 4.7 million in 1990 to 8.9 million since 1990.

The growth decompositions show this clearly, with a strong contribution from growth in hours worked as well as some productivity catch-up. Israel's per capita GDP growth has been relatively low over this period. Labour productivity levels are low, and hours worked per capita are high. And the export sector remains relatively small for a small advanced economy (~30% of GDP).

Israel also consistently ranks at the bottom of the small advanced economy group in terms of various measures of human capital: the PISA scores, adult skills survey, the proportion of NEETs, as well as various composite measures. There is a highly skilled, educated portion of the population; but also a large part of the population that lags on these outcomes (including Arab Israelis and Orthodox Jews). Deliberate attempts are being made to broaden and strengthen the human capital base, opening up opportunities to Orthodox Jews and Israeli Arabs.

And reviews of Israel's vocational education system by the OECD and other suggest that there is significant room for improvement: it remains fragmented and uncoordinated, with low funding and participation rates. There is little focus on work-based learning.<sup>93</sup> Note however that one of the distinctive features of Israel is the contribution of military National Service to the skills profile of the population.

But Israel has very strong performance on multiple measures of innovation.<sup>94</sup> The Israel Innovation Authority notes that 'Israel has the largest number of start-ups per capita in the world, including more than 2,000 which were founded in the past decade. There is substantial start-up activity in a wide range of technology sectors, from cyber-security to agritech, and numerous Israeli firms are listed in the US or have been acquired by larger foreign firms.

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93 <http://www.oecd.org/fr/israel/apprenticeship-and-vocational-education-and-training-in-israel-9789264302051-en.htm>

94 For a useful discussion of Israel's innovation system, refer Dan Senor and Saul Singer, 'Start-Up Nation: The Story of Israel's Miracle', Council on Foreign Relations/Twelve, 2009.

The rates of entrepreneurial activity, the scaling up of companies into global firms (and unicorns), the IPOs, and the attraction of high quality FDI into Israel is increasing, even as Israel's headline GDP growth moderates. The venture capital ecosystem has also become much more mature and effective, able to grow companies to scale (whereas it used to be the case that Israeli companies sold out, more firms are now growing into international markets from an Israeli base).

'Israel is also home to more than 350 R&D centers of some of the world's largest multinational corporations, such as Microsoft, Apple and Google'. There are very high levels of R&D spending (4% of GDP), substantial amounts of FDI into knowledge-intensive sectors, and Israel performs very well on most composite measures of innovation.

There is a very strong research base in Israel. The Shanghai world rankings in 2018 ranked the Hebrew University of Jerusalem and the Technion (Israel Institute of Technology) in the 100 best universities in the world.

Israel's high tech sector is very successful but it remains a relatively small part of the overall economy (<10% of GDP). Although this sector has high levels of productivity, there is a very long tail of relatively low productivity sectors elsewhere in Israel – with limited spillovers between the high tech part of the economy and elsewhere.<sup>95</sup> To boost Israel's overall economic performance, this innovation capability needs to be broadened across the economy.

This innovation system has been supported by waves of immigration from Russia, Eastern Europe, the US, and elsewhere, which has brought significant mathematical and scientific skills; Israel's skills base is not simply a function of the domestic education system. However, the high tech sector is reported to be facing increasing challenges with respect to ongoing growth, including from shortages of skilled workers.<sup>96</sup>

This discussion will focus mainly on innovation – and the extent to which this is integrated into an overall national economic strategy. This is the dimension on which Israel is most distinctive.

## **Innovation policy**

Serendipity played an important role in the development of Israel as a 'start up nation'. It was not planned by the government, but began to emerge in a bottom up way. Factors such as the various financing and policy schemes, the skills and networks of the famed Unit 8200, Israeli chutzpah culture, immigrants with strong technical skills, all contributed – but it is not clear exactly how and why it took off.

There are some idiosyncratic features that have supported the Israeli innovation system, such as the important role of the military. The defence sector is a significant contributor to R&D

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95 <https://www.ft.com/content/dae642aa-5601-11e9-a3db-1fe89bedc16e>

96 <http://www.bloomberg.com/news/articles/2016-06-21/israel-tech-hub-status-hampered-by-growth-slump-talent-drought>

spending in a direct sense; and there have been multiple start-ups that have come out of this military innovation space (e.g. cyber-security). Some of the roles in the military have created skills and networks that have been powerful in driving the development of the innovation ecosystem. For example, alumni from the elite Unit 8200 have been at the centre of a disproportionate amount of Israel's innovation success. Relatedly, there is a strong culture of risk-taking as well as technical skills, which supported the growth of start-ups.

However, once the innovation cluster emerged, the government was supportive. The key government agency in the innovation system is the Israel Innovation Authority.<sup>97</sup> The IIA is '*an independent publicly funded agency... created to provide a variety of practical tools and funding platforms aimed at effectively addressing the dynamic and changing needs of the local and international innovation ecosystems. This includes early-stage entrepreneurs, mature companies developing new products or manufacturing processes, academic groups seeking to transfer their ideas to the market, global corporations interested in collaborating with Israeli technology, Israeli companies seeking new markets abroad and traditional factories and plants seeking to incorporate innovative and advanced manufacturing into their businesses.*'

*Government support toolkit includes a combination of direct and indirect support measures. Direct measures include direct government investments in the form of grants or R&D loans dedicated for the business sector or for inter-government R&D activities such as, military R&D or the acquisition of technologies. Indirect support tools mostly include various tax incentives for companies dealing with R&D and innovation*

*We invested in 920 companies and financed approx. 1500 innovative projects with a total of 1.7 billion shekels'. [US\$500m]*

There are a few things to note about the way in which Israel's innovation ecosystem works, and the nature of the policy support. First, in terms of policy, there is a distinctive willingness to directly fund firms, including through equity stakes, and to assume a high risk tolerance in its funding decisions than seen in some other economies. This requires strong capabilities and disciplines, but seems to work well in the Israel context.

Second, an important part of the success of Israeli innovation is the development of a mature venture capital system. There is strong capability in scaling firms up, as well as capital available to fund expansion. Israel still faces issues in terms of the exit of successful firms, but there is a relatively strong ability to commercialise ideas.

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97 [www.innovationisrael.org.il/en/](http://www.innovationisrael.org.il/en/)

Lastly, there is a strong community of bottom-up support for the Israeli innovation ecosystem – and the attempts to link it to the rest of the world. Start Up Nation Central is a non-profit body, that links various stakeholders in Israel’s innovation system, and also connects it to the world.<sup>98</sup>

The university sector is high quality, with solid arrangements with respect to funding and governance, but this is not a distinctive feature of Israel. The Council for Higher Education is responsible for higher education policy, and also funds higher education.<sup>99</sup> The CHE was established by legislation as an independent institution, in order to insulate higher education from political pressures. By legislation, at least two-thirds of the council members will be elected due to their academic standing at institutions of higher education.

The CHE oversees the allocation of funding for research (e.g. through Israel Science Foundation, participating in EU’s Horizon 2020 research programmes).<sup>100</sup> The heavy representation of senior academics on the funding council creates a bias towards scientific excellence as the primary criterion through which research funding is allocated. For the most part, this is a bottom-up competitive grant process; which makes it harder for the government to shape the system. However, there are flagship research programs (such as personalised medicine, quantum science and technology, and data science); additional funding is allocated for these priority research areas.

## Strategic integration

The National Economic Council in the Prime Minister’s Office provides strategic coordination and development of economic policy.<sup>101</sup> Israel’s political situation and the frequent external crises have generated a relatively short-term bias to policy-making, with less engagement on longer-term policy issues.

However, although Israel has not articulated an overall economic strategy, there is an implicit understanding of where its strengths lie. There has been a greater focus on externally-oriented, technology-focused sectors relative to domestic sectors. And in the way in which the funding is allocated e.g. by the IIA, there is implicit prioritisation. The clusters of excellence are identified.

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98 [www.startupnationcentral.org/](http://www.startupnationcentral.org/)

99 <https://che.org.il/en/>

100 <https://www.isf.org.il/#/>

101 [www.pmo.gov.il/English/PrimeMinistersOffice/DivisionsAndAuthorities/TheNationalEconomicCouncil/Pages/TheNationalEconomicCouncil.aspx](http://www.pmo.gov.il/English/PrimeMinistersOffice/DivisionsAndAuthorities/TheNationalEconomicCouncil/Pages/TheNationalEconomicCouncil.aspx)

## Key insights

The key takeaways are less systemic, because the overall skills and innovation system is not a small economy model of good practice. But there are elements of Israel's experience that are instructive. Most obviously, Israel shows the contribution that innovation can make to a small economy, even one that faces some disadvantages, and is starting from a relatively low base.

Perhaps the most instructive element is in terms of the delivery mechanisms; the preparedness to work alongside firms to help them expand with a variety of funding mechanisms – including putting government capital on the line. There are disciplines and accountability, but this is not a risk averse system.

In addition, Israel's experience shows that success in innovation is not just about high levels of public funding; it is also about creating the culture, as well as building the capability and expertise.

## NEW ZEALAND

### Outcomes

Economic outcomes have been relatively poor in New Zealand over a sustained period; it now has one of the lowest per capita income levels in the small advanced economy group. New Zealand has a labour-rich growth model. It has very high employment rates, with flexible labour markets, and has been able to absorb significant number of immigrants into the workforce. However, it has low labour productivity levels (and growth rates) with relatively low levels of business investment.

One of the reasons for this relatively weak economic performance is relatively weak performance on skills and innovation. In terms of skills, New Zealand is around average on most scores. For example, New Zealand has reasonable scores on PISA (weak on maths, better on science and reading), but its relative ranking has been weakening over time. There is also a wide distribution of scores across the population; there is an unequal distribution of human capital. And there are persistent challenges in terms of the transition from secondary education into work of further training; New Zealand has above average NEET rates relative to other small advanced economies.

There is a similar story on various other measures of human capital quality, such as the Human Capital Index and the Global Competitiveness Report. And New Zealand's tertiary institutions are declining in the international rankings, with only one in the top 200. This is not a result of the absence of public funding of education, where New Zealand ranks reasonably well. Rather, factors like a significant brain drain of skilled New Zealand citizens<sup>102</sup> (partly offset by strong migrant inflows) as well as the absence of an integrated skills and innovation strategy have contributed.

On innovation, New Zealand performs poorly for an advanced economy. There is low R&D spending as a share of GDP (by business and in total) and weak rankings on most index measures of innovation. Part of this is due to New Zealand's economic structure (high shares of agriculture and tourism) and the absence of large firms (that tend to be relatively R&D intensive). But, more importantly, research and innovation has not been treated as a policy priority; the focus has been on strengthening the overall business environment (macro policy, flexible labour and product markets) rather than building deep competitive advantage based on skills and innovation.

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<sup>102</sup> The OECD estimates that New Zealand has one of the highest shares of its skilled population living overseas (~24%).



## Skills policy

The discussion of skills focuses on the tertiary sector: universities, polytechnics and technical training, vocational education, and various private learning establishments. New Zealand includes all of these post-secondary institutions in a broad tertiary education strategy.<sup>103</sup> The six strategic priorities for the tertiary sector are:

- delivering skills for industry
- getting at-risk young people into a career
- boosting achievement of Maori and Pasifika
- improving adult literacy and numeracy
- strengthening research-based institutions
- growing international linkages (i.e. export education)

However, the ambition of these goals and the extent to which this is integrated into a coherent economic strategy is questionable.

The Tertiary Education Commission (TEC) is responsible for delivering against the tertiary education strategy; it delivers funding, negotiates budgets and investment plans, and monitors the various providers against quality standards.<sup>104</sup> The following discussion considers the key sectors in more detail:

- Universities

New Zealand has eight main universities, of which the University of Auckland is the largest and the only one in the top 200 of the global rankings. The bulk of university funding is delivered on a per-student basis. Universities receive about 40% of funding directly from the government, with the remaining income coming from student fees and from research grants/income. A relatively small amount is made available through contestable research funding (mission-led, often awarded to researchers rather than institutions). There have also been some small amounts of incremental funding for tuition subsidies in high need areas (science, agriculture, etc), but this funding tends to flow to students rather than to the institutions.

This results in an egalitarian approach to the university sector, with idiosyncratic research strengths that are more the result of specific researchers than a deliberate approach. New Zealand has eight good universities, but is unlikely to get a great university under the current

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<sup>103</sup> Ministry of Education: [www.education.govt.nz](http://www.education.govt.nz); Tertiary Education Strategy: [www.education.govt.nz/further-education/policies-and-strategies/tertiary-education-strategy/](http://www.education.govt.nz/further-education/policies-and-strategies/tertiary-education-strategy/) For overall statistics on the New Zealand education sector: [www.educationcounts.govt.nz/statistics](http://www.educationcounts.govt.nz/statistics)

<sup>104</sup> Tertiary Education Commission: [www.tec.govt.nz](http://www.tec.govt.nz)

funding model. This contrasts with Australia's decision to establish the Australian National University (ANU) as the leading research university in the country.

The recent policy emphasis has been on raising tertiary participation rates by reducing the financial burden on students, e.g. through free tuition for one year of study (just introduced) and interest free student loans for New Zealand-based borrowers, which now accounts for a substantial share of public education funding.<sup>105</sup>

Direct funding for research (or to fund institutions) is limited. However, there are some exceptions to this. For example, there is now dedicated funding for eight centres of excellence housed in several universities.<sup>106</sup> These institutions are arranged around clusters of researchers undertaking world-class research. The selection of these centres is largely based on the quality of the science, rather than on economic impact (or contribution to key sectors).

However, there are also an increasing number of contestable grants available for funding, including more that are 'mission-led' (connected to important challenges, some of which have economic implications).

- Vocational education

The New Zealand vocational education system is patchy. In terms of the structure, there are a large number of polytechnics and other private training establishments (that receive public funding once they are accredited). There are 11 'Industry Training Organisations' (ITOs) that act as intermediaries between employers and various tertiary education providers.<sup>107</sup> These work with the institutions to design courses that will provide the right skills, work with employers on workplace training, as well as set national skills standards.

Many of these training institutions are quite small, and many of the employers are also SMEs (New Zealand has a relatively small number of large firms).

The numbers of people undertaking vocational training have been dropping over the past few years, partly due to low unemployment rates, which have reduced the incentive to invest in further training. There are well-reported skills shortages in basic trades; immigration has been used as a way to fill some of these gaps – some of the most common occupations for skilled migrants include chefs, nurses, electricians, dairy workers, and so on. The large scale of migration creates a challenge because employers, particularly SMEs, are less inclined to invest in training local staff, e.g. through apprenticeships. There has been a 'buy not build' approach to training staff.

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<sup>105</sup> [www.education.govt.nz/news/details-of-fees-free-tertiary-education-and-training-for-2018-announced/](http://www.education.govt.nz/news/details-of-fees-free-tertiary-education-and-training-for-2018-announced/) Note that this policy is planned to be extended to free tuition for three years of tertiary education.

<sup>106</sup> [www.education.govt.nz/further-education/policies-and-strategies/centres-of-research-excellence-cores/](http://www.education.govt.nz/further-education/policies-and-strategies/centres-of-research-excellence-cores/) The current centres of research excellence are listed here: [www.tec.govt.nz/funding/funding-and-performance/funding/fund-finder/centres-of-research-excellence/current-cores/](http://www.tec.govt.nz/funding/funding-and-performance/funding/fund-finder/centres-of-research-excellence/current-cores/)

<sup>107</sup> [www.tec.govt.nz/teo/working-with-teos/itos/](http://www.tec.govt.nz/teo/working-with-teos/itos/)

Much of the government's policy focus over the past few decades has been on raising university participation rates, with less focus on vocational training. But the attitudes to vocational education are changing – as is the intensity of policy attention.

The government has recently proposed to 'establish a unified, coordinated, national system of vocational education and training.'<sup>108</sup> The proposals are:

- Redefined roles for education providers and industry bodies (Industry Training Organisations (ITOs)) to extend the leadership role of industry and employers;
- Bringing together the 16 existing ITPs as a one entity with the working title of the New Zealand Institute of Skills & Technology with a robust regional network of provision; and
- A unified vocational education funding system

## Innovation policy

New Zealand has not prioritised research and innovation at the policy level, and there are several constraints on firm investment in innovation (small scale of the market, small firm size, and the key economic sectors that tend not to be R&D or technology intensive). There have not been meaningful efforts to use research and innovation to transform New Zealand's economic structure. New Zealand's total R&D spending (and business R&D spending) is low relative to other small advanced economies.

The Ministry of Business, Innovation & Employment (MBIE) is the lead government agency that is responsible for science and innovation policy.<sup>109</sup> It notes that '*The science and innovation systems are critical to boosting the number of knowledge-intensive, internationally-connected firms. We are working to lift business expenditure on research and development, improve the benefits to the wider economy from business development assistance, and harness the potential of the digital economy*'. There is also a National Statement of Science Investment, 2015-2025, but this is not clearly linked to broader economic policy.<sup>110</sup>

Much of the direct government funding for R&D is channelled through universities and Crown Research Institutes. There are 7 Crown Research Institutes, which undertake applied research in areas that are linked to demand (most are related to the primary sector).<sup>111</sup> Most of these Institutes can trace their existence back for several decades through multiple organisational forms. They are 'each aligned with a productive sector of the economy or a grouping of natural resources'.

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108 [www.beehive.govt.nz/release/new-future-work-skills-training-nz](http://www.beehive.govt.nz/release/new-future-work-skills-training-nz)

109 [www.mbie.govt.nz/science-and-technology/science-and-innovation/](http://www.mbie.govt.nz/science-and-technology/science-and-innovation/)

110 <https://www.mbie.govt.nz/science-and-technology/science-and-innovation/funding-information-and-opportunities/national-statement-of-science-investment/>

111 [www.mbie.govt.nz/science-and-technology/science-and-innovation/agencies-policies-and-budget-initiatives/research-organisations/cri/](http://www.mbie.govt.nz/science-and-technology/science-and-innovation/agencies-policies-and-budget-initiatives/research-organisations/cri/)

There is also a research funding institution (Callaghan Innovation), which provides direct funding and support to growth firms.<sup>112</sup> *'Our people – including more than 200 of New Zealand's leading scientists and engineers – empower innovators by connecting people, opportunities and networks, and providing tailored technical solutions, skills and capability development programmes, and grants co-funding.'*

There are some target sectors for this research funding, but this is not driven by an overall perspective on how best to position New Zealand for competitive success. Public funding for innovation is largely bottom-up, with research support being delivered to firms largely through tax credits (who can deduct R&D expenditures against income). By its nature, this method of funding is not deliberately focused on priority sectors – it is an attempt to respond to market forces.

One of the ongoing challenges with New Zealand's innovation intensive firms is that they frequently relocate offshore once they get to a certain scale, sometimes because of acquisition by a foreign firm. Although policy attempts have been made to deepen venture capital and private equity markets, the supply of risk capital remains limited.<sup>113</sup> The absence of clusters with non-replicable characteristics makes the international exit of innovative firms and talent much more likely.

## Strategic integration

Overall, there is relatively limited integration of New Zealand's skills and innovation policy. The education system is highly devolved, with relatively limited ability to shape or steer the system. For example, funding follows students in the tertiary education system with little institutional funding. And although the Ministry of Education is the lead advisor on the overall education system, and is responsible for the overall strategic direction of the education sector, its ability to direct the system is limited because many of the institutions in the sector have measures of autonomy or independence. It is not actively involved in shaping the course offerings of universities in a meaningful way (for example, investing to increase the supply of courses in areas of strategic importance).

And in terms of innovation, much of the funding for R&D is either directed to research institutions on the basis of research excellence or in a general way through the tax system. Direct funding of research priorities is relatively limited. These institutional characteristics constrain the extent of strategic interaction between skills and innovation policy.

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<sup>112</sup> [www.callaghaninnovation.govt.nz/](http://www.callaghaninnovation.govt.nz/)

<sup>113</sup> <https://www.nzvf.co.nz/>

But the more fundamental constraint is the absence of an explicit statement of economic strategy, with a coherent view on the role of skills and innovation and the nature of the strategic priority areas. Different agencies are involved, with different approaches and objectives. And even when there is coordination it is more operational than strategic in nature. This reflects a philosophical choice in New Zealand economic policy that the government should create a supportive overall environment, but not get involved in deliberate shaping.

The default policy emphasis is on market forces – with government funding following decentralised choices made by students, firms, and so on. This is designed to deliver an efficient, responsive system – but means that there is little strategic content to skills and innovation policy. This devolved approach makes it more difficult to drive deliberate change.

There is limited integration or coordination of skills and innovation policy. There are some aspects that are interesting (such as the centres for research excellence) but for the most part this approach is relatively under-powered. The return on investment from the investments made in the sector is likely to be limited relative to a more joined up strategy.

## Current issues

There are some early indications of more attention being paid to the impact of disruptive technology on the future of work, and the need to update skills and education policy in order to meet these changes. For example, the New Zealand Productivity Commission has just been mandated to undertake an inquiry on technology and the future of work.<sup>114</sup> This creates the potential for a more focused, coherent economic strategy – around responding to the changing nature of work, emerging technologies; and hopefully related to a sense of New Zealand's competitive advantage.

There is a commitment to increased R&D spending and innovation, although this is not yet material and had been captured in the context of a sustained economic strategy.

And there are changes underway to the vocational training sector, with proposed reforms currently out for consultation.<sup>115</sup> These respond to concerns about the financial sustainability of many of the institutions, the extent to which they are delivering quality outcomes, and the responsiveness to industry.

But the main elements of the skills and education system look set to remain in place. For the most part, the focus is on access (for example, the recent decision to introduce free tuition) and on making the system efficient. There is talk of responsiveness to industry demands, but the system is fragmented and sub-scale (as are many of the firms and industry groups), which makes it more challenging to deliver strategic coherence.

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<sup>114</sup> <https://www.productivity.govt.nz/inquiry-content/3960?stage=1>

<sup>115</sup> <https://conversation.education.govt.nz/conversations/reform-of-vocational-education/>

## Key insights

New Zealand has some contextual similarities with Northern Ireland: both economies have been subject to meaningful amounts of brain drain over the past few decades as disparities have opened up in terms of per capita income levels with neighbouring economies; both have significant parts of the economy in areas of relatively low knowledge intensity (such as tourism); and both are in need of economic transformation.

New Zealand illustrates the limitations of a decentralised system that follows firm and individual decision-making. This can create an efficient, responsive system – but it is more appropriate for a large, diversified economy than a small economy in which there is a stronger need to build core areas of strength and critical mass. This requires a more deliberate shaping of the system. However, there is no explicit economic strategy, in which priority areas of the economy are identified – and there is no deliberate targeting of sectors.

New Zealand delivers some adequate outcomes, but it does not organise skills and innovation policy in a coherent fashion to drive an economic strategy. There are some useful specific aspects of skills policy, but it is more a story of missed potential in terms of the absence of a coherent strategy. There are some positive developments, but there is still substantial divergence in economic, skills, and innovation outcomes relative to high-performing small advanced economies.

## SCOTLAND

### Outcomes

In terms of per capita income, Scotland is near the bottom of the small advanced economies group, just below the full UK, at about 80% of the small economy median (the Netherlands). However, compared to many other regions in the UK, Scotland performs well. For example, Scotland's gross value added (GVA) per capita is 25% above that of Northern Ireland. The only regions in the UK with a higher GVA than Scotland are London and the south east of the UK. Scotland's GVA per capita, expressed in nominal terms, is about 93% of the full UK.<sup>116</sup>

In terms of GDP growth, Scotland has tracked UK GDP growth reasonably closely over much of the past two decades – with the marked exception of the past few years when Scotland's GDP growth has weakened sharply. However, there has been a consistent gap between Scotland's GDP growth rates and that of other small advanced economies.

Scotland's relatively low per capita income is largely a labour productivity story. Scottish Government estimates are that labour productivity (on an hours worked basis) is 96% of that of the full UK, which places Scotland towards the bottom of the small economy average. The contribution from hours worked per capita is in line with the small economy average. More encouragingly, about 70% of Scotland's 1.4% average GDP growth rate since 2000 has come from labour productivity growth – which is also in line with comparable small advanced economies.

Scotland's export share is in line with other small advanced economies when calculated as a stand-alone economy. Exports to the UK are about 30% of GDP and exports to the rest of the world account for another 20%, for a total of around 50% of GDP. This export share is in line with several other small European countries.

Scotland's performance on skills, as measured by the OECD's PISA surveys of maths, reading and science, is towards the bottom of the small advanced economy group – indicating that there is room for improvement.

On innovation, Scotland is in the bottom third of the small advanced economy group in terms of R&D spending, at 1.5% of GDP in 2016. This partly speaks to the economic and company structure of Scotland; a relatively small base of manufacturing and a relatively small number of large firms. The R&D spending in higher education institutions, however, is relatively high: Scotland ranks 5th in the OECD on this measure. Scotland has a strong university sector, with four universities in the top 200 worldwide: Edinburgh, Glasgow, Aberdeen, and St Andrews.

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<sup>116</sup> Note that using National Accounts data, which uses a different methodology, Scotland's GDP per capita was 99% of the full UK in 2016.

However, Scotland has produced some start-ups, such as SkyScanner, and there is more recent evidence around innovation in digital and fintech. Scotland also has competitive strengths in knowledge intensive activities (e.g. branding, creative industries) that are not as technology intensive.

## Skills policy

Education is devolved to Scotland.<sup>117</sup> Education Scotland is the key agency responsible for the compulsory education sector.<sup>118</sup> The Scottish Funding Council is responsible for the funding of colleges and universities, as well as supporting research and innovation in the tertiary sector (and also for monitoring outcomes).<sup>119</sup> Scotland keeps university tuition free for Scottish and EU students, which positions Scotland well; some of these students stay on in Scotland after graduation.

In terms of strategic policy statements, Scotland's skills strategy dates from 2010.<sup>120</sup> Much of the policy focus expressed in successive Programmes for Government has been on extending access to various levels of education, as well as improving outcomes.<sup>121</sup> Similarly, the first objective in the 2015 Economic Strategy statement was to 'Invest in Scotland's people at all stages of life to ensure that we have a well skilled, healthy and resilient population and an innovative, engaged and productive workforce'.<sup>122</sup>

Skills Development Scotland is responsible for delivering modern apprenticeships; needs a view on demand and supply of different qualifications, and ensuring that funding is appropriately targeted.<sup>123</sup> This now extends to greater skills investment planning for sectors and regions. There is also some involvement in career guidance, active labour market policy.

There is an increasing focus on work based learning, particularly apprenticeships.<sup>124</sup> Relatedly, there is greater involvement of employers in the design and delivery of vocational training; although this is at an early stage. Note that apprenticeships in Scotland are designed in different way than in the rest of the UK.<sup>125</sup> The Scottish Apprenticeship Advisory Board provides employer leadership and contributes to the development of apprenticeships in Scotland.<sup>126</sup>

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117 <https://www.gov.scot/education/>

118 <https://education.gov.scot/>

119 <http://www.sfc.ac.uk/>

120 *Skills for Scotland: Accelerating the Recovery and Increasing Sustainable Economic Growth, 2010.*

121 <https://www.gov.scot/programme-for-government/>

122 <https://www.gov.scot/publications/scotlands-economic-strategy/>

123 <https://www.skillsdevelopmentscotland.co.uk/>

124 <https://beta.gov.scot/policies/young-people-training-employment/>

125 <https://www.gov.scot/publications/scottish-apprenticeships-seven-things-you-need-to-know/>

126 <https://www.skillsdevelopmentscotland.co.uk/what-we-do/partnerships/the-scottish-apprenticeship-advisory-board/>



## Innovation policy

Innovation policy is not fully devolved to Scotland (e.g. some research funding and programme design is UK-wide). There are several statements of intent with respect to innovation policy in Scotland. For example, the 2015 Economic Strategy noted the following objectives:

- Support the development of highly innovative businesses across the Scottish economy;
- Encourage more of Scotland's diverse business base to engage in innovation and research and development as part of their day-to-day activities;
- Continue to support the high-impact, world-class research of Scotland's Universities and improve levels of commercialisation of academic research;
- Develop with key partners, such as business organisations and trade unions, innovative approaches to developing progressive workplace practices; and
- Develop and deliver new approaches to public service reforms and make better use of our public procurement to drive innovation

And a recent process involving industry, government, academics, and so on generated an 'Innovation Action Plan For Scotland' (published in 2017).<sup>127</sup> This made a series of recommendations about the importance of supporting the growth of scale-up businesses, and identified some key sectors on which focus should be placed (such as digital, fintech, and manufacturing).

Scottish universities provide an anchor for the research and innovation ecosystem; very well-ranked, attract top students and faculty. HERD is high, scientific output is ranked well, but business R&D spending is low. Scotland is transitioning to more applied research; in addition to a well-performing public sector research system, there is increased focus on commercialising this research.

The Scottish Funding Council is supporting a network of Innovation Centres in partnership with Scottish Enterprise and Highlands and Islands Enterprise.<sup>128</sup> These Centres are collaborations between universities and businesses to enhance innovation. There are eight Innovation Centres to date, focusing on: Stratified Medicine, Sensors and Imaging Systems, Digital Health, Industrial Biotechnology, Oil and Gas, Big Data, Construction, and Aquaculture.

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<sup>127</sup> <https://cando.scot/about/>

<sup>128</sup> <http://www.sfc.ac.uk/innovation/innovation-centres/innovation-centres.aspx>

In terms of the broader innovation ecosystem, a National Investment Bank has recently been established (legislation was tabled in February 2019).<sup>129</sup> *‘Scottish Ministers will set out major priorities for investment “missions” which address major societal challenges in order to achieve transformative and inclusive change. This will allow us to create and shape future markets and help define how our economy develops. The Scottish National Investment Bank will be a public body but will operate commercially and be operationally and administratively independent from government’.*

A £2 billion commitment over 10 years has been made to capitalise the Scottish National Investment Bank. *‘By aligning its aims and objectives with Scotland’s Economic Strategy, the Bank has the potential to transform and grow Scotland’s economy.’*

## Strategic integration

The constraints on the powers that are devolved to Scotland necessarily add complexity to the task of strategic integration of skills and innovation policy. As one example, the Apprenticeship Levy is imposed on all of the UK – and Scotland had little role in shaping it. And research funding and policy design is constrained.

However, even beyond that, skills and innovation policy have not been fully integrated. Although these various strategy documents both identified skills and innovation as important elements in the overall economic policy agenda, they did not provide a sense of meaningful integration: the discussion was more about identifying useful initiatives in each of the respective policy domains.

But the direction of travel is towards a more deliberate, strategic approach to economic policy. One notable development was the recent Enterprise and Skills Review, which ran from 2016-2017. This Review deliberately aim to align and co-ordinate the activities of Scotland’s enterprise and skills agencies: Scottish Enterprise, Highlands and Islands Enterprise, Skills Development Scotland and the Scottish Funding Council.

An Enterprise and Skills Strategic Board was created in November 2017 in response to the Enterprise and Skills Review.<sup>130</sup> The Strategic Board seeks to maximise the impact of the collective investment that Scotland makes in enterprise and skills development, and to create the conditions that are conducive to delivering inclusive and sustainable growth.

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<sup>129</sup> <https://www.gov.scot/policies/economic-growth/scottish-national-investment-bank/>

<sup>130</sup> <https://www.gov.scot/groups/enterprise-and-skills-strategic-board/>

In the same spirit, the innovation strategy process discussed above, noted that *‘We need to simplify the innovation landscape and deliver optimal alignment between our innovation approach and the Scottish Government Economic Strategy, in order to maximise the impact of public sector support for innovation, and, in doing so, to make a greater contribution to meeting the needs of Scotland’s economy and society, such as in tackling climate change and delivery of low carbon, cost effective and sustainable energy supplies, or supporting ‘fintech’ innovation in financial services’.*

The Scottish Government’s Economic Action Plan 2018-2020 also integrates a range of policy domains, including skills and innovation policy.<sup>131</sup> And the recently released export strategy will also likely support a measure of integration.<sup>132</sup> It notes that ‘successful exporting countries specialise in a limited range of goods and services’ and identifies Scotland’s export sectoral strengths as ‘food & drink; engineering services & manufacturing; life & chemical sciences; technology, digital & media; financial & business services and energy’.

Similarly, the SNP-sponsored Sustainable Growth Commission work identified skills and innovation as a priority area for transforming the Scottish economy.<sup>133</sup> This included a discussion of the importance of developing deep areas of competitive advantage in strategic priority sectors.

## **Key insights**

The Scottish experience shows that progress can be made even in the context of constraints on devolved powers. Indeed, aspects of the skills and innovation agenda can be a way of distinguishing Scotland from the rest of the UK.

And although integration of skills and innovation is challenging, there is some evidence that Scotland is making progress.

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<sup>131</sup> <https://economicactionplan.mygov.scot/>

<sup>132</sup> *A Trading Nation: A plan for growing Scotland’s exports*, April 2019.

<sup>133</sup> *Sustainable Growth Commission*, May 2018.

## SINGAPORE

### Outcomes

Singapore has placed skills and innovation at the centre of its economic strategy over the past several decades, and this is reflected in the economic outcomes that it has generated. The Singapore economy has grown very strongly since independence in 1965, moving to become one of the richest countries in the world ('from third world to first').

This was due to a combination of labour force growth (natural demographics as well as high rates of inward migration) as well as strong productivity catch-up (as foreign capital and practices were imported). Singapore relied heavily on a particular model of economic development, positioning itself as a business friendly hub for inward direct investment. Inward FDI is ~400% of GDP, and total exports are ~180% of GDP.

A key part of this economic strategy was upgrading the quality of the workforce as the economy developed and became increasingly sophisticated (including importing foreign talent with appropriate skills) as well as a focus over the past two decades of building deep innovation capability. Singapore was – and is – distinctive in the region (and beyond) for the strength of its skills and innovation capability.

Singapore's GDP growth rates are moderating now, due to an aging population, reduced migration inflows, and fewer opportunities for productivity catch-up (as Singapore is already at the income frontier). The focus of its economic strategy is now on raising productivity, largely through an increased focus on skills and innovation (in the context of specified growth sectors, and a sense of how Singapore will compete).<sup>134</sup>

Singapore already has impressive skills and innovation outcomes. In terms of skills, Singapore has some of the highest PISA scores in the world, and ranks very strongly on multiple measures of human capital. At tertiary level, Singapore now has two very highly-ranked universities that have moved up the international rankings very quickly. And in addition to the skills generated through the education system, Singapore imports many highly skilled migrants (in addition to many lower-skilled workers for sectors such as construction and retail).

In terms of innovation, an increasing amount of government resourcing is flowing into innovation. R&D spending has increased rapidly (currently 2.2% of GDP), and is expected to continue to grow. Singapore also scores very well on various summary measures of competitiveness and innovation, such as the Global Innovation Index and the Global Competitiveness Report. However, this effort remains top-down – and the ratio of innovation outcomes to inputs (like R&D spending) remains relatively weak. But Singapore is moving in the right direction, and doing so with aggression.

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<sup>134</sup> *Economic Strategies Committee, 2010; Committee for the Future Economy, 2017.*

## Skills policy

There are several ministries and agencies that have responsibility for skills in Singapore. The Ministry of Education is the lead government agency responsible for the overall shaping of the education system, from pre-school through to universities and vocational training. Workforce Singapore supports training and advice for people in the workforce. And the Ministry of Manpower is responsible for labour market issues, including oversight of employment passes for foreigners.<sup>135</sup>

Singapore's compulsory education system has a few particular characteristics that are worth noting. It generates very strong outcomes, particularly in maths and science. But it is heavily streamed, with a focus on testing. A rite of passage is the PSLE (Primary School Leaving Exam), taken at the end of primary school (~12 years old), which determines the secondary school that you can go to. Public secondary schools range widely from the elite to the average; and all Singapore citizens have to attend public schools, private schools are only available for foreign citizens.

Note also that the Singapore culture around education reinforces the approach to compulsory education: education is highly valued, and many families invest heavily outside of the formal school system in external tuition to improve performance. Singapore's strong educational outcomes are not simply due to the characteristics of the formal education sector.

The focus of the post-secondary education system in Singapore has been universities.<sup>136</sup> Singapore has had two leading universities, although there are now several more. These have high quality standards; the focus is on quality rather than access. Studying abroad or in one of the local campuses of foreign universities is a popular among students with average grades.

These two top universities have moved rapidly up the rankings – two in the top 10 in Asia (National University of Singapore and Nanyang Technology University). There are particular strengths in sciences. The government deliberately uses these universities to build strengths and capabilities, in order to advance its strategic economic policy agenda. Two more recently-established universities, Singapore Management University and Singapore University of Technology & Design, respond to perceived gaps.

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<sup>135</sup> [www.moe.gov.sg](http://www.moe.gov.sg); [www.wsg.gov.sg/adapt-and-grow.html](http://www.wsg.gov.sg/adapt-and-grow.html); [www.mom.gov.sg](http://www.mom.gov.sg);

<sup>136</sup> [www.moe.gov.sg/education/post-secondary](http://www.moe.gov.sg/education/post-secondary)

There is also a stronger focus on vocational education and reducing the emphasis on universities (for example, by putting more resources into technical institutes). The government is explicitly learning from countries with established apprenticeship/vocational educational schemes like Switzerland. This will be an ongoing area of focus for the government.<sup>137</sup> There is a deliberate attempt to change social norms with respect to the status of vocational education relative to universities. These themes have been a staple of Ministerial speeches over the past several years.<sup>138</sup>

The Singapore government is also responding to the changing nature of work, and a sense that lifelong learning is becoming increasingly important. In this regard, it has recently established the SkillsFuture programme.<sup>139</sup> A key element of this is the SkillsFuture Credit scheme, in which citizens aged 25 and older will receive a \$500 voucher to enrol in courses to upgrade their skills. This enables people at different stages of their career to acquire new skills, often in short-form courses (there is significant flexibility in the courses that qualify for this scheme). Other programmes include subsidies for workers and employers, when working adults switch careers.

More generally, Singapore has long worked to develop a highly responsive and high quality skills system. For example, Singapore's Sectoral Manpower Development plans, and strong policy focus on encouraging lifelong learning.<sup>140</sup>

## Innovation policy

Singapore has a well-developed innovation system, with senior leadership – reflecting its importance to Singapore's overall strategic agenda. In terms of direct funding and guidance for research and innovation, the peak body is the National Research Foundation (NRF).<sup>141</sup> This is located in the Prime Minister's Office, and is chaired by the Prime Minister. The NRF Board comprises senior Ministers and officials, and has an advisory board of senior private sector executives (from Singapore and offshore) as well as senior academics/researchers.

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137 This is a useful recent speech on the policy approach by the Education Minister: [www.gov.sg/microsites/budget2018/press-room/news/content/speech-by-mr-ong-ye-kung-minister-for-education-committee-of-supply-debate-2018](http://www.gov.sg/microsites/budget2018/press-room/news/content/speech-by-mr-ong-ye-kung-minister-for-education-committee-of-supply-debate-2018)

138 Refer this 2012 speech by the Prime Minister setting out a changed policy approach: [www.pmo.gov.sg/newsroom/speech-prime-minister-lee-hsien-loong-official-opening-ite-headquarters-and-ite-college](http://www.pmo.gov.sg/newsroom/speech-prime-minister-lee-hsien-loong-official-opening-ite-headquarters-and-ite-college)

139 This was announced in the 2015 Budget speech: [www.singaporebudget.gov.sg/budget\\_2015/BudgetSpeech.aspx](http://www.singaporebudget.gov.sg/budget_2015/BudgetSpeech.aspx) For more information, refer [www.skillsfuture.sg/](http://www.skillsfuture.sg/)

140 Note the activities of Workforce Singapore: <https://www.ssg-wsg.gov.sg/> Sectoral Manpower Development Plans can be seen at: <https://www.ssg.gov.sg/programmes-and-initiatives/manpower-lean-productivity/sectoral-manpower-plan.html>

141 [www.nrf.gov.sg](http://www.nrf.gov.sg)

*‘The NRF sets the national direction for research and development (R&D) by developing policies, plans and strategies for research, innovation and enterprise. It also funds strategic initiatives and builds up R&D capabilities by nurturing research talent. The NRF aims to transform Singapore into a vibrant R&D hub that contributes towards a knowledge-intensive, innovative and entrepreneurial economy; and make Singapore a magnet for excellence in science and innovation’.*

The guiding document for the NRF is the ‘Research Innovation Enterprise 2020 Plan’.<sup>142</sup> This Plan allocated S\$19b of funding between 2016 and 2020 to pursue strategic priorities. Four focus areas were identified: Advanced Manufacturing & Engineering, Health & Biomedical Sciences, Services & Digital Economy, and Urban Solutions & Sustainability; together with three supporting ‘horizontals’ – Academic Research, Innovation & Enterprise, and Manpower.

The Research, Innovation and Enterprise Council most recently met in March 2019, and agreed on the latest tranche of funding: an additional S\$500m into expanding critical digital capabilities, S\$80m into developing cell therapy manufacturing capabilities, and up to S\$144m into sustainable urban food production, future foods, and food safety science & innovation.<sup>143</sup>

There are several other institutions in Singapore’s innovation system. The Agency for Science, Technology and Research (A\*STAR) bridges *‘the gap between academia and industry in terms of research and development. In these endeavours, we seek to integrate the relevant capabilities of our research institutes and collaborate with the wider research community as well as other public sector agencies towards meaningful and impactful outcomes. Together with the other public sector entities, we develop industry sectors by:*

- integrating our capabilities to create impact with Multi-National Corporations and Globally Competitive Companies;
- partnering Local Enterprises for productivity and gearing them for growth; and
- nurturing R&D-driven Start-ups by seeding for surprises and shaping for success’<sup>144</sup>

A-STAR focuses on several key sectors, at the intersection of research capability and private sector activity. For example, electronics, engineering, medical technology, infocomm, and pharmaceuticals and biologics.

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<sup>142</sup> [www.nrf.gov.sg/rie2020](http://www.nrf.gov.sg/rie2020)

<sup>143</sup> [www.nrf.gov.sg/docs/default-source/modules/pressrelease/11th-riec-press-release.pdf](http://www.nrf.gov.sg/docs/default-source/modules/pressrelease/11th-riec-press-release.pdf)

<sup>144</sup> [www.a-star.edu.sg/language/en-SG/Home](http://www.a-star.edu.sg/language/en-SG/Home)

There are also a broad range of initiatives, agencies, and funding programmes, that bear on innovation. The Economic Development Board is responsible for attracting FDI into Singapore, a major engine of the Singapore economy. Many of the target firms are in knowledge and innovation-intensive activities. Enterprise Singapore works with local Singapore firms looking to expand, often on the back of innovation. There is substantial fiscal support.<sup>145</sup> The central bank, the Monetary Authority of Singapore, has taken a leading role in creating a regulatory environment supportive of innovation in fintech.<sup>146</sup> SG Innovate is a government-owned firm nurturing deep tech start-ups in Singapore.<sup>147</sup> Together, these activities have positioned Singapore as a major hub for venture capital and innovation in the region.

## Strategic integration

Singapore is a very good example of how skills and innovation policy is integrated into overall economic strategy, and how these are adapted over time in response to a changing context (technology, new competition, changed direction in the economic strategy)

There are three levels at which this is the case. First, human capital has played an integral part of Singapore's economic development strategy over the past several decades. Skills and innovation policy is designed to support the specific priorities of Singapore's economic strategy, which are often sectoral in nature).

For example, the Committee for the Future Economy document identified skills and innovation as important priorities for Singapore. The supply of skills (and innovation) is linked to a broader strategy of building new competitive strengths in the Singapore economy, and has a strong demand-side focus. Many of the recommendations to lift growth and productivity were organised around sectors. 'Industry Transformation Maps' were prepared for 23 sectors, subsequently organised into 6 clusters.<sup>148</sup>

Second, the focus on upgrading for the changed nature of work, new technologies and activities, spans a broad range of policy activities: from education and skills policy, to migration policy, and labour market policy. And there is a clear focus on the emerging skills that will be required to remain an innovative, knowledge-led economy. Note that this upgrading of the workforce has been ongoing consistently for several decades, adapting to reflect changing challenges and opportunities.

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<sup>145</sup> [www.edb.gov.sg](http://www.edb.gov.sg); [www.enterprisesg.gov.sg](http://www.enterprisesg.gov.sg)

<sup>146</sup> For example: [www.mas.gov.sg/News-and-Publications/Speeches-and-Monetary-Policy-Statements/Speeches/2018/Singapore-FinTech.aspx](http://www.mas.gov.sg/News-and-Publications/Speeches-and-Monetary-Policy-Statements/Speeches/2018/Singapore-FinTech.aspx)

<sup>147</sup> [www.sginnovate.com/](http://www.sginnovate.com/)

<sup>148</sup> <https://www.mti.gov.sg/ITMs/Overview>



The third level at which skills and innovation is coordinated is in terms of the various stakeholders. One element of this, particularly important with respect to education and skills, is the tripartite system.<sup>149</sup> The Singapore government works actively with unions and businesses in a formal tripartite system, which allows for communication and engagement. This has been around since the early days of Singapore, and the standing platforms are an effective coordination mechanism between the government, business and labour. In Singapore, there is a grey line between these various institutions – with current or former government officials taking senior positions in the union movement, as well as in large government-linked companies. But this tight network allows for multiple stakeholders to work together well.

One recent example in the innovation space is the establishment of the Council for Skills, Innovation and Productivity, which contains members from business, unions, civil society, as well as officials and Ministers.<sup>150</sup> This is also the case for the Future Economy Council, which has oversight over the implementation of the recommendations from the Committee for the Future Economy process.<sup>151</sup>

Note also the numerous advisory boards that comprise leaders of government, research institutions, and the private sector – including many from foreign MNCs operating in Singapore. This provides Singapore with insights and perspectives on global dynamics, as well as a sense of the emerging needs of industry, and supports strategic integration.

## Current issues

There are a few strands of current debate and activity in Singapore's skills and innovation system.

First, as discussed, there are aggressive efforts to focus the skills and innovation system on growth sectors and new technologies – as well as to future proof it. This can be seen at multiple levels of the education sector: from secondary schools, to universities and tertiary institutions, to vocational and ongoing learning.

There is investment in forecasting skills supply and demand; trying to understand what the new skills and competencies are. More generally note that Singapore invests heavily in futures thinking and scenarios, to develop insights into emerging dynamics to inform policy-making

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149 See: [www.mom.gov.sg/employment-practices/tripartism-in-singapore/committees-and-initiatives](http://www.mom.gov.sg/employment-practices/tripartism-in-singapore/committees-and-initiatives); [www.tripartism.sg/](http://www.tripartism.sg/);

150 [www.ssg-wsg.gov.sg/new-and-announcements/2016/20\\_May\\_2016.html](http://www.ssg-wsg.gov.sg/new-and-announcements/2016/20_May_2016.html)

151 [www.futureeconomy.sg/about/the-future-economy-council/](http://www.futureeconomy.sg/about/the-future-economy-council/)

There is also significant activity around the Smart Nation initiative, which involves a range of activities from the use of big data in the government, to acting as a testbed for new technologies, to actively building innovation ecosystem in Singapore.<sup>152</sup> The government will sometimes fund new courses in areas of strategic priority (for example, the Smart Nation initiative in Singapore is informing priority areas for universities).

Second, there is a rebalancing of the emphasis between academic and vocational training: this recognises that there are ‘multiple pathways’ to advancement. The government is trying to reorient the education system towards softer skills, build in more flexibility. Singapore has placed a heavy emphasis on academic credentials (which is reinforced in the culture), and it is now trying to alter this to place more importance on soft skills. This reflects an understanding that jobs, and the nature of work, are likely to change very substantially over the coming years.

Third, changing the incentives away from low-cost (foreign) labour and adopting a Singapore First approach to hiring. Singapore has relied heavily on foreign workers: both for industries like construction as well as highly skilled talent. But there is a deliberate shift in policy. Restrictions have been imposed to give Singapore citizens an advantage (jobs have to be advertised to locals first). But this is done in a targeted way. This is partly to shift the incentives towards productivity-enhancing investments (in training and technology) rather than a desire to protect Singaporeans.

## Key insights

Although Singapore is a very different economy from Northern Ireland, there are several insights from the Singapore policy approach and experience that are instructive.

First, the centrality of skills and innovation to the overall economic strategy. Although tax rates, infrastructure, the overall business environment, are important elements in national positioning, skills and innovation are vital to developing positions of competitive strength. The sustained intensity of policy focus as well as resourcing is a key part of the reason that Singapore has been able to converge rapidly to the per capita income frontier.

Second, the way in which skills and innovation strategy are deeply integrated into an overall economic strategy that is responsive to growth sectors, new challenges and opportunities, and so on. Growth sectors and clusters are identified, and this guides the focus of innovation policy as well as the focus of the investment in skills.

Third, the way in which the private sector (including MNCs) and unions are deeply involved in delivering skills and innovation. Although the government is the lead actor, this is done in concert with other stakeholders – drawing on their advice, and engaging with them in the delivery of the various policies and initiatives.

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<sup>152</sup> [www.smartnation.sg/](http://www.smartnation.sg/)

## SWITZERLAND

### Outcomes

Switzerland has one of the highest levels of per capita income in the world, and tops the small advanced economy group. Switzerland has been at or near the global income frontier for much of the past 200 years.<sup>153</sup>

Switzerland is routinely ranked as one of the most competitive economies in the world, because of a combination of strong policy foundations and very strong innovative capacity and business sophistication. Swiss exports and outward investment have been very high for a sustained period of time. Switzerland is a bottom-up, private sector driven economy; although it has a thoughtful government, the central government has a relatively limited role. The policy approach is much more about building on strengths rather than deliberately creating new areas of strength in a top-down way.

Central to Swiss economic success has been a well-diversified set of innovative firms. The innovative, internationally-oriented activities happen in large, well-established corporations (Nestle, Novartis, ABB, Swatch, Holcim, Swiss Re, and many others) as well as in the many small and medium-sized companies, often in highly specialised activities (such as precision engineering).<sup>154</sup>

These internationally-oriented firms are frequently embedded in dense, sophisticated clusters: finance, precision engineering (including watches), pharma, wealth management, and so on. The supporting firms and services in these clusters, and the deep networks and capabilities, are core to Swiss dynamism and resilience. It means that these activities are less likely to relocate after a shock (e.g. the CHF shock in 2015) and are able to respond to supply-side shocks (the watchmaking sector had access to the skills required to respond to the introduction of low cost quartz technology in the 1970s and 80s). Many Swiss clusters operate at world-class levels (high margin, niche production) and provide a hard to replicate ecosystem. This increases the stickiness of the Swiss economy, and provides economic resilience.

Switzerland is ranked very strongly on a wide range of measures of skills and innovation. It has strong PISA scores and high levels of human capital (including from foreign talent); and has high rankings on composite measures of innovation, including the level of investment by the private sector.

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<sup>153</sup> Landfall Strategy Group, 'On the performance and resilience of small economies: a long-term perspective', Analysis, November 2017.

<sup>154</sup> James Breiding, *Swiss Made: The untold story behind Switzerland's success*, Profile Books, 2013; <http://www.bloomberg.com/news/articles/2014-08-05/starbucks-secret-weapon-is-machines-from-sleepy-swiss-village>

## Skills policy

The key government agency is the Federal Department of Economic Affairs, Education and Research (EAER). Under this agency sit several agencies, including the State Secretariat for Economic Affairs (SECO) and the State Secretariat for Education, Research and Innovation (SERI).<sup>155</sup> This means that issues of skills and innovation are coordinated in the same Department, although much occurs at the cantonal level. There is also a Swiss Conference of Cantonal Ministers of Education, to coordinate cantonal level approaches (there are 26 cantons).

Switzerland publishes a Swiss Education Report every four years, in order to guide development of education and skills policy.<sup>156</sup> This provides a substantial amount of data, analysis, and commentary across the education and skills domain. All elements of the Swiss education and skills based system are instructive, but this discussion will focus on vocational and professional education and training (the university sector will be discussed under the innovation heading).

One of the most distinctive aspects of the Swiss skills system is the apprenticeship and vocational system. According to the Swiss Education Report: *'Upper-secondary education follows on from the period of compulsory education and includes both general and vocational (school-based or work-based) education and training. The largest group of young people in general education attends baccalaureate schools, with the second largest group going to upper-secondary specialised schools (FMS). In Switzerland, however, a clear majority of young people in their first year after compulsory school (just on 60% in 2011) attend a work-based (dual) VET course. Taking the dual and school-based forms of VET together, these add up to as much as two-thirds of the whole. Considerable differences exist between the cantons (higher in German speaking cantons than in French speaking cantons).'*

What currently distinguishes Switzerland from many other countries is the fact that pupils finishing their compulsory schooling have a choice of different educational formats to match their abilities, and that these educational options are all of a similar quality.

Switzerland provides a significant role to employers in system design and delivery, making education and vocational training highly responsive to labour market needs. There are strong pathways from vocational training to higher professional education, and into university education, which makes it more likely employers get the specialist skills they require. The IMD rank Switzerland as having the best apprenticeship system in the world.

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<sup>155</sup> <https://www.wbf.admin.ch/>; <https://www.seco.admin.ch/seco/en/home.html>; <https://www.sbfi.admin.ch/sbfi/en/home.html>

<sup>156</sup> <http://www.skbf-csre.ch/en/education-report/education-report/>

In addition, the Swiss Federal Institute for Vocational Education and Training SFIVET (an expert organisation for vocational education and training) provides training to VET professionals, conducts VET research, and contributes to the development of occupations.<sup>157</sup>

The system is designed in a way to make it incentive compatible for both firms and apprentices, but there is still meaningful variation in the firms that are willing to offer vocational training. For example, the Education Report notes that the rise in the number of self-employed people and of smaller firms is constraining the number of apprenticeships being offered. Training rates increase with firm size; 30% of firms with 1-9 employees, about 80% for firms with over 100 employees. The large number of large Swiss firms (including foreign MNCs) helps to make the vocational education training system work.

Company-based VET programmes, in particular, which account for the majority of programmes, are heavily dependent on economic trends (structural change and the economic climate), since these influence the number of firms that are potentially willing to offer apprenticeships.

In addition to these economic forces, the vocational education system seems to work particularly well in Switzerland because it is deeply embedded in the culture; norms make this work even for SMEs.

Because industry and firms are directly involved, changing economic realities are rapidly reflected in apprenticeships. This contrasts with a qualification-based system, where it may take some time for the educational institution to adjust the curriculum.

The VET system is jointly run by the Confederation, the cantons and professional organisations. All three partners are necessary. The nation-wide federal role reflects 'the fact that vocational and professional education and training is intended to train young people who will then be mobile throughout the Swiss job market ...and who are therefore dependent on the greatest possible degree of standardisation in their qualifications'. There are also advantages of scale, given that there are 230 types of apprenticeship.

The cantonal role supports alignment to the local job markets and assists with interaction with compulsory education and the other types of upper-secondary education (which is also arranged at the canton level). Professional organisations play a relative large role in the Swiss system. But this 'is more standardised than in countries where it is primarily the individual employers who carry great weight'. This ensures 'a high match between learning content and the skills required on the job market and, on the other hand, a high mobility of trainees on the job market'. 75% of public funding for vocational education comes from cantons, the balance from the Confederation.

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<sup>157</sup> <https://www.sfivet.swiss/>

In terms of continuing education space, this is largely privately-provided with a smaller role for the government: 'Employers and companies play a major role in provision: they organise nearly half of job-related CET themselves'. MGI note that 'Switzerland is already well positioned on adult training. In 2015, 89 percent of the companies in Switzerland supported further training courses and 44 percent of all employees in companies with at least ten employees took part in training courses'.<sup>158</sup>

## Innovation policy

Switzerland has a very strong university sector, with 7 universities in the top 200 worldwide. There are several types of universities in Switzerland: canton universities; federal institutes of technology (ETH Zurich and EPF Lausanne); and universities of applied sciences (UAS).<sup>159</sup> It is a very regional approach; cantons are the main funders of cantonal universities (with some support from the Confederation). The federal institutes of technology and the cantonal universities are focuses on fundamental research, whereas applied research takes place in the private sector and in the universities of applied science.

Much of the public research funding is directed to research activities at universities. Additional research funding is available through the Swiss National Science Foundation, including through National Centres of Competence in Research.<sup>160</sup> The focus is on scientific excellence, and it is not clearly linked to a strategic economic agenda. SERI notes that 'All funding measures are driven by a bottom-up approach, freedom to choose the research topics and a quest for excellence'.

There is a strong tradition of private sector engagement in the university sector. Switzerland has a total R&D spending of 3.4%, of which 2.2% is from business R&D spending (the highest in the small advanced economy group).

In terms of the broader innovation system, SECO is responsible for economic development, enterprise policy – but this is relatively hands off, focused on the business environment rather than industry policy. There are however several agencies that are support innovative Swiss firms to expand.

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<sup>158</sup> McKinsey Global Institute, 'The Future of Work: Switzerland's Digital Opportunity', October 2018.

<sup>159</sup> SERI, *Higher Education and Research in Switzerland*, 2018; <https://www.sbf.admin.ch/sbf/en/home.html>

<sup>160</sup> <http://www.snf.ch/en/Pages/default.aspx>

Innosuisse is the Swiss Innovation Promotion Agency (a federal entity); its role is 'to promote science-based innovation in the interests of industry and society in Switzerland'. *'Innosuisse especially promotes the partnership between academia and the market with innovation projects, networking, training and coaching, laying the groundwork for successful Swiss start-ups, products and services.'*<sup>161</sup> Innosuisse has a particular focus on working with SMEs in Switzerland. Innosuisse follows a bottom-up approach. Although there are five primary funding areas (ICT, Life Sciences, Engineering, Energy & Environment and Social Sciences & Business Management), there are no predefined topics.

Swissnex is an international network of Swiss science counsellors that maintain bilateral relations, observe science technology and innovation developments.<sup>162</sup>

## Strategic integration

At a governance level, the role of the federal government is relatively limited (compared to other small advanced economy governments). A substantial amount is devolved to cantons. And the multiple linguistic areas of Switzerland – particularly the gap between French and German speaking areas of Switzerland – also complicate strategic integration.

However, there is implicit integration, in that the parts of the system work together very well. Although there is no national economic strategy that identifies priority clusters, there is a bottom-up focus that is driven by the deep clusters that have established in the Swiss economy over many decades, and to which the skills and innovation system is responsive. The Swiss government (federal and cantons) invest heavily in skills and innovation, alongside the private sector, and the strong linkages with industry support the flow of these investments into parts of the economy where the returns are high.

It is a responsive system, with a tight relationship between the different agents in the system (government, industry, education and research institutions, and others). This delivers a relatively coherent, integrated system.

Government policy has played an important supporting role. For example, there has been strong commitment to investing in innovation (R&D spending, high quality research institutions); its vocational education system is world-class and its labour markets work effectively.

Switzerland's industrial structure has been developed over a long period, and is relatively mature. The Swiss innovation model has traditionally been incremental in nature. But there is an increasing policy focus on entrepreneurial activity, including elements of disruptive innovation (although frequently building on existing strengths, for example fintech). This activity is supported by the strong investments made in R&D and human capital, and well-functioning labour markets (including vocational education).

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<sup>161</sup> <https://www.innosuisse.ch/inno/en/home.html>

<sup>162</sup> <https://www.swissnex.org/>

## Current issues

As with other small advanced economies, it is likely that disruptive technologies will place significant pressure on the skills system in Switzerland. A recent McKinsey analysis estimated that 20-25% of jobs would be disrupted by automation and digital by 2030, with a roughly equal number of new jobs created.<sup>163</sup> McKinsey also estimate that 1.4 million jobs are dependent on the performance of six key export sectors (chemicals and pharmaceutical products; machines, appliances, and electronics; watches and precision instruments; financial services; and tourism). A response in these sectors will be needed.

## Key insights

The Swiss experience demonstrates the value of work-based learning, both for apprentices but also in an ongoing manner. This is supported by system design that creates strong incentives for participation by both firms and individuals.

Second, the deep clusters that have been developed in Switzerland support the complementary investments by firms and workers in specific skills and capabilities. This would be less likely to happen without this broader environment.

And third, the Swiss system is an example of a supportive government – that has a focus on skills and innovation – but where a significant amount of the leadership (in terms of investment and strategic integration) comes from the private sector and other social partners. Informal, bottom-up integration is possible in the context of well-developed, competitive clusters in the economy.

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<sup>163</sup> McKinsey Global Institute, 'The Future of Work: Switzerland's Digital Opportunity', October 2018.



## About the author

Dr David Skilling is the founding Director of Landfall Strategy Group, which was established in 2011. David advises governments, companies, and financial institutions in several small countries, and writes regularly on global economic and political trends from a small country perspective. Previously, David was an Associate Principal with McKinsey & Company in Singapore, as well as being a Senior Fellow with the McKinsey Global Institute. Before joining McKinsey, David was the founding Chief Executive of the New Zealand Institute, a privately-funded, non-partisan think-tank. Until 2003, David was a Principal Advisor at the New Zealand Treasury. David has a Ph.D. in Public Policy, and a Master in Public Policy degree, from Harvard University, as well as a Master of Commerce degree in Economics from the University of Auckland. David was named as a Young Global Leader by the World Economic Forum in 2008.

## About Landfall Strategy Group

Landfall Strategy Group is a Singapore-based research and advisory firm that provides advice on strategic issues to governments, firms, and financial institutions, particularly in small advanced economies. We provide distinctive perspectives on emerging global trends, working with decision-makers to understand key global changes and how governments, firms, and institutions should respond and position themselves in the emerging global economic and political environment.

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