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WHEN SMALL IS BEAUTIFUL

LESSONS FROM
HIGHLY-INNOVATIVE
SMALLER COUNTRIES

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Nesta...

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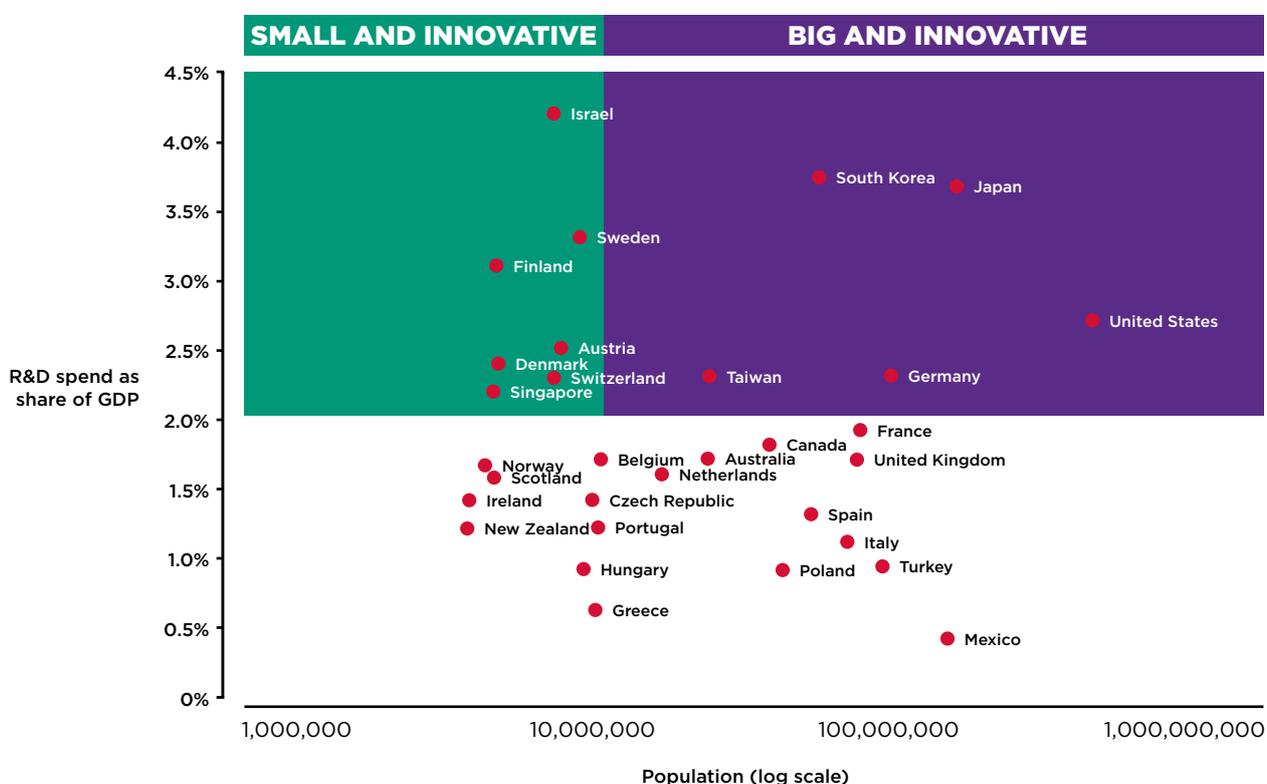
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1.

INTRODUCTION

When it comes to innovation, big countries loom large in the popular imagination. Asked which countries in the world are most innovative, the public tend to think of the US, sometimes Japan, Germany and South Korea, and perhaps the rising power of China.

But smaller countries can innovate too. Rankings of the world's most innovative countries often include not just the familiar giants, but also a handful of countries with populations of less ten million. Small countries like Finland, Israel, Singapore and the Scandinavian nations more than hold their own against bigger countries on a range of measures of innovation, from research and development investment to the adoption of new technologies.



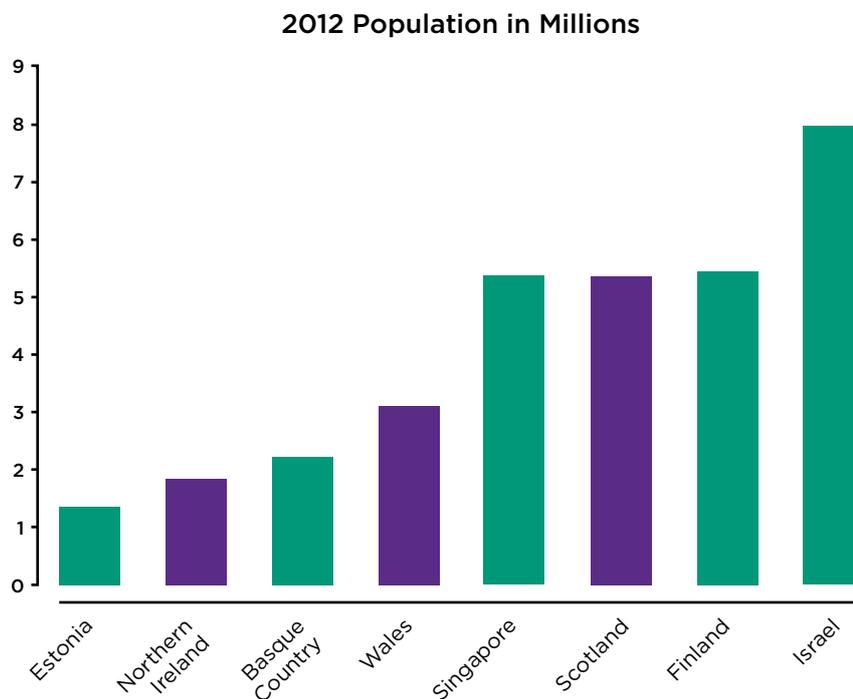
Note to chart: R&D is far from a perfect measure of a country's innovativeness, but is a useful starting point for comparison.

Being an innovation leader certainly seems to have paid off for the small nations that have managed it. Between 2007 and 2012, the average annual GDP growth rate for countries in the top left quadrant of the chart exceeded that of those in the bottom left quadrant of the chart by 3.4 percentage points (3.8 per cent versus 0.4 per cent; UK growth in this period was less than 2 per cent per year). It is no wonder innovation is an increasingly important element of the countries' economic plans. If the UK's constituent nations were to enjoy the higher growth rates of the small innovative nations in the future, it could, by 2019, be worth £12 billion per year in GVA for Scotland, and £5 billion per year for Wales or Northern Ireland.

INSEAD/WIPO/Cornell Global Innovation Index 2013		WEF Global Competitiveness Index 2013-2014		INSEAD Global Talent Competitiveness Index 2013	
Country	Rank	Country	Rank	Country	Rank
Switzerland	1	Switzerland	1	Switzerland	1
Sweden	2	Singapore	2	Singapore	2
UK	3	Finland	3	Denmark	3
Netherlands	4	Germany	4	Sweden	4
US	5	US	5	Luxembourg	5
Finland	6	Sweden	6	Netherlands	6
Hong Kong (China)	7	Hong Kong (China)	7	UK	7
Singapore	8	Netherlands	8	Finland	8
Denmark	9	Japan	9	US	9
Ireland	10	UK	10	Iceland	10

Of course, simply being a small country is not a guarantee of success. Crucially, these smaller innovative nations have generally not copied the strategies of their larger counterparts. Lacking large domestic markets, or the scale to be at the leading edge of research in every field, they have made the most of their existing advantages, and developed others.

This report looks at how innovation happens in five countries with populations of less than ten million, focusing on Finland, Estonia, Israel, Singapore and the Basque Country.



Source: World Bank/ONS

Five themes emerge from looking at these case studies: the importance of downstream innovation, not just basic research; openness to the world, its ideas and opportunities; a sense of national mission; a government whose wider policies support innovation and technology; and strong but flexible institutions to back this up.

The success of these nations is good news for the UK's smaller component countries and regions: it shows that innovation can and does drive significant prosperities in smaller countries that can make it work.

At the same time, it should give us pause for thought. In the past, much innovation policy in the UK and its component nations and regions has emulated aspects of the American innovation system. For example, UK policy has made a virtue of funding excellent scientific research and then hoping to profit from it by backing startups, and encouraging venture capital investment. At the same time, the innovation systems of successful smaller countries exhibit tensions – for example between cohesion and openness to the world – which any country seeking to emulate them will have to manage carefully.

So the lesson for the UK's smaller component countries is a mixed one: innovation is a powerful source of prosperity, and is certainly not the exclusive preserve of larger nations, but fostering it involves overcoming several challenges.

This report will examine the experience of five innovative countries in turn, identify some common themes, and then look at some of the opportunities and challenges these lessons present for Scotland, where the question of what the economic future holds is particularly topical given September's independence referendum.

2.

CASE STUDIES

FINLAND



In the early 1990s, Finland was in the grip of a deep depression. The decline of its traditional industries of paper and wood and the collapse of the Soviet Union, Finland's main trading partner, led to a dramatic decrease in economic output. Unemployment levels rose from 3 per cent in 1991 to nearly 20 per cent by 1994.

Since then, Finland has transformed into one of the most innovative and productive countries in the world. It became a world leader in electronics, led by the global domination of Nokia in the late 1990s and early 2000s. It invests heavily in R&D (over 3 per cent of GDP). Technology and gaming remain a key strength, even though Nokia is no longer the world's leader in mobile handsets. It has also built on a long-standing track record for innovative public services, such as the North Karelia Project, which used community incentives to dramatically reduce levels of heart disease,¹ or the country's habitual position at the top of the OECD's educational league tables.

Finland's transformation builds on a long-standing and widely held belief in the importance of innovation as part of the future direction of the country. The Finnish government put innovation at the heart of its response to the crisis of the early 1990s, maintaining spending on technology in the face of wider cuts. Since then, the level of research and development investment has increased by a factor of five,² buoyed by the ambitious R&D targets set by the government throughout the last 20 years. Notably, much of this increase has been driven by increasing amounts of R&D in the private sector.

Recognising the importance of capitalising on its research strengths, Finland has geared its public expenditure on R&D towards support of applied research and commercialisation. Thirty per cent of public funding, the highest individual share of the R&D budget, is directed towards support of commercially oriented applied research and development through Tekes, the Finnish Funding Agency for Innovation. Its technology programmes are designed to enhance research and development co-operation between different companies, public R&D institutes and international partners, transferring knowledge and skills along the way.³ Tekes have also set up Strategic Centres for Science, Technology and Innovation (SHOKS) in important sectors. With joint public and private funding, these encourage research and development in industry through collaboration.⁴



Aalto University's landmark auditorium acts as a focus for Finland's entrepreneurial and innovation drive.

Picture credit: Creative Commons

Innovation has been increasingly placed at the heart of government policy, with active coordination taking place at the highest level. The Research and Innovation Council, established in 1987, is chaired by the Prime Minister. It has the input of the Finance, Education and Employment Ministries which has encouraged a more systemic, whole-of-government approach. In 2008 Finland enshrined this

concept in its National Innovation Strategy, introducing a broad-based innovation policy that linked the innovation to the *“highest possible long-term benefits for the national economy and society”*.⁵

Such approaches have led to some interesting examples of innovation in delivering public services. Taltioni, an independent cooperative of health and social care providers who collaborate to provide new electronic healthcare services to Finns, aims to shift focus from treating diseases to promoting better health. Taltioni was set up and backed by SITRA, Finland’s National Fund for Research and Development.⁶

SITRA itself is an independent-minded, innovative project developer and funder with a somewhat more experimental role than Tekes. SITRA has, in the past, played a role in funding experimental innovation in a number of ways: as a venture capitalist making direct investments; as a backer of specific innovations in fields from healthcare to sustainability to design, and as a systems thinker developing ideas for the public good. Although it is linked to the Finnish state (it is supervised by the Finnish parliament and received its endowment – in the form of residual Nokia shares – from the Finnish government), it has a track record of independent thinking. Its role as a direct investor is shared by Finnish Industry Investment, a separate public entity providing risk capital.

Finland has also found ways to engage the general public in national conversation about the direction of the country. Finland Foresight, in 2012, asked citizens to come forward with ideas on Finland’s future, and the possibilities that lie ahead.

All this is underpinned by a coordinated market economy in which government and businesses are used to working together, with a highly-skilled, highly-paid workforce and a strong social safety net.

ESTONIA



When Estonia regained independence from the Soviet Union in 1991, only half the population had a phone line.⁷ Two decades later, Estonia is widely recognised as one of the most tech-savvy nations in the world. A new and young generation of politicians were quick to see how rapid expansion in new technologies could be used to mitigate Estonia’s apparent disadvantages: its small population, institutional newness, and shabby post-Soviet infrastructure.



Estonia has over 2,440 free certified Wi-Fi areas meant for public use, including at cafes, hotels, hospitals, schools, and petrol stations.

Picture credit: Creative Commons

Looking to their Scandinavian neighbours for inspiration, Estonia prioritised investment in technology. The results have been striking: a high rate of tech startups, investment by established multinational companies like Skype and world-leading electronic government systems.

Estonia achieved this by embedding innovation policy in the political mindset at the highest level. In 2000, the Estonian Parliament declared basic internet access as a human right, and embarked on an ambitious programme to give its population widespread and free access to wifi. It recognised the value of access to technology in

improving education outcomes and by 1998 the vast majority of schools had internet access. Estonia has continued to promote technology as part of its education policy, launching the ProgeTiger programme in 2012 to teach basic coding to five year olds.

Estonia has increasingly approached innovation as a cross-government policy, coordinated at the Prime Minister-led Science and Development Council. The 2007-13 Estonian Research and Development and Innovation (RDI) Strategy 'Knowledge-Based Estonia' seeks to propel Estonia towards a knowledge-based economy based on research and innovation that leads to the sustainable development of society. This whole systems approach can also be seen in the development of E-Estonia, the Estonian Government's world-leading integrated e-services developed from a partnership between government and the ICT sector. Starting with the introduction of ID cards in 2002, Estonians can access a wide variety of government services online. In 2007, Estonia became the first country to use e-voting in a general election.

The E-Estonia project demonstrates how a small nation can integrate complex cross-government projects in a way that might defeat larger countries - or those with more legacy infrastructure. The Estonians have not stopped there. Estonia piloted the world's first network of fast chargers for electric cars, with a unified payment system and government subsidies for fully electric cars.

Estonia is a small, catching-up economy, but it has embraced digital technologies determinedly.

SINGAPORE



Singapore's combination of openness, entrepreneurship, and strong and effective government policy has put it near the top of many of the world's innovation league tables.

When Singapore was expelled from Malaysia in 1965 it was a small island with nowhere near the physical or public infrastructure to support its rapidly growing population. Today it is one of Asia's greatest success stories: an international business and transport hub and gateway to Asia with a GDP per head that rivals the US and Switzerland.

Singapore's transformation is based in part on creating a country that is open and outward facing, attracting both talent and foreign investment. It also relied on a government that has a reputation for a bold, activist approach based on an acceptance of taking risks and a high degree of political control, supported by a well-resourced, keenly incentivised and highly skilled civil service.



Biopolis and Fusionopolis, Singapore's hubs for biomedical sciences, and the physical sciences and engineering form the nexus of Science and Innovation in Singapore.

Picture credit: A*STAR

The Government's activist industrial policies fostered the skills and attracted the investment necessary for Singapore's industries to move up the value chain over the decades.

The Government has voraciously sought out ideas and talent from around the world, leading to an influx of researchers and scientists who want to take advantage the research facilities that Singapore has to offer.

International students and graduates are offered generous financial incentives to study at Singaporean universities, while top researchers are lured with generous salaries and infrastructure.

By 2008 the amount of Foreign Direct Investment into Singapore had tripled in a decade. The Government has prioritised setting up an open and flexible system to support the location of multinationals in the country. Singapore's long-standing Economic Development Board has the ability to react quickly to pull together attractive, personalised packages of support for potential incoming companies, e.g. Dyson, Nestlé and Philips.

An open approach has attracted international human talent to the country, but the Government is also taking steps to support the development of talent within the country. The Singaporean education system is one of the best in the world. The A*STAR graduate scheme gives comprehensive support to Singaporean PhD students to study overseas in top universities in Europe and the US, with the aim of fostering knowledge exchange and collaboration when the students return to Singapore.⁸

Singapore has also put in place policy to capitalise on its research and development strengths. The creation of clusters in key sectors such as the pharmaceutical specialist Biopolis utilises the co-location of R&D capabilities within a compact location to foster interaction, networks and collaboration. This has significantly reduced the barriers for scientists from industry and academia to get together to explore areas for collaboration.

The government has also recognised that innovation goes beyond research and development. The Productivity Tax Credit scheme gives companies based in Singapore tax breaks based on wider innovative activities such as design, staff training as well as intellectual property and patents.⁹

Other innovation policies include a programme of Innovation Certification for SMEs and a detailed innovation measurement framework.

Singapore has internationally recognised institutions to support innovation, such as A*STAR,¹⁰ which funds research and scientific talent development. Rather like a combination of the UK's research councils and Technology Strategy Board, its activities run the gamut from pure to applied research to co-development of technologies with businesses. It also plays a role in encouraging open innovation and building partnerships across the sectors.

“For a small nation to thrive from innovation, R&D cannot exist in a vacuum. From resource-planning to policy formulation, there must be traction with developing an ecosystem where open innovation and translational R&D can propel socio-economic outcomes. While there is an important role for blue sky R&D, a significant part needs to be focused on economic outcomes or societal benefits, building support for technology commercialisation and working with the industry.

Apart from creating a conducive environment to bridge and synergise innovation, talent development is critical – we need a whole spectrum of talent to support the entire innovation value chain from scientific talent to those who have experience in commercialisation.

In Singapore's case, the commitment by the Government to scientific research and innovation, adequate funding support, an open talent strategy, world class infrastructure, a conducive environment for R&D, a robust IP protection regime and an openness to collaboration and partnerships are all important factors that contribute to our value proposition.

Partnering with industry is critical. As companies increasingly leverage on open innovation through public-private partnerships, policymakers need to develop differentiated value propositions to maintain competitiveness in attracting partnerships with the private sector. ”

Mr Lim Chuan Poh, Chairman, A*STAR

ISRAEL



The modern state of Israel, established in 1948, is no stranger to adversity. Surrounded by enemies and with few natural resources, the country's remarkable journey to the vibrant economy of a 'Startup Nation'¹¹ has gained international acclaim. Israel leads the world in the amount spent on research and development per capita. The country's economy showed remarkable resilience in the 2008 global recession, leading all other OECD countries in GDP growth from 2009–2012.

The boom has been fueled by technology and innovation. Israel has more high-tech firms listed on the NASDAQ than any other country apart from the US. Its tech industry has some of the most transformative technological breakthroughs of the last 30 years to its name, with Israeli companies pioneering technologies from instant messaging, to flash memory to the Google suggestion function.¹²

Multinational companies from Microsoft to Apple have invested in R&D functions in Israel and acquired local startups, citing the highly skilled labour force and the Israeli culture as reasons for their decision.¹³

The transformation of the Israeli economy owes something to longstanding government policy. The Israeli government decided in the 1970s that the country's economics future depended on science-based industry. The Office of the Chief Scientist was established in 1976 and oversaw a dramatic increase in the amount of research and development undertaken both in academia and in private businesses. Between 1969 and 1987, industrial research and development spending grew at 14 per cent a year.¹⁴

Unsurprisingly, defence has been an important driver too. Prior to 1967, France was Israel's main military supplier. When France declared an arms embargo in the aftermath of the Six Day War, Israel needed to find alternatives, leading to the expansion of the Israeli aerospace industry and a heightened awareness of the need for local technological expertise.

Israel's military has also contributed to its human capital in the field of innovation. The prestigious Talpiot programme run by the Israeli Defence Forces takes high achieving school leavers and sets them to work on finding technological solutions to the military's challenges. The programme offers intensive three years of training followed by six years of service in the armed forces, producing creative and adaptable leaders to transform the military. Not only does the programme enhance the military's use of new technology, but after finishing their service some of the Talpiot participants have become prominent figures in the civilian tech startup scene,¹⁵ using the experience and skills they have gained in the military.



Beautifully situated in the heart of Jerusalem's 'Cultural Mile', the JVP Media Quarter gives expression to the vision of fusing technology, creativity and social action in one exciting complex.

Picture credit: Creative Commons

Israel's strong links to the US and lack of regional markets for its products have encouraged it to look overseas for innovation partners. Perhaps more than anywhere else, Israel's tech sector is intimately linked to that of Silicon Valley. Many of the US's largest technology companies (including IBM, Intel, Google and Oracle) have established centres for research and development in Israel, while even more have acquired Israeli firms.

Although this dynamic now has a momentum of its own, in earlier times it was supported by government policy. In 1976 The US and Israeli governments set up the Binational Industrial Research and Development (BIRD) Foundation which matched Israeli companies with a technology idea with an American company that could market and distribute the product in the US. Beyond providing funding, the legacy from BIRD has been a new generation of Israeli tech companies that have acquired processes and contacts for doing business in the US,¹⁶ cementing the economic and cultural links between two countries.

Israel's venture capital (VC) market also shows evidence of effective links with the US. The Israeli tech VC sector is arguably the world's most mature outside the US; Israel invests more per capita in VC than any other country. It got its start from a conscious decision on the part of the Israeli government to create a US-style VC sector through a co-investment initiative called simply Yozma ('yozma' means initiative in Hebrew). Yozma is the most successful of several schemes that have been tried around the world to kick-start venture capital through public coinvestment (it is notable for its generosity to private investors – it provides up to 40 per cent of the capital for new funds, and allows private investors to buy the government out after five years). Several of the original private co-investors were US funds, and many US-based funds continue to invest in Israeli startups today, either from local offices or remotely.

In the face of adversity, Israelis have had a motive to push forward and make their country successful. Dan Senor and Saul Singer argue that this has given Israelis a core purpose – a stake in the country – that is the driving force behind its remarkable achievements.¹⁷ The Israeli 'chutzpah' or bold, persistent attitude means the country has entrepreneurs that are not afraid to risks, buoyed by regulations that reflect a unique attitude to failure that encourages entrepreneurs to try again, using what they have learnt.

BASQUE COUNTRY



When Juan José Ibarretxe, President of the Basque Country region of Spain from 1999 to 2009, explains his region's remarkable progress in the last 20 years, he sums up the Spanish region's approach as "*all together, or not at all*".¹⁸ A sense of shared identity, distinct from the rest of Spain and based on history, culture, and language has driven the region to seek the ability to control its own destiny.

The 1979 Statute of Autonomy for the Basque Country came just as a deep economic crisis hit the region in the early 1980s. A sluggish global economy plus a heavy reliance on declining industry had led to negative GDP growth and a ten point percentage jump in unemployment. The newly elected Basque leaders set in train a long-term restructuring of their economy. By 2008 the Basque Country had the highest income per capita in Spain at 33 per cent above the Spanish average, and 36 per cent above the average EU-27 level.¹⁹

Throughout the 1980s and 1990s successive governments prioritised industrial competitiveness through investment in research and technology and worked with private partners to develop a cluster-based industrial policy. Built on traditional technology transfer institutions set up in 1982, the Basque Country's Technology Centres have evolved into powerful and diversified networks comprising basic and applied research centres. Between 1997 and 2006 they generated \$1 billion in revenue. As the cluster programme developed, a strong focus was placed on promoting firm cooperation in R&D.

The Agency for the Promotion and Restructuring of Industry, SPRI, was founded in 1981 and played a significant role in the economic turnaround of the region,²⁰ helping businesses to survive and grow. One of its main objectives has been to promote exports and internationalisation of the region's industries. Internationalisation programmes increased the number of Basque firms with facilities abroad. Since the mid-1990s, Basque exports to foreign countries grew faster than to the rest of Spain.²¹ In addition, the Basque Government set up the Ikerbasque Foundation to recruit international senior researchers work in the region's research institutions.

Innobasque,²² created in 2007, is part of the region's broader approach to innovation. Capitalising on the Basque Country's sense of cohesiveness, Innobasque focuses on encouraging collaboration through networking. It brings together diverse groups to take forward agreed key areas of action for the region, including better delivery of public services. It has a powerful Board of Directors from leading public and private organisations²³ who can take forward change.



The Mondragon Corporation, a federation of workers cooperatives, started making heaters in 1956 and now consists of 269 companies across retail, knowledge, finance and industry.

Picture credit: Creative Commons

True to their sense of egalitarianism, the Basque Country has some interesting examples of balancing economic growth with social balance. Mondragon²⁴ is a Basque Country corporation and a federation of worker cooperatives with a shared vision and values of cooperation, participation, social responsibility and innovation. It is certainly profitable: it is the seventh largest business group in Spain and makes up 3.6 per cent of the Basque Country GDP. It also has a strong focus on innovation. The University of Mondragon provides training and skills development for the co-operative workers and separate R&D departments drive technological innovation. It has invested €140 million in R&D and participated in over 70 individual projects, with separate tech centres and R&D units that have a combined budget of €54 million in 2009.

3.

LESSONS FOR INNOVATION-LED GROWTH IN A SMALL COUNTRY

Of course, these five countries have significant differences. There is no single foolproof route to being an innovative economy, and there are other small countries that have struggled to do so. But there do seem to be some common features from our case study countries.

1. Getting 'downstream' innovation right

The first notable feature of these innovative small economies is how good they are at turning good ideas and early-stage innovations into commercial successes.

This is something of a contrast from the way policymakers often think about US innovation. The popular conception of American innovation involves cutting-edge university research, entrepreneurial finance, and fast-growing new businesses, especially but not only in the technology sector²⁵ – the upstream rather than the downstream aspect of innovation, so to speak.

Several of the small innovative nations in this report take a rather different tack. In Finland and Singapore, government and research institutions work closely with private businesses to co-fund innovation. TEKES, Finland's business-facing public innovation agency, is large and well-funded (spending roughly the same amount as the UK's Technology Strategy Board in an economy a tenth the size). Singapore's research funding body, A*STAR also has a significant focus on providing insights to business and the wider economy, and Israel's Office of the Chief Scientist has played an important role in fostering collaboration as well.

In addition to heavy-duty funders of applied research, some of the smaller countries surveyed also possess more strategic innovation support bodies. Finland's SITRA, Innobasque in the Basque Country, and Estonia's ArenguFond not only fund experimental projects but also undertake research and futures work about their countries' wider innovation systems.

It is not just institutions that are gearing towards downstream innovation. Singapore also backs downstream innovation through its tax credit policies. Its Productivity and Innovation Credit refunds tax not only to firms that undertake R&D (as many countries' tax systems do²⁶), but also to those that make other intangible investments necessary to bring innovations to market, such as design, training and IP acquisition, and even to investments in innovative plant and machinery.

The high levels of business R&D in Finland, Israel and Singapore suggest that far from crowding out private investment, public investment in the downstream aspects of innovation, if anything, crowds it in. The importance of collaborative relations between business and government in some small nations was highlighted by Michael Keating and Malcolm Harvey in their recent survey of small countries, *Small Nations in a Big World*.²⁷

Of course, some large economies also have a reputation for downstream innovation and strong coordination between business and researchers, Germany being the most obvious example. But while for larger nations, downstream innovation might be seen as a choice, for smaller nations it looks more like a necessity.

In a very large economy like the US, the chance that an early-stage innovation developed in the country will be taken up and scaled-up by a domestic business is likely to be relatively high, simply because its industrial base is larger. The sheer mass of the economy can to some extent substitute for policy coordination. In a country of five or ten million people, this seems much less likely. Simply backing academic research or bright startups and hoping that they will reach commercial maturity at home is a risky tactic in a small country with fewer larger businesses and a smaller local market.

So being small seems to put a greater premium on effective coordination of downstream innovation.

2. Openness

Openness to the world also seems to matter for small countries. No country has a monopoly on good ideas or on innovations, and it seems that the small countries that do best at innovation are also good at adopting the good ideas of others.

The US offers a big-country counterexample, the exception that proves the rule. For all its reputation as a global melting pot, compared to most countries its economy is very self-contained, with exports and imports amounting to less than 25 per cent of GDP (the equivalent figure for the UK or France is nearly 50 per cent).²⁸

Our innovative small nations are rather different in their engagement with the rest of world. It is not so much that they trade more with the rest of the world, although they do (as might be expected of smaller economies, their trade-to-GDP ratios are much higher than the US's: 54 per cent for Israel, 60 per cent for Finland, and over 250 per cent for Singapore, because of its role as a global entrepôt).

The particularly significant difference is cultural. The innovative small nations are on the whole outward-facing, not only selling their innovations to the world as a whole but enthusiastically embracing the world's best ideas and prospering from them.

Singapore's generous funding to nationals who pursue PhDs in top foreign labs and then return home is one example of this. So are the extensive international links developed by the Finnish electronics sector, or the remarkable presence of Estonian tech entrepreneurs in the world's leading startup clusters from Berlin and London, to New York and Silicon Valley. In Israel's case, its tech sector is particularly closely linked to that of the US, between which people, ideas, businesses and capital flow freely.

This openness is no doubt partly borne out of necessity – smaller countries cannot dictate terms to the world or assume the best ideas will all arise at home.²⁹ But the innovative countries we examined for the most part have gone way beyond necessity and made a virtue of openness.

3. Innovation pervading the whole of Government

The governments of our small innovative nations do not just support innovation directly, with research funding and favourable tax regimes. They also promote it through their wider activities.

Estonia is a widely recognised example of this. Its adoption of digital technologies in its public services, and in particular its adoption of an e-commerce-friendly national identity system, is a notable success. It not only helps deliver better public services, but by encouraging adoption of and demand for technology, it helps innovative businesses.

Finland has also put innovation to work in its wider public services. Taltioni, the project backed by innovation agency SITRA to use digital technology to help people look after their health, is a promising example of public service innovation with a strong technological flavour. The strong links between Israel's defence establishment and its tech sector are well known: the Talpiot programme, which educates Israel Defence Force recruits in maths and physics alongside their military training, and which has trained many tech entrepreneurs, is a notable example. Singapore's public service innovation projects are run within the same department as A*STAR, its research funding body, creating opportunities for alignment.

4. Effective, entrepreneurial innovation institutions

Small innovative countries also tend to possess well regarded innovation institutions, which tend to be part of, or related to the state but somewhat removed from central political control.

Finland's SITRA and TEKES are perhaps the best known examples, but Estonia's ArenguFond, Innobasque in the Basque Country and a wide range of institutions in Singapore (including the aforementioned A*STAR) also fit the bill.

One thing that these organisations have in common is their ability to bring together the public and private sectors to coordinate innovation activity, as we discussed in point 1.

But they have more in common than just their innovation role. In a study of Finnish and Israeli innovation bodies, Dan Breznitz observed that independence and partial freedom from political control made them more effective, not least by allowing them to take long-term or counterintuitive bets and to avoid politically-driven investment decisions.³⁰ Strong and entrepreneurial leadership also seems to be a feature of some of the more successful institutions: Yigal Erlich, founder of Israel's Yozma initiative or Esko Aho, former Prime Minister of Finland who subsequently became President of SITRA, were certainly not shrinking violets or bland consensus-seekers.

5. A sense of national mission

The final characteristic of innovation in small nations is perhaps the hardest to evidence, but one that is widely attested by people in the countries themselves: a sense of national mission.

In the case of Finland, Estonia and Israel, this sense of mission is driven by the cultural power of external threat. Finland and Estonia have both been shaped by their proximity to Russia, which has been at times their ruler and at times a looming threat. The threat to Israel from its neighbours is even more part of its national psyche. The perception of what it means to be Finnish or to be Israeli in part involves being quick-witted enough to thrive in a tight geopolitical spot.

The same is true, albeit in a milder way, for the Basque Country and Singapore, both of which have prospered despite tense relationships with Francoist Spain and Malaysia during parts of the 20th century.

Arguably it is easier to cultivate this sense of national mission in smaller countries, especially if they have a deeply engrained culture, consensual politics or strong government – which all five countries we have looked at do.

The relationship between culture in this sense and innovation is of course hard to prove. But it is plausible that common agreement about the need for a country to innovate makes it easier to make the long-term political commitments required to support innovation institutions and investment in innovation by businesses and governments. The frequency of direct contact between decision makers and their constituents further builds up social capital.³¹ Low power distances and the forming of personal relationships mean communication lines are more open. Links between industry and government can be strengthened, enhancing information and knowledge flows for better decision making.

Indeed, some would argue that this sort of culture matters more than many other factors. At any rate, the presence of national myths of innovation is something that these small innovative countries seem to have in common.

3.

OPPORTUNITIES AND CHALLENGES FOR SCOTLAND



This final chapter will consider what the lessons of Finland, Israel, Estonia, Singapore and the Basque Country mean for Scotland, since the question of Scotland's economic future has come into sharp focus in the context of September 2014's Independence Referendum.

It is important to note that small countries are by no means guaranteed success simply by virtue of their size. Being small carries its own risks and the impact of crises can be severe, as seen in the recent economic difficulties of Ireland and Iceland.

The most important lesson from these case studies is that small countries can succeed economically through innovation. This may be obvious to some, but it bears repeating: going large is not the only viable option when it comes to national innovation policy.

But the way small innovative nations have succeeded also presents challenges, and suggests some future directions for innovation policy in Scotland. This chapter considers some relevant features of Scotland's innovation system, and looks at four challenges and choices in more detail.

Scotland's innovation system has several salient characteristics, which have been widely noted elsewhere,³² and which are especially relevant when considering the implications of the success of other small innovation nations:

- **Excellent university research.** Like the rest of the UK – but if anything more so – Scotland has a world-class university research sector. Scotland's universities punch above their weight in UK research funding stakes, and the UK itself is a global research leader.
- **Low business R&D investment.** However, Scotland's businesses underinvest in R&D, relatively speaking. Business and enterprise R&D in 2012 runs at 0.59 per cent of GDP, lower than the UK's 2012 of 1.1 per cent, which is itself considered low.³³
- **Ongoing efforts to link businesses and universities.** Bridging the gap between universities and business has been a goal of universities and policymakers for some time. An attempt to establish Intermediate Technology Institutes, begun in 2002, was wound up in 2009. More recently, a number of centres have been established and a new Scottish Innovation Agency proposed.³⁴ The work of organisations like Interface show there is demand for this service and that it can lead to successes if pursued effectively.
- **Public service innovation.** Scotland's public services have followed a different path from those south of the border, choosing integration over market-based reforms. In this context, there has been considerable interest and investment in areas such as telehealth.

These characteristics are relevant to four important questions for Scotland if it is to become an innovation leader. These questions matter whether or not Scotland chooses to become an independent country in September 2014, but have a particular bearing on the economic debate around September's referendum. They are:

- a. **How to balance a cohesive national vision for innovation with an economy open to the world**
- b. **How to do downstream innovation well in a country with a reputation for great upstream research**
- c. **How to embrace public and social innovation**
- d. **How to create adaptive, effective innovation institutions**

a. Balancing a cohesive national vision for innovation with an economy open to the world

A strong sense of the importance of innovation, both among the political classes and in the wider national debate is something that several of our innovative small nations have in common. This shared sense of mission makes it easier to devote resources to the public promotion of innovation, and perhaps at the margin makes public-private cooperation over innovation projects easier.

On the positive side, Scotland's government has made innovation an important part of its vision for Scotland's future.³⁵ Recent announcements, notably plans for a Scottish Innovation Agency, have further enhanced that commitment.³⁶ The Scottish government has also made more of a commitment to international openness, especially by seeking to actively welcome immigration, than other parts of the UK.

On the other hand, as in any part of the UK, there remains the risk that the tradition of British pragmatism and a political and media culture that is, on the whole, resistant to grand political statements, frustrates this national mission, or that fear of failure stifles the innovative spirit.

Whether or not Scotland votes for independence in September, an important challenge will be to throw the weight of government policy behind a clearly articulated vision for the country that has innovation at its heart.

There are of course many ways to do this badly. Not long ago, Argentina appointed a government Secretary for the Strategic Coordination of National Thought to craft a national vision, which perhaps might not fit with the political culture in Scotland or the wider UK. But there are more edifying examples in recent history. Following its near collapse in the Global Financial Crisis, Iceland tried to develop a new constitution by means of a long-running discussion between its citizens. This process, which used face-to-face meetings and digital technologies, was described by some as a failure, because the resulting constitution did not end up being implemented. But the experiment shows the potential of public deliberation and digital technology for helping focus national energies – without the need for Secretaries of Strategic Thought-Coordination.

Of course, in some respects there is a tension between getting people to unite behind a cohesive national narrative about innovation, and maintaining an openness to the world. Tightly networked societies can also be open to the world – Finland is a powerful example – but they can also turn inwards and fall prey to local delusions. Ireland and Iceland's experience in the run up to the crash of 2008 provides a salutary example.

At the same time as presenting a coherent innovation vision and the policies to back it, Scotland should continue to foster strong links with innovative centres beyond its shores, to make the most of the rest of world's ideas and do its best both to attract innovative people from around the world and retain those who come from or come to Scotland.

b. How to do downstream innovation well in a country with a reputation for great upstream research

As we have seen, innovative small nations cannot assume that domestic industry will capture the benefits of every piece of research that goes on in the country. The idea of backing great research and then encouraging private risk capital to scale it up may work in the US, with its colossal home market and relatively low export: GDP ratio (and even in the US, the role of the state in innovation is significant), but it is not what most small innovative countries do.

This presents a challenge for Scotland, with its very strong research universities and the relatively limited appetite of its businesses to undertake R&D. If Scotland chooses to move to something more like a Finnish model, which was the explicit aspiration of John Swinney's March 2014 speech announcing the SIA, it is likely to require a shift in spending and priorities from pure and undirected research to more applied research, mission-oriented projects and development. We know from experience that this is not easy in the UK: when the EPSRC tried to develop its so-

called shaping capability in 2011, it ran into fierce opposition from academics who felt funders should not be picking winners among different fields of research; the attempts to measure and reward 'impact' through the Research Excellent Framework have also had a chequered history.

Getting downstream innovation right will also require improved links between businesses. As University of Sussex innovation expert Paul Nightingale observes,³⁷ most innovation in the UK does not involve universities at all. For government to promote innovation outside universities, it needs to fund things like business networks, supplier development, the financing of intangibles, and perhaps even intangible tax credits along the Singapore lines. This also implies a diversion of resources from basic university research.

A world in which Scotland chose to fund more applied research and technological development and deployment, and less curiosity-driven basic research would be a significant upheaval for Scotland's research-intensive universities, but could lead to a more innovative economy.

c. Embracing social and public service innovation

The third challenge for Scotland relates to the wider role of government. The examples of Estonia's internet-friendly ID cards and Finland's Taltioni digital healthcare experiment show that both innovative businesses and citizens benefit when government as a whole takes innovation seriously.

The opportunity for Scotland is to make the most of the benefits of its existing public service programme – in particular its decision to choose the integration of services over the creation of quasi-markets along the English model – while at the same time taking on board the best examples of public services and social innovation from around the world.

But as Nesta observed in our 2011 report *Radical Scotland*, these kinds of changes are not easy. Like all innovation, they involve risk. And require political leaders to share in this risk and to expend political capital to make them happen.

Implementing these changes will certainly involve some upheavals. But the rewards, both for economic growth and wider society, are huge.

d. Creating adaptive and efficient innovation institutions

This leads to the final challenge for Scotland: how to build the right institutions to support innovative change.

As we have seen, successful public innovation institutions are curious organisations: they benefit from political support, but also from being somewhat removed from direct political control. They need to be good at brokering cooperation between industry, academia and civil society; but they also need to take risks and not simply seek consensus.

And above all, they need to adapt, making use of new techniques for fostering innovation and being aware of emerging innovation trends. The role of innovation methods like prizes, business acceleration and experimental procurement have come to the fore in recent years; 20 years ago organisations like SITRA and Innobasque were pursuing different tactics. The ability to experiment with different methods and pick the ones which best meet contemporary businesses' needs is all important. This cannot simply be achieved by copying a blueprint from another country, but other countries' experience can help. Nesta has recently published research on so-called 'i-teams', focused public innovation teams that are helping governments in cities and countries around the world drive innovative change – this should serve as a basis for designing future innovation institutions.

These four challenges are important but by no means insuperable. The lesson that Scotland should take away from the experience of Finland, Estonia, Singapore, Israel and the Basque Country is that with the right culture and policy, it is possible for a smaller economy to be innovative and to thrive, and that this is a goal well worth aiming for.

BIBLIOGRAPHY

- Armstrong, H.W. and Read, R. (1998) Trade, competition and market structures in small states: The role of contestability. 'Bank of Valetta Review.' 18, 2-11.
- Edquist, C. and Hommen, L. (Eds.) (2008) 'Small Country Innovation Systems: Globalization, Change and Policy in Asia and Europe.' Cheltenham: Edward Elgar Publishing.
- Katzenstein, P.J. (2003) Small States and Small States Revisited. 'New Political Economy.' 8:1, 9-30.
- Price, A, and Levinger, B. (2011) 'The Flotilla Effect: Europe's small economies through the eye of the storm.' EFA/Plaid.
- Reid, A. (2012) 'A smart, sustainable nation?' Technopolis Group.
- Roolaht, T. (2009) The Characteristics of Small Country National Innovation Systems. In: Carayannis, E.G., Varblane, U. and Roolaht, T. (Eds.) 'Innovation systems in small catching-up economies: New perspectives on practice and policy.' Chapter two. Springer Publishing.
- Skilling, D. (2012) 'In Uncertain Seas: Positioning small countries to succeed in a changing world.' Discussion Paper. Singapore: Landfall Strategy Group.

ENDNOTES

1. 'The Sunday Times.' 25 May 2014.
2. See: https://www.innovationpolicyplatform.org/suggested_fragment?sp=138&ep=141&fn=czoXMDk6lMhOdHBzOi8vd3d3Lmlubm92YXRpb25wb2xpY3lwbGF0Zm9ybS5vcmcvc2l0ZXMvZGVmYXVsdC9maWxlcY9yZGZfaW1wb3JOZWRfZG9jdW1lbnRzL2lnbml0aW5nIGlubm92YXRpb25fMC5wZGYiOw==
3. See: https://www.innovationpolicyplatform.org/suggested_fragment?sp=138&ep=141&fn=czoXMDk6lMhOdHBzOi8vd3d3Lmlubm92YXRpb25wb2xpY3lwbGF0Zm9ybS5vcmcvc2l0ZXMvZGVmYXVsdC9maWxlcY9yZGZfaW1wb3JOZWRfZG9jdW1lbnRzL2lnbml0aW5nIGlubm92YXRpb25fMC5wZGYiOw==
4. See: http://www.tekes.fi/Julkaisut/Licence_to_SHOK.pdf
5. See: http://www.tem.fi/files/21010/National_Innovation_Strategy_March_2009.pdf
6. See: <http://www.sitra.fi/en/news/taltioni/finland-launches-its-trailblazing-taltioni-cooperative-amid-global-interest>
7. See: <http://news.bbc.co.uk/1/hi/world/europe/3603943.stm>
8. See: <http://www.a-star.edu.sg/Awards-Scholarship/Scholarships-Attachments/For-Graduate-PhD-Studies/A-STAR-Graduate-Scholarship-Overseas.aspx>
9. See: http://www.iras.gov.sg/irasHome/page04.aspx?id=13838#Research_and_Development_Activities
10. See: <http://www.a-star.edu.sg/About-A-STAR/Overview.aspx>
11. Senor, D. and Singer, S. (2009) 'Start-Up Nation.' New York NY: Twelve.
12. See: http://www.oecdobserver.org/news/fullstory.php/aid/3546/Start-up_nation:_An_innovation_story.html
13. See: <http://www.israeltoday.co.il/NewsItem/tabid/178/nid/23050/Default.aspx>
14. See: https://www.innovationpolicyplatform.org/suggested_fragment?sp=172&ep=176&fn=czoXMDk6lMhOdHBzOi8vd3d3Lmlubm92YXRpb25wb2xpY3lwbGF0Zm9ybS5vcmcvc2l0ZXMvZGVmYXVsdC9maWxlcY9yZGZfaW1wb3JOZWRfZG9jdW1lbnRzL2lnbml0aW5nIGlubm92YXRpb25fMS5wZGYiOw==
15. See: <http://online.wsj.com/news/articles/SB118368825920758806>
16. Senor and Singer, 2009.
17. Ibid.
18. Talk at the Hay Festival, 24 May 2014.

19. Porter, M.E., Ketels, C. and Valdaliso, J.M. (2013) 'The Basque Country: Strategy for Economic Development.' Boston MA: Harvard Business School.
 20. OECD (2011) 'OECD Reviews of Regional Innovation: Basque Country, Spain 2011.' Paris: OECD.
 21. Porter, M.E., Ketels, C. and Valdaliso, J.M. (2013) 'The Basque Country: Strategy for Economic Development.' Boston MA: Harvard Business School.
 22. See: <http://www.innobasque.com/home.aspx?tabid=1126>
 23. OECD (2011) 'OECD Reviews of Regional Innovation: Basque Country, Spain, 2011.' Paris: OECD.
 24. See: <http://www.mondragon-corporation.com/eng/co-operative-experience/history/>
 25. There is of course an extensive literature arguing that there is much more to the US innovation system than research and startups, but the myth is persistent. See Hughes, A. 'Innovation Cargo Cults'; Mazzucato, M. 'The Entrepreneurial State'; or Block, F. 'Swimming Against the Current.'
 26. Manchester Institute of Innovation Research 'Compendium of evidence on Innovation Policy.'
 27. Keating, M. and Harvey, M. (2014) 'Small Nations in a Big World: What Scotland Can Learn.' Edinburgh: Luath.
 28. See: <http://data.worldbank.org/indicator/TG.VAL.TOTL.GD.ZS>
 29. Skilling 2012, see bibliography.
 30. Breznitz 2007.
 31. Armstrong and Read 1998.
 32. Reid, A (2012) 'A smart, sustainable, nation?'
 33. See: <http://www.scotland.gov.uk/Topics/Statistics/Browse/Business/RD/KeyFacts>
 34. In 2002, Scottish Enterprise launched a series of Intermediate Technology Institutes to link research and industry; these were not successful and were closed in 2009. In 2012, Scottish Enterprise, Scottish government and Scottish Research Council established the Fraunhofer Centre for Applied Photonics with the University of Strathclyde. Scottish universities have built effective partnerships with industry, such as, Robert Gordon University's Energy Centre and Abertay's Centre for Excellence in game design and development. But the gap remains a problem, as acknowledged by John Swinney in his announcement of a new Scottish Innovation Agency in a March 2014 speech. [link]
 35. See: <http://news.scotland.gov.uk/Speeches-Briefings/Alex-Salmond-in-New-York-Bloomberg-New-Energy-Finance-Summit-April-8-2014-b55.aspx>
 36. See: <http://news.scotland.gov.uk/News/Opportunity-for-innovation-in-Independent-Scotland-a48.aspx>
 37. 'Demos Quarterly' article on Science Park Economy.
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