Department of Enterprise, Trade and Investment

Building Economic Competitiveness – Lessons from Small Peripheral European States

OVERVIEW REPORT

March 2011

Graham Gudgin, Niall McKenzie, Mark Magill, Neil Gibson

Centre For Business Research
Judge Business School
University of Cambridge
Trumpington St.
Cambridge CB2 1AG

Oxford Economics
Lagan House
Sackville St
Lisburn
BT27 4AB

CONTENTS

Acknowledgements

We are grateful for the advice of a large number of people in Finland, Sweden, Estonia and Ireland who willingly gave their time to assist this project. We are also grateful for comments on this draft from Paul Montgomery and Thomas Byrne of DETI. The views expressed in this chapter remain our own.

SECTION 1 – INTRODUCTION

The University of Cambridge Centre for Business Research and Oxford Economics were commissioned by the Northern Ireland Department of Enterprise, Trade and Investment (DETI) to investigate economic development policies in small, peripheral European nations to draw lessons for remote UK regions like Northern Ireland. The context of the study is NI's disappointing record of labour productivity which is the lowest of any UK regions and which has diverged further from the UK average in recent years.

The results of the study have been submitted in a main report. Because of the length and complexity of this report we have produced a shorter overview. This overview report brings together the lessons for Northern Ireland from the main report of the study. The aim here is not to summarise all of the main points from the wider study but to reflect on key lessons from the study, focussing ways in which small and peripheral EU countries have built or maintained their productivity. This report is structured as follows:

- **Section 1** introduces definition and measurement for productivity and outlines the selection of case study countries;
- **Section 2** highlights key findings from the literature on the relevant drivers of productivity and outlines the performance of selected economies for these;
- **Section 3** outlines the drivers of economic success for each of the chosen countries and identifies key organisations and programmes in place; and
- **Section 4** brings together key findings from the case studies, assesses their relevance for Northern Ireland and makes policy suggestions in key areas.

We have tried to focus on government policies which have supported productivity over recent decades, but recognise that it is never easy to predict how effective similar policies will prove to be in different circumstances. Cultural and other factors which are difficult to pin down also have an influence. On being told that unemployment rates in Sweden were very low, Milton Friedman replied that this was interesting because few Americans of Swedish descent were unemployed in the USA[1]. The implication that Swedes will do well under a range of conditions may well be correct, but for this study interest falls on the policies that Swedes (or Finns, Estonians and the Irish) pursue to attain their aim of high living standards in their own countries. Since Northern Ireland is a region and the comparator areas in this study are nation states we focus on policies that are within the competence of a regional administration. With all the countries studied being within the EU and most within the Euro-zone this is not now however such an important distinction as it once was.

The theoretic approach underlying the report is as follows:

- Small open economies depend heavily on trade.
- A large export sector is needed to finance the wide variety of imports required to run a modern economy and support a high standard of living
- The size of a small economy open to trade is approximately proportional to the level of exports unless the country can run a long-term balance of payments deficit (as is the case in countries like Canada where inflows of capital occur to finance the exploitation of mineral resources).

[1] Quoted in P J O'Rourke. *Eat The Rich*. A Treatise on Economics.

- Living standards, measured as per capita GDP, reflect the productivity of both the export base and the rest of the economy. Productivity in some sectors serving local demand is particularly important because of their large size.
- Living standards also depend on the proportion of the population in work i.e. engaged in productive activities.

In Northern Ireland, the tradable services export base is too small to support 1.8 million people at standards of living close to the UK average. Instead, a huge 'subvention' from the UK Exchequer, currently worth over £7 billion per annum[2], supports much of both public sector services and transfers (pensions and benefits). This inflow of funds is equivalent to over 25% of GDP and is thus likely to be very much larger than any long-term balance of payments deficit in any OECD country (typically below 3% of GDP before the current recession). As a first approximation it is probable that exports support only half of the NI economy with the subvention underpinning the rest[3]. Without this large subvention the Northern Ireland economy would be much smaller, with many fewer people. Since measured GDP per employee is lower in the private sector than in the public sector, the Northern Ireland economy without a large subvention would find itself, not only smaller but probably also with a larger productivity gap than at present.

Per capita GDP in NI has been close to 80% of the UK and EU15 averages for many years, and average wages are also 20% below the UK average. However, living standards are maintained at a higher level than this because, despite having the same tax and benefit system as the UK, the personal tax burden is lower than the UK average[4], benefit payments per head of population are higher[5] and particularly because public services are provided at national standards which are well above what could be afforded from local tax revenues.

These salient facts of the NI economy have been stable for a significant period, but the current problems facing the UK public finances mean that NI faces particular difficulties over the next few years. Projected cuts in UK real public spending between 2010 and 2016 are 11%[6]. The cuts in NI are proportionately a little smaller[7] but the impact on the NI economy will be larger than in other UK regions because public spending is a higher proportion of GDP than in any other region. Our estimate is that cuts on this scale will mean sharply reduced growth in the NI economy over the next 5 years, and sharp rises in unemployment[8]. Slow growth is likely to widen the gap in per capita GDP between NI and the UK average, and with most EU countries. This will increase the pressure to adopt new policies which accelerate growth and raise productivity. It is within this context the lessons from this study are particularly relevant.

---

[2] The subvention would be closer to £9 billion per annum if contributions to national defence, monarchy etc were included at a rate proportional to population in Northern Ireland.

[3] It is difficult to be precise because we have little data on the value of imports that are directly involved in the production of exports.

[4] DFP give the NI percentage of UK income tax revenue as 1.9% in 2007/8. This compares with Northern Ireland's 2.7% of UK employment including the self-employed. Hence the NI level of income tax per employed person is 70% of the UK average. Northern Ireland Net Fiscal Balance Report 2007-8 (Experimental) DFP May 2010.

[5] Regional Trends 39, Table 8.8. This gives the percentage of NI households in receipt of any benefit excluding retirement pensions in 2006 as 51% compared with a UK average of 39%.

[6] Current and capital departmental spending. Spending on welfare is projected to rise in real terms by 5% by 2015.

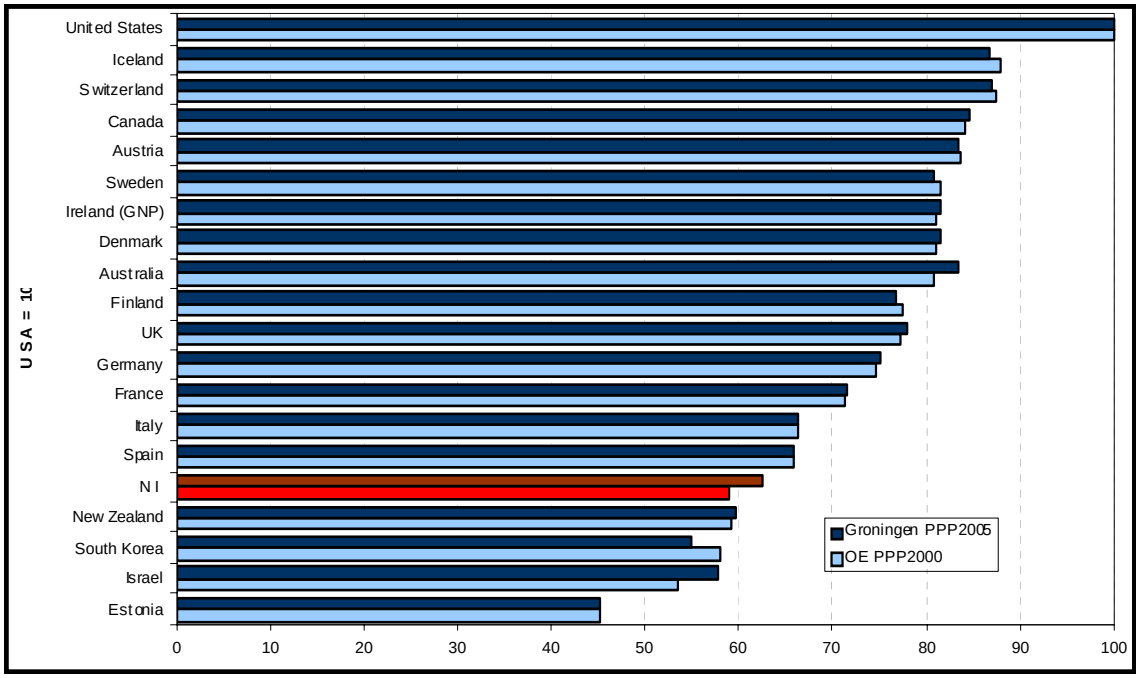
[7] This is because the way in which the Barnett Formula works. When public expenditure is rising nationally, PE in NI rises by a smaller proportion because it is initially large. When UK PE falls the opposite occurs.

[8] Economic growth will be reduced by public expenditure cuts and also by the collapse of demand for house-building and public sector construction, neither of which can be expected to reach previous peaks for many years. In addition, the boom in retail investment over the last two decades has now largely run its course in NI.

Productivity Comparisons

The study compares productivity across a range of OECD and associated countries, and uses these comparisons to select four countries for detailed analysis of economic development policy. Using the conventional measure of living standards (GDP per head) we can see that Northern Ireland is low in the ranking among the OECD and associated countries in Figure 1. The measures in Figure 1 are in purchasing power parity, and use two different base years because changing composition of expenditure can alter rankings.

Figure 1: GDP (PPP) per Head of Population (USA = 100), 2007



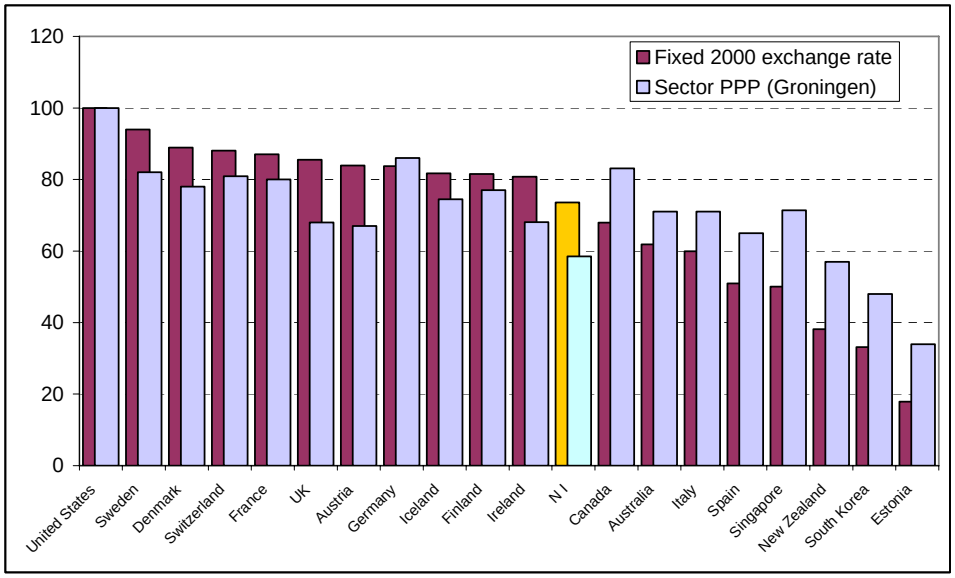
Sources of data: GDP (OE) is from national sources converted to PPP$ in 2000 and country GDP deflators GDP (Groningen) is from OECD converted to PPP (EKS) in 2005. Population is from OE (national sources). Northern Ireland is calculated as the nominal GDP per head relative to the UK average multiplied by the UK levels shown in this chart.

Per capita GDP depends firstly on labour productivity (GDP per hour worked) but also on the proportion of working-age people gainfully employed (the employment rate), the number of hours worked, and ratio of the working age population to the whole population including children and elderly people. Northern Ireland is unlike almost all countries in having values below the OECD average on all of the four components of per capita GDP. It has low productivity (GDP per employee), a low employment rate, low hours worked and a low ratio of working-age to total population. Countries with low productivity usually have longer working years to compensate. Northern Ireland is able to combine low productivity with low hours because the subvention permits tax rates much lower than those that would be needed to support current levels of public expenditure. Without the subvention taxes would be higher and there would be pressure to lengthen hours to maintain post-tax incomes.

Productivity, defined as GDP per hour worked, is difficult to compare across countries because price levels and exchange rates differ, and also change from year to year. One way of standardising for these differences is to use a purchasing power parity deflator, which allows for differences in prices and currencies and is essential in comparing developing with developed economies since prices of local services can differ hugely between countries. Expenditure-based PPP deflators are used in Figure 1, but to measure productivity it is better in principle to use output-based PPP deflators calculated by sector. The use of sector PPP deflators tends to reduce

the disparities in productivity calculated using actual exchange rates (Figure 2). Germany and Canada emerge as second only to the USA under this measure. Productivity in the UK is shown to be only around two-thirds of the US level, where-as the over-valued sterling exchange rate of 1996-2007 suggests a level over 80% of the US level when used without price adjustment. The use of sector PPP deflators suggests that GDP per hour in Northern Ireland is a little over half the US level, similar to New Zealand and above only South Korea and Estonia among the countries in Figure 2.

Figure 2: GVA per Hour 2005-7 (USA=100)

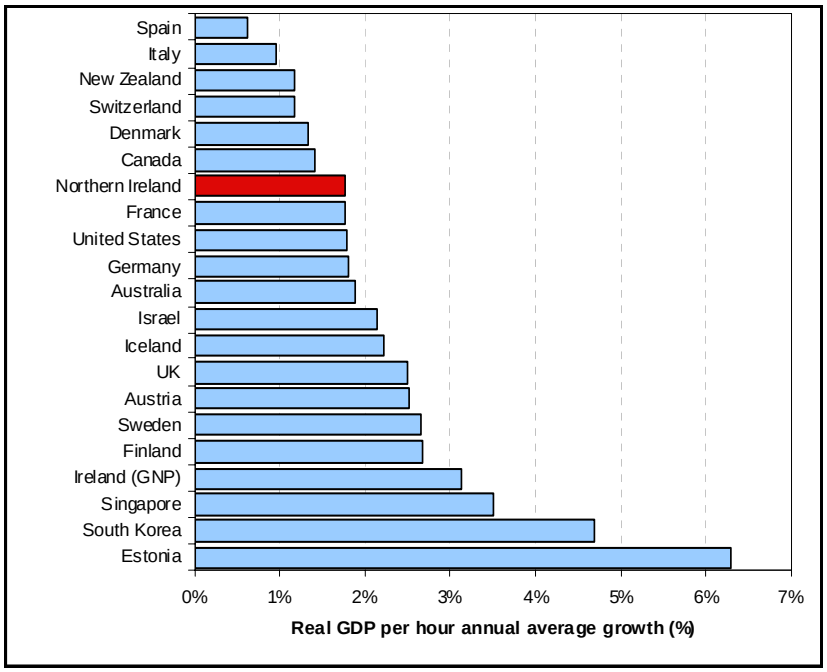


Sources of data: Fixed exchange rate (OE database 2007), Sector PPP Groningen 2005[9]
Note: UK PPP adjustment was used for NI

The countries with the most rapidly growing productivity over the last decade have generally been small (Figure 3). They include Estonia, Ireland, Finland, Sweden and Austria among EU countries. Each of these has had faster growth in productivity than the UK since 1992. Productivity has grown relatively slowly in Northern Ireland since 1992. Although its growth was less favourable than the small countries listed above, Northern Ireland's productivity growth was faster than in Denmark, Switzerland and New Zealand, but a significant part of NI's productivity growth consisted of rising wages in the public sector, underpinned by the subvention[10].

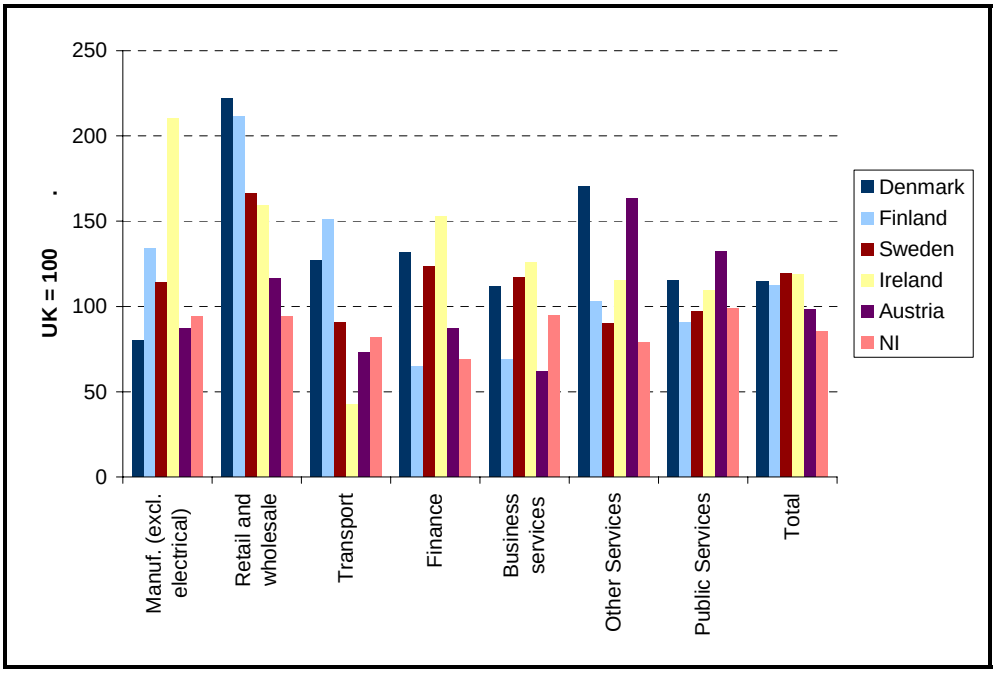
[9] Inklaar R and Timmer M P (2008) *International Comparisons of Inputs, Output and productivity at the Industry Level*, Research memorandum GD-104 University of Groningen.
[10] See for instance Figure 7.7 in Finland chapter in Main report.

Figure 3: Annual Average Growth in Real GDP per Hour (1992-2007)



Source of data: GDP from national sources (Oxford Economics database) divided by OECD hours

Figure 4: Sector Productivity Levels 2005 Using Sector PPPs (Value added per hour worked, UK =100)



Source: Inklaar and Timmer (2009) CGDC Productivity Level database

The study also calculated productivity comparisons for individual sectors, again using sector-specific PPP deflators. This was done for five small peripheral countries in Figure 4. The results are mixed. Northern Ireland has the lowest aggregate GDP per hour of any of the countries, but

has low productivity in retail and wholesale distribution, finance and other services. A more extensive range of sectors are covered in an analysis based on exchange rates without price deflation. This suggests high GDP per employee in utilities, and public services but low levels in agriculture and construction. Productivity is also low in manufacturing on the exchange rate measure but is intermediate among the countries considered on the sector PPP measure. It is however well below that in Sweden, Finland and the Republic of Ireland.

Selection of Detailed Comparator Countries

The criteria for selecting comparator countries are that these economies should be small and remote from major global markets, should have higher productivity than NI and faster productivity growth over recent years. In addition education standards and investment in R&D should be high. Four countries meet all of the six selection criteria. These are Finland, Sweden, Austria and the Republic of Ireland. Austria was excluded as it was deemed to offer the least potential for policy lessons compared with the Finland, Sweden and Ireland. Estonia which met five of the six criteria was included despite having a much lower level of productivity. It is included as an ambitious and fast growing country on course to overtake NI in productivity within two decades.

SECTION 2 – DRIVERS OF PRODUCTIVITY

It is clear that what is needed for high national or regional productivity is a large number of well managed companies. These are most likely to be present within a national or regional context that is supportive of efficient production and distribution. While companies can be competitive without high productivity as long as costs, including wage costs are sufficiently low, in this study we are concerned that productivity should be high enough for companies to be competitive at high rather than low wage levels. What is most important is that companies in nationally or internationally traded goods and sectors should have high productivity, but high aggregate productivity, and hence high incomes, depends on high productivity throughout the economy.

While well managed companies are essential, a supportive economic context is also very important. Within the Anglo-Saxon economies the dominant view is that competition is the main driver of productivity and that governments should seek to remove as many impediments to competition as possible. A supportive government is one that maintains the rule of law, enforces a level playing field and protects security, but otherwise imposes the minimum number of impediments on free markets. While this view has been dented in the recent financial crisis, it remains largely intact except in respect of banking. Acceptance of the importance of competition has also spread, not only into former communist countries but also into the social democracies of Europe and Australasia, and particularly within the English speaking world.

At its most extreme the free market doctrine leaves little role for government intervention, but most countries, including most small countries accept that competition is not enough. Advanced companies and sectors need to be attracted, created and supported, especially where they are initially thin on the ground, albeit within a context of relatively free trade and competition. In practice governments in most countries give considerable attention to creating conditions that will facilitate and encourage the creation and growth of high value-added companies and sectors. This section thus examines what the economics literature suggests might be expected from such supportive actions. There is widespread agreement about what constitutes a ‘driver’ of productivity. The key drivers are:

- R&D and innovation
- School and higher education and training
- Investment especially foreign direct investment
- Enterprise and company formation
- Competition and regulation

The remainder of this section of the report will consider each of these five drivers in turn, highlighting the main findings from the literature and including a headline assessment of performance. Much more detailed information on these drivers is included in the relevant chapters of the main report.

R&D and INNOVATION

Productivity in all manufacturing, and most services, ultimately depends on invention and on the diffusion of innovation. Competition between producers ensures that new products and improved production processes continually displace existing ones. However, the process of innovation is complex and is only partially understood. Its impact on productivity has attracted much research but has proved difficult to quantify. Much of the research on innovation has focused on formal R&D, but there is an increasing recognition that R&D is only one component of the process of innovation. In addition, many firms with little direct involvement in R&D can gain access to innovations through purchasing up to date equipment, licensing, through publications, reverse engineering, exchange of scientists and collaborations with other firms, universities etc.

Impact on productivity

There have been many attempts in the academic literature to estimate the impact on productivity of spending on R&D. The results have been highly variable and different approaches to estimation tend to generate very different estimates of the impact. It has long been recognized that firms benefit from R&D undertaken by other firms and institutions (spillovers) as well as from their own research. Increasingly the literature on the impact of R&D attempts to capture the influence of both firms' own research and spillovers. This research is summarized in the main report. Here we focus on the main results, particularly from recent UK research:

- Little evidence that government R&D spending had a significant direct impact on private sector productivity growth[11].

- Business R&D (BERD) in the USA has quadrupled as a share of GDP over the last 50 years and is now close to 2% of GDP. The equivalent in the UK has been a decline in BERD as a percentage of GDP from 1.5% in the 1980s to a little over 1% today. BERD in Northern Ireland has remained close to 0.5% of GDP.

- The most recent UK study suggests that a doubling of a firms stock of R&D knowledge would lead to an increase of 7-13% in total factor productivity (measured in terms of company sales)[12].

- Spillovers from R&D in other sectors (but not the same sector) have a significant positive impact on productivity. A doubling in external spending on R&D would increase a firm's productivity by 2-5%.

- Larger firms gain most advantage from their own research while smaller firms gain more advantage from spillovers (i.e. from the research of others)

[11] US Congressional Budget Office op cit p2. This cites two earlier CBO reviews for this conclusion ie How Federal Spending for Infrastructure and Other Public Investments Affects the Economy CBO July 1991; and The Economic Effects of Federal Spending on Infrastructure CBO June 1998. The BLS summary reaches the same conclusion p44, but also points out that much public research contributes to benefits which may not show up in productivity statistics. These include benefits to health and to defence.

[12] Kafouros M and Buckley P J (2008) *Under what conditions do firms benefit from the research efforts of other organisations?* Research Policy 37 pp225-239. This was a study of productivity change 1995-02 based on a sample of 117 UK manufacturing firms which reported their expenditure on R&D. Around 60% of the sample were firms in high-tech sectors and a similar proportion were in large rather than small firms.

- In high tech sectors the impact of own research and spillovers was greater than in low-tech sectors. A doubling of own R&D in high-tech sectors led to an 18% increase in productivity. Both same sector and other sector spillovers had a significant positive impact with the former more important.

The largest study of the impact of R&D in NI on productivity was that undertaken by Harris, Li and Trainor, based on 400 firms in Northern Ireland over the period 1998-2003[13]. This study found that firm's own research had a significant positive impact on productivity (measured in terms of real GVA), but it was difficult to detect an impact of spillovers from other research except in transport engineering (dominated by the Bombardier aircraft company). The impact of own R&D varied greatly between sectors. In most low-tech sectors a doubling in the stock of R&D was associated with a 3-5% increase in the level of productivity. However in the electronic sector the impact was much larger at 13%, echoing the finding of Kafouros and Buckley that high-tech sectors experience a higher elasticity.

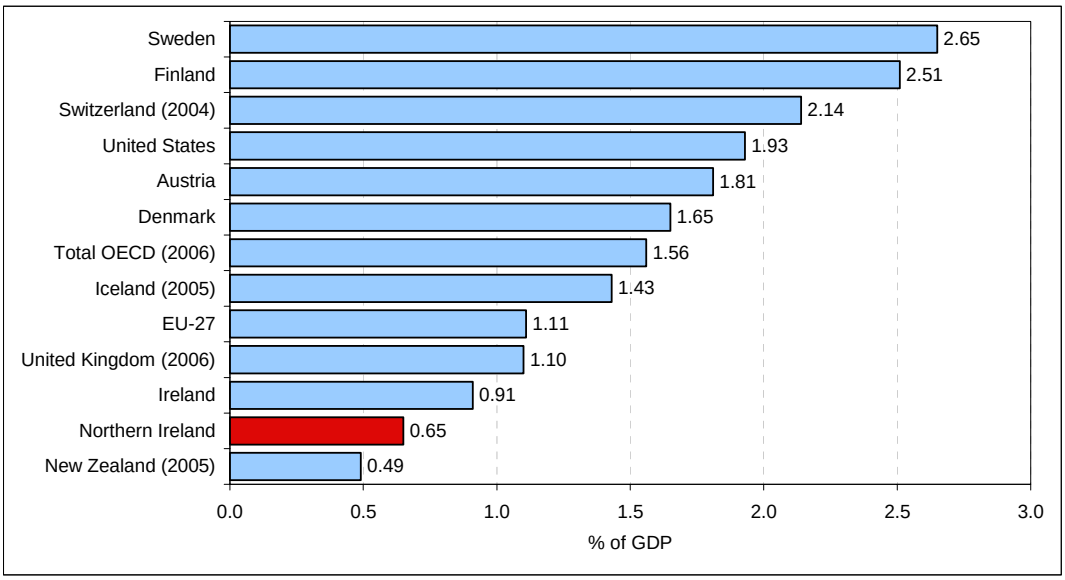
The diversity of results from academic studies make it difficult to draw simple or universal conclusions on the value of R&D spending for raising levels of productivity. Although there is general common-sense belief that more R&D is associated with more successful firms and economies, it is less easy to recommend any particular level of R&D as optimal, or to support particular levels of government support. Our conclusion is that a doubling in the stock of R&D spending would lead to an average increase in productivity of around 5-10% in most manufacturing sectors but more in science-based sectors. Such a large change in the R&D stock might take a decade or more to achieve and hence the impact on productivity would be spread over a long period. In addition the impact is also likely to be highly variable between sectors and firms. Also, productivity rises because of research undertaken in other firms, other sectors and in universities etc., and hence productivity gains can be made without undertaking large amounts of own research. Studies do indicate though that an in-house R&D capacity is necessary to be able to adapt the lessons of external R&D to a firms own circumstances. The impact of own R&D is much lower outside manufacturing, but non-manufacturing sectors gain from R&D and innovation in other sectors.

International Comparisons of Spending on R&D

This section focuses on business expenditure on R&D (BERD) since the economics literature suggests that it is this which most influences international differences in levels of productivity. It is clear that NI has a level of BERD well below half of the OECD average. NI is even further behind small peripheral countries. Sweden and Finland have levels four times greater than NI, and Switzerland and Austria have levels three times higher (Figure 5). Denmark and Iceland are at over double the NI level. All UK regions except the East of England (which includes the Cambridge high-tech cluster) have levels of BERD below all of these countries except Iceland. Even Iceland is above all UK regions except the East and South east of England. Most of these countries also have a long history of having internationally high levels of BERD. The interesting exception is Finland which in the early 1980s had a level of BERD close to the current level for NI (i.e. 0.5% of GDP). Over the following two decades Finland raised its level of BERD from one the lowest countries to the second highest. For this reason we pay particular attention to Finland in the country section.

[13] Harris Li and Trainor (2006) *Assessing the Case for a Higher R&D tax credit in NI,* CPPR and QUB for ERINI

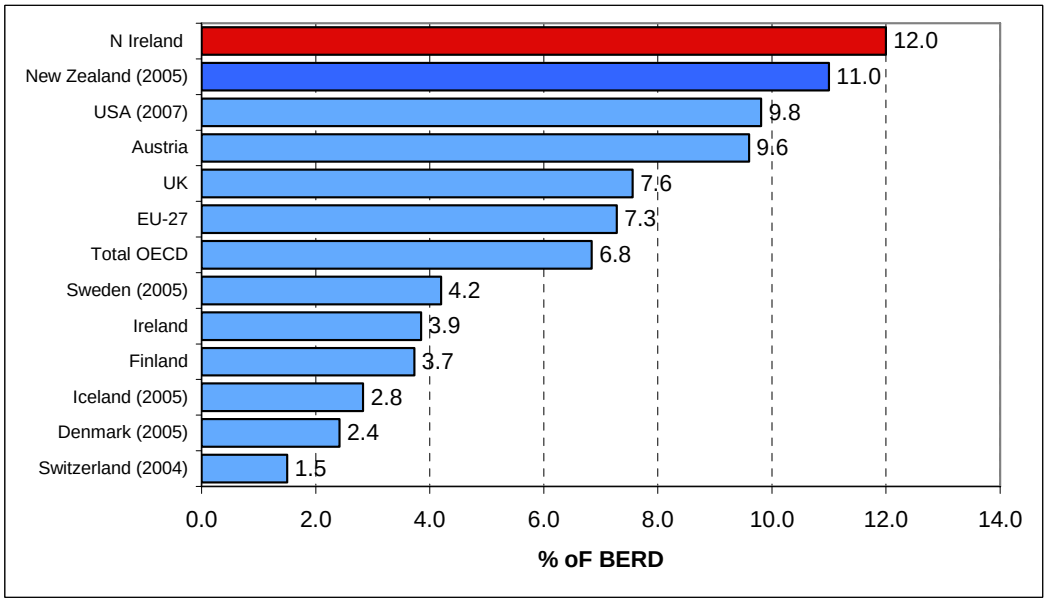
Figure 5: Business Expenditure on R&D as a % of GDP (2007)



Source: OECD Main Science and Technology Indicators Database 2008 and NI R&D Statistics 2007.

Although some of these small countries had active government policies to promote R&D and innovation, most contributed very little directly to the costs of business R&D through grants (Figure 6). NI had the highest level of direct support of any country examined here. The Nordic countries and Switzerland, with high levels of BERD all had levels of government support below a third of that in NI. Also, most of the countries with high levels of BERD do not have systems of R&D tax credits, although some have had them in the past.

Figure 6: Percent of BERD Financed by Government (2006)



Source: OECD Main Science and Technology Indicators Database 2008 and NI R&D Statistics 2006.

Effectiveness in converting R&D spending into patents is also uneven across countries. Although relative latecomers like Finland have a high patenting rate, the rate is lower than might be suggested from the level of expenditure on R&D (GERD). The UK comes relatively far down the patenting league table and NI has very few patents[14]. If some simple allowance is made for the structure of the economy in generating patents the UK and Ireland remain relatively ineffective in generating patents. The most effective patenting countries allowing for sector composition, are mostly 'Rhineland' economies (Switzerland, Austria, Germany, Netherlands) and the Far East (Japan and Korea).

Implications for Northern Ireland

Northern Ireland has a very low level of business spending on R&D (BERD) and an extremely low rate of patenting. Part of this is due to the small size of the private sector, but NI's BERD is also particularly low compared with the Nordic countries which like NI have large public sectors. Although spending on R&D by the NI university sector is high by international standards, and above the OECD average, the evidence is that this type of R&D spending has relatively little impact on productivity.

The low level of BERD is however likely to be a significant influence on low productivity in NI. Evidence from the economics literature suggests that doubling of BERD, from 0.65% of GDP to 1.3%, could increase total factor productivity by around 5-10% in manufacturing, less in low-tech sectors and more in higher-tech sectors. The impact in the service sectors is less clear but could be as large. This may be difficult to achieve in NI, since the work of Harris, Li and Trainor suggests a smaller impact of BERD on productivity. The low number of R&D staff in NI may for instance lead R&D to have a lower salience in wider company decisions. It would require a large increase in R&D capacity and numbers of researchers, and probably a substantial number of new research-intensive firms. It would also take a considerable time to work through the economy. Increasing R&D would require changes in company strategy and may be unlikely to be achieved solely through higher grants or tax credits, even though the literature suggests that both have a positive impact on raising company spending on R&D.

Doubling BERD in NI manufacturing could raise productivity close to the UK average. Although the evidence on service sector productivity is less well developed, the general relationship between BERD and GDP per employee across UK regions suggests a similar conclusion as that for manufacturing. A doubling in BERD would bring NI up to the UK average for BERD, but would still only be half the levels in Sweden or Finland. NI has an advantage in its relatively well developed HE research sector, and harnessing this more towards business productivity is one obvious way to direct policy.

[14] Evans P and Khan K (2009) in The Characteristics of Patenters in The Economic and Labour market review Vol 3 no. 12 Dec 2009 suggest that NI has the lowest rate of patenting of any NUTS 2 region in the UK at under 20% of the UK median area. Revised are due in a additional ONS study by Khan in late 2010.

EDUCATION and VOCATIONAL TRAINING

The average educational level in a country has a profound effect on levels of GDP per capita and labour productivity and hence on living standards. The common sense view that highly educated workforces are required to operate modern, high-productivity economies has been confirmed by academic studies. However, while this common-sense view may be true for extremes of technological sophistication it is less obvious that small differences in educational achievement have much influence on productivity and living standards. When confined to OECD countries alone, academic studies have found it more difficult to find a significant relationship between education and productivity.

This tells us that the economic impact of education is complex. Even with a well educated workforce, it matters that the labour skills are well or fully utilised. For instance, productivity levels in Soviet block countries were well below what could expected in the West from the often well educated Soviet workforces. More widely, high levels of education are generally not needed for many jobs. There is thus a tendency for technology to replace skills, and for competition to force firms down this road. Sophisticated economies have thus far managed to stay partly ahead of this technological curve partly through innovation and through becoming increasingly competitive in knowledge intensive sectors which do rely on skills. Some economies, particularly Nordic countries and Germany, have retained large manufacturing sectors, especially in engineering and electronics, and the high-skilled nature of the manual workforces are likely to have played a role in this.

Returns to Education

If education and literacy are to have a wider impact than for individuals alone the impacts should show up in two ways. Firstly, companies should show benefits. If companies benefit, then it is likely that their national economies will also do so. More generally, comparisons of national economies should demonstrate a connection between investment in education and literacy on the one hand and economic success on the other.

For individuals, every study shows that more education, better qualifications and higher literacy all result in higher wages. Authors who have attempted to differentiate purely personal gains from gains to the wider economy conclude that most of the wage gains made by better educated individuals are likely to reflect genuine benefits of education rather than merely being signals to employers about the inherent abilities of individuals. Benefits in terms of higher wages are typically measured as 5-10% for each additional year in education, and around 50-75% above the level with no qualifications for having degree qualifications.

The most relevant studies of company productivity have typically compared firms in the UK or Northern Ireland with those in Germany. The results have shown substantially higher productivity in German companies and this has been ascribed by a range of authors to superior standards of vocational training. Better trained workers tend to be more flexible, to realize higher gains from investment through avoiding breakdowns and repairing equipment more rapidly. An ability to understand complex machine manuals was one factor contributing to these advantages.

Educational Returns for Countries

Cross-country studies of the impact of education on productivity have had mixed results. The earliest work was in the growth accounting tradition. OECD (1993) reviewed a large number of

'growth accounting' studies across seven OECD countries. In these studies the evidence suggested that 10-20% of economic growth could be explained by improvements in education. However, a large number of cross-country regression studies have struggled to find a clear relationship between human capital and growth in per capita GVA for OECD countries. Findings that secondary school enrolments did influence economic growth was not always confirmed when years in education was used instead as the measure of human capital. However, when literacy scores were introduced as a measure of human capital a more positive and significant relationship was observed. It was at this stage that the International Adult Literacy Survey (IALS) data became available and was used for the first time in a cross-country growth regression study[15]. This study, by Coulombe et al in 2004, found that:

- In the short run, a rise of 10% in the relative literacy score results in a short term rise in the 5 year *growth rate* of per capita GDP of 1%. The short-run impact on labour productivity is similar but a little higher.

- In the long run, a permanent rise of 10% in the literacy rate results in a level of per capita GDP of 15%. For productivity (GDP per employee) a 10% rise in literacy rate leads to a rise of 25%.

- These long term improvements in relative GDP will take a long time to be realised. The authors state that it would take between 12 and 33 years to realize half of the productivity gain following a policy change that shifted average literacy scores up or down. Our own calculation based on the Coulombe results is that a sustained 10% improvement in literacy scores, from 90% of the international average to 99%, would take over 30 years to realize half of the 25% long-term gain in productivity.

- A change in literacy scores has a long-term impact three times as large as a change in physical capital. However this may not translate into economic returns three times higher since the cost of increasing human capital by a given percentage may be higher than for increasing the investment rate.

- The higher impact of literacy rates on productivity (GDP per employee) than on per capita GDP implies that while literacy scores raise productivity they may also indirectly reduce employment rates or raise net in- migration (both of which would reduce the increase in per capita GDP below that in productivity)

- It does not matter which of the three measures of IALS literacy are used. All give similar results.

- Literacy scores are a better predictor of per capita GDP (or labour productivity) than years of schooling. When both variables are included in the growth regressions, only the literacy scores are statistically significant.

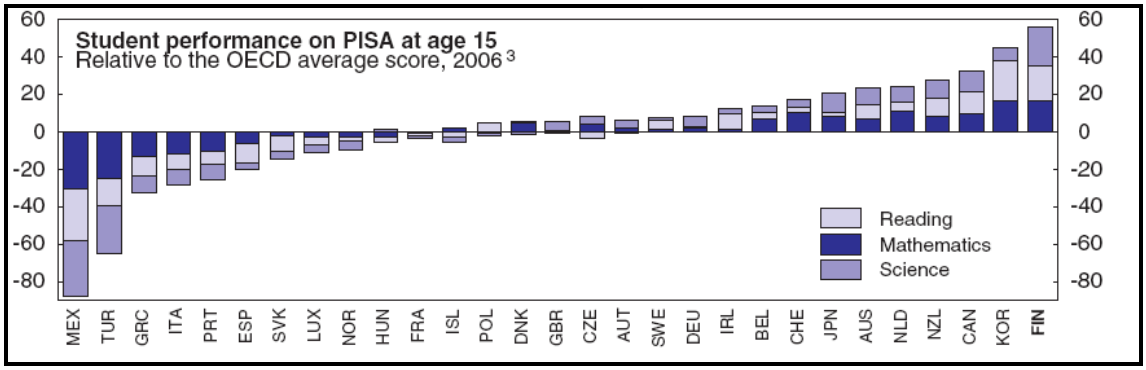
International Comparisons of Educational achievement

The most widely accepted measure of school achievement are the OECD's standardised PISA tests for 15 year olds. These have been undertaken three times, most recently in 2006 and cover literacy in maths, reading and science. Although not without their critics (for instance maths teachers complain about a lack of testing of techniques) these are the most comprehensive and

[15] Coulombe S., Tremblay J.F. and Marchand (2004) *International Adult Literacy Survey: Literary scores, human capital and growth across fourteen OECD countries*, Statistics Canada

most carefully standardised measures. In each of the three rounds of PISA tests Finland has had the best results across all three subjects with a mean performance around 10% above the OECD average. Korea and Japan attain mean scores (Figure 8) around 5% above the OECD average but appear to achieve this with a good deal of cramming and pressure on school children. Finland is particularly impressive in achieving high marks with one of the shortest school days and school years of any country. Within the spectrum from the high achieving Finnish or Far Eastern countries, down to the low achieving Mediterranean countries the UK is intermediate and close to the OECD average. Northern Ireland provided an extended sample in the 2006 PISA tests to provide a valid measure of achievement. Average scores were close to, but a little below, the UK average.

Figure 8: Performance of 15 Year-Olds on International PISA Tests (2006)



Source: OECD

The UK, including NI, spends close to 4% of GDP on school education and 1% on tertiary education. For schools the UK is towards the higher end of OECD countries, but for tertiary education is below the OECD average and well below the USA and Canada (and even Korea and Chile). Teachers salaries are a little above the OECD average when purchasing power is taken into account. Among OECD countries there is little correlation between spending on schools and average attainment in the PISA tests.

Implications for Northern Ireland

A recent OECD study of the UK economy[16] views the UK as reasonably well endowed with graduates but points to the high proportion of working-age people with low qualifications as a priority for education policy. NI has always been well behind the UK average for the percentage of graduates in the workforce but has largely caught up among the younger working-age groups and can be regarded as reasonably endowed in this respect by international standards. However, Northern Ireland is the worst-placed region of the UK with regards to low skills and thus has much to gain from up-skilling this group. The analysis in this study also suggests that the UK, including Northern Ireland, achieve much poorer results in the lowest 20% of attainment especially when compared with Finland (see Finland chapter).

Rates of staying on at school and full-time FE until age 18 in NI are ahead of the UK but are still below international best practice. Surprisingly, it is in school attainment that improvements in NI are most needed. The pride taken in NI's educational achievement at school level is generally based on comparisons with GB. However international comparisons show that GB is not an especially good benchmark particularly for school attainment. NI is well behind the world's best

[16] OECD Education at a Glance 2009

achieving countries in PISA scores for 15 year olds. As noted above, it compares poorly with Finland especially at lower attainment levels. This suggests that much could be done at these lower levels.

A related priority is improvement in the vocational education system even though some reforms are underway with such things as modern apprenticeships. The impact on productivity of better vocational educational has been amply demonstrated by a range of detailed studies, and countries with well developed vocational systems tend to have been able to maintain larger manufacturing sectors than the UK. Although NI's manufacturing sector is larger than in GB, this has been achieved through an expensive system of grant assistance[17]. Improved vocational education and higher levels of R&D spending are better ways forward[18]. This is not however easy. It seems likely that a range of legislative changes are required together with close collaboration between government and business. Changes in the provision of vocational educational alone are unlikely to be sufficient.

What could educational improvements do for NI? The research on international adult literacy tests suggests that a permanent 10% rise in the literacy test scores could raise GDP per head by 15%. A rise of this magnitude would take NI close to the levels achieved by Nordic countries (examined in the country chapters). However, the 15% rise in per capita GDP would take decades to realise, and it would take years to reform education provision and decades before better educated school leavers percolated into the workforce. Improvements to education in NI could also be undermined if many of the best educated left NI. A better educated workforce in NI therefore depends not only on the local education system but also on the creation or attraction of jobs in high value-added activities. Research by Regional Forecasts Ltd on regional wage levels confirms a strong relationship within the UK between average wages and the proportion of the workforce who are graduates working in the private sector. This suggests that doubling the proportion of graduates in the private sector would raise average wages for all employees by 15%.

[17] IREP 2009. para 4.56 p92

[18] For instance Germany and Finland have proportionately larger manufacturing sectors than NI. In both cases there are few investment grants but strong vocational training systems and high levels of BERD.

FOREIGN DIRECT INVESTMENT

Foreign-owned multi-national companies (MNEs) are an important element in economic development and productivity growth in most modern economies. They generate about a quarter of manufacturing output in the EU and a fifth in the USA[19]. They almost always have much higher levels of productivity than domestic firms in the same country, and their parent firm's high levels of competitiveness are the main reason why they have been able to spread their operations beyond their own borders. They are particularly important for newly industrialising countries, and for older industrial areas which are unable to domestically generate sufficient levels of economic development to achieve target levels of prosperity. Some countries, including Germany, Japan, Sweden and Finland have generated strong competitive economies without much reliance on foeign MNEs, but in others, including Ireland, Estonia and Singapore, FDI has been the mainspring of modernization and much of this is new FDI. The UK and France are also surprisingly highly dependent on MNEs, with MNEs accounting for 31% and 36% respectively of manufacturing output. However as in other large well developed economies much of this was achieved through take-overs and mergers.

Impact of FDI on Productivity and Wages

Most studies of FDI show that foreign-owned firms have higher productivity than locally-owned firms. In a study of 165,000 UK manufacturing firms over the period 1996-2000 Criscuolo and Martin (2003) for instance found that foreign-owned firms had levels of value added per employee 59% higher than local firms[20]. Figures for other advanced economies are lower than this, but all reveal higher productivity in foreign-owned companies[21]. Foreign firms in manufacturing are usually larger than domestic firms, are more capital intensive, and have a high propensity to operate in high technology sectors. It thus seems likely that a policy of attracting new FDI in manufacturing will tend to raise labour productivity in the host economy, mainly by attracting capital-intensive firms in high technology sectors. There is little published evidence on productivity in service-sector FDI and the experience of new service sector firms moving into Northern Ireland suggests that when these seek out low cost labour, levels of labour productivity can be low.

The main impact on the host economy will usually come through wages and tax revenues rather than profits (which are usually repatriated). An extensive study of the effects of FDI found that '*it is rare to find a study of FDI and wages in any country that does not find that foreign-owned firms pay higher wages, on average, than at least privately-owned local firms*[22]*'.* Firms may pay higher wages for greater skill, but even in the absence of higher skills may wish to reduce labour turnover, or simply to attract the most effective workers. Studies on UK data find a wage premium paid by MNEs of 6-26% even after controlling for firm size and sector[23]. Studies of skills in the UK tend to show higher levels in MNEs but it is not known whether this is due to acquisitions or to new FDI.

---

[19] Navaretti G B and Venables A J (2004) *Multinational Firms in the World Economy*, Princeton University Press. P1

[20] Criscuolo C and Martin R (2003) *Multinationals, foreign Ownership and productivity in Uk Businesses*, Royal Economic Society Conference 2003

[21] Navaretti and Venables op cit table 1.7. p13.

[22] Lipsey R B (2002) *Home and Host Country Effects of FDI*, NBER Working Paper 9293

[23] Studies cited in Navaretti and Venables p164.

Location Factors

There are many reasons why firms choose one country over others in which to locate their overseas activities. A number of authors have pointed out that the cross-country pattern of FDI location is quite well approximated by a 'gravity' relationship, in which firms are likely to locate in countries which are nearer rather than farther from their home base. Trade barriers increase the likelihood of firms needing to set up production in order to exploit local markets, although such factors cannot account for differences within the EU and their importance has waned as trade barriers have diminished. Studies not surprisingly find that larger countries, measured by GDP, attract more FDI than smaller countries. The formation of the EU single market in 1992 was, for instance, followed by a substantial rise in UK FDI into the EU, and especially into smaller EU nations since these gained easier access to wider EU markets.

The 2009 Ernst and Young European Investment Monitor tracked 3,718 new FDI projects across Europe in 2009 (involving 148,333 jobs promoted), and asked 809 company executives about the factors influencing their locations. The main groups of factors were:

- **Access to markets**, including proximity to markets, transport mobility, and telecommunications infrastructure;
- **Labour and productivity**, including skills, labour availability and costs;
- **Taxes and laws**, including taxes and incentives, laws and regulations; and
- **Environment and region** including specific local expertise, R&D and innovation, and quality of life.

The Ernst and Young 2007 European Attractiveness Survey provided more information on the ranking of these factors. The five most important factors in influencing investment were found to be infrastructure (transport, logistical and telecoms), labour costs, potential productivity, legal & regulatory environment and corporate taxes. Labour skills were also found to be important. In contrast, neither R&D availability nor support from public authorities was valued by firms to the same extent. Some of the factors identified are relatively equally available across a range of European countries and hence cease to discriminate between locations. Factors like Corporation Tax, which differ sharply between countries, can thus become the determining factors.

Impact of Corporation Tax

To examine the scale of FDI and reasons for location in a range of small peripheral countries we have specially commissioned data from fDi Intelligence Ltd on FDI into ten small, and mainly peripheral, countries that might reasonably be considered to have some similar characteristics to NI. In addition, data is included for the UK as a benchmark and also for export sectors in NI. The data covers the years 2003-09 and includes 8,578 new investment projects with an estimated 894,000 jobs promoted or an average of 128,000 per annum[24]. Around a third of projects were in sectors we have designated as 'export' sectors[25]. Table 1 highlights that among the smaller countries Singapore attracted by far the largest number of jobs and had the highest ratio of jobs to population at 37 jobs promoted per thousand people, or 5.3 jobs per thousand population per annum. This rate of attraction was almost 6 times higher than in the UK. Estonia and Ireland also had high rates of attraction at around four times the UK rate. The Scandinavian countries generally have the lowest rates of attraction at around 10% below the UK.

[24] Additional data is in the annex to this chapter.

[25] Export sectors include manufacturing, business services, call centres, HQs, R&D and ICT centres, and sales marketing and support centres. Local market sectors are retailing ,construction, logistics and extraction.

Table 1: Jobs Promoted in New FDI 2003-9 per Head of Population

	All Sectors	Export sectors	Local Market Sectors
Singapore	37.4	27.1	10.3
Ireland	22.2	9.3	12.9
Estonia	25.2	8.8	16.5
Iceland	9.5	8.3	1.3
NI	n/a	4.6	n/a
Switzerland	6.2	3.8	2.4
Austria	5.5	2.7	2.8
NZ	5.2	2.6	2.6
UK	6.4	2.1	4.3
Denmark	5.3	2.1	3.2
Sweden	5.2	1.7	3.5
Finland	3.7	1.1	2.7

Source of data: fDi Intelligence Ltd.
Note: the raw data for 2009 is for Jan-Aug but has been pro-rated up to a full year.

We have investigated the influences on the number of jobs promoted in new FDI in each country over the period 2003-09 using this data (see section 4.1 in the main report for full details). To provide a broad indication of the scale of the relationships, a regression analysis was undertaken across 12 countries, including NI, to analyse the effect of eight location factors[26], including labour costs and corporate taxes, on number of jobs promoted per thousand population over the period. The key variables proved to be statistically significant and with the expected signs, with the most significant influences on FDI in export sectors found to be corporate tax rates and labour costs. Labour market regulation was also significant but only if Singapore was included. A one percentage point decrease in corporate tax rates was associated with a 10% increase in the number of FDI jobs promoted. Similarly, a one percentage point decrease in labour costs was associated with a 1% increase in the number of FDI jobs promoted. In order to further validate these results it would be necessary to conduct the analysis over a broader range of countries as well as a greater number of explanatory variables. In addition, the nature of the relationship between the rate of corporation tax and FDI that applied over the period of strong economic growth between 2003 and 2009 may not apply to the same extent in future years.

A great variety of academic studies have examined the impact of corporation tax rates on inward investment flows have been most recently reviewed in an OECD Tax Policy Study in 2007[27],.This reviewed 36 different studies but relied heavily on a meta-analysis of these studies by De Mooij and Ederveen (2005). This study attempts to separately identify the influence of tax on direct investment alone, excluding mergers and acquisitions (which were also excluded from the analysis above). The meta-analysis suggests that a one percentage point decrease in corporation

[26] The factors included in the analysis are taken from the academic literature and are dependent on data availability. They include three of the top five variables from the Ernst and Young List, i.e. labour costs, corporate taxes and legal & regulatory environment. Some other variables from the Ernst and Young list were also included in the analysis but proved to be statistically insignificant (Size and growth of market, English language and Eurozone membership).

[27] OECD (2007) *Tax Effects of Foreign Direct Investment: Recent Evidence and Policy Analysis*, Tax Policy Studies no.17 Paris

tax rates will be associated with a 7-14% rise in inward investment flows and is broadly in line with the 10% rise estimated in this report using the fDi data[28].[29]

Implications for Northern Ireland

In recent years almost all new FDI in companies moving into NI (i.e. excluding re-investments by MNEs) have been in the service sectors. IREP showed that a large proportion of these have been in contact centres and many pay low wages, below the existing average wage rate in NI. Although some of the FDI projects pay much higher wages it is unlikely that new FDI as a whole does much to raise average productivity levels in Northern Ireland. Since most MNE companies have much higher productivity than local firms, Northern Ireland is unusual in this respect. The reasons for this anomaly are likely to reflect grants and low wages as attractors for FDI projects. In the Republic of Ireland, where low corporation tax is the key attraction, the productivity of FDI firms is much higher than for local firms.

Our analysis suggests that a reduction in Corporation Tax could have a significant impact on the level of new FDI into Northern Ireland, both in terms of levels of investment and jobs created (see section 4.1 of main report for more information). Tax rates are, of course, only one of a number of variables that influence the location of FDI (Ernst and Young identify 19). However, many of these location factors are relatively equally available in most developed economies and do not differ much between countries. Factors which are relevant for the four case study economies (and which do tend to differ across economies) include skill levels, labour costs, R&D availability and Corporation Tax.

[28] Note that our analysis includes only new FDI and excludes most reinvestments. Corporation tax can be expected to have a lesser impact on reinvestments than on new FDI because in the former case the influence is on whether or not to invest. In the case of new FDI the impact is merely on the location in cases where the decision to invest can be assumed to have already been made.

[29] OECD (2007) op cit table 2.6 p62.

ENTERPRISE and COMPANY FORMATION

Although entrepreneurship has long been recognised as important in driving economic growth, it has only recently regained attention as a driving force for innovation and productivity growth. The dominant role of large firms in the innovative process previously held sway in debates on productivity and growth, but the role and importance of small firms is now recognised with respect to radical innovations in the economy (Thurik, 2009)[30]. Whether small firms or large incumbents are dominant is seen to be dependent on the prevailing technological regime. Small firms tend to dominate in an entrepreneurial regime favourable to innovative entry by contrast with a routinised regime favourable to established firms. (Nelson and Winter,1982; Audretsch,1995)[31].

Research makes an important distinction between entrepreneurial activity and enterprise. Entrepreneurship is the activity of an individual(s) in starting a new firm. Entrepreneurs whether they are individuals or small firms are distinguished by the role they play in exploiting (new) knowledge in the process of innovation. 'Entrepreneurship becomes central to generating economic growth by serving as a conduit for new knowledge', Audretsch and Keilbach (2005). The contribution of entrepreneurial activity is therefore distinguished from that of small and medium size enterprises (SMEs) which include previously established firms. Audretsch (2002), also distinguishes between (traditional) SME policies and entrepreneurship policies with the latter having a much broader focus. SME policies focus on existing firms and policy is designed to promote their viability and growth. Entrepreneurship policies focus more on potential entrepreneurs and their role in supporting innovation, and include support for individuals as well as enterprises, clusters or networks, which might involve a sectoral and/or spatial dimension. Notwithstanding this difference in focus, SME policy still remains at the heart of entrepreneurship policy.

Cross Country Differences in Entrepreneurship

The OECD Entrepreneurship Indicators Programme provides a one year snapshot of entrepreneurial performance (measured by birth rates and death rates) for several of the peripheral economies. These exclude the UK (and NI), which we have added from UK VAT registration sources[32]. There are significant differences in birth and death rates across the countries in Figures 9 and 10.

In the manufacturing sector, the Nordic countries, except Finland, tend to have low birth rates and high death rates giving a net decline in the number of enterprises. Canada, Italy, Estonia and New Zealand had the highest birth rates. These were either countries with low population densities and growing populations, or in Italy's case an economy with a very large family-oriented SME sector. The UK is intermediate on this scale but like the Nordic countries had a declining population of industrial enterprises. Northern Ireland is interesting. Although its birth rate is low, the death rate is even lower, giving one of the highest net increases in manufacturing firms. This is indicative of a lack of competition, and possibly the impact of grants and other subsidies in keeping firms alive. Although wages are not as low as in Estonia, the relatively low wages in Northern Ireland may also help firms to survive.

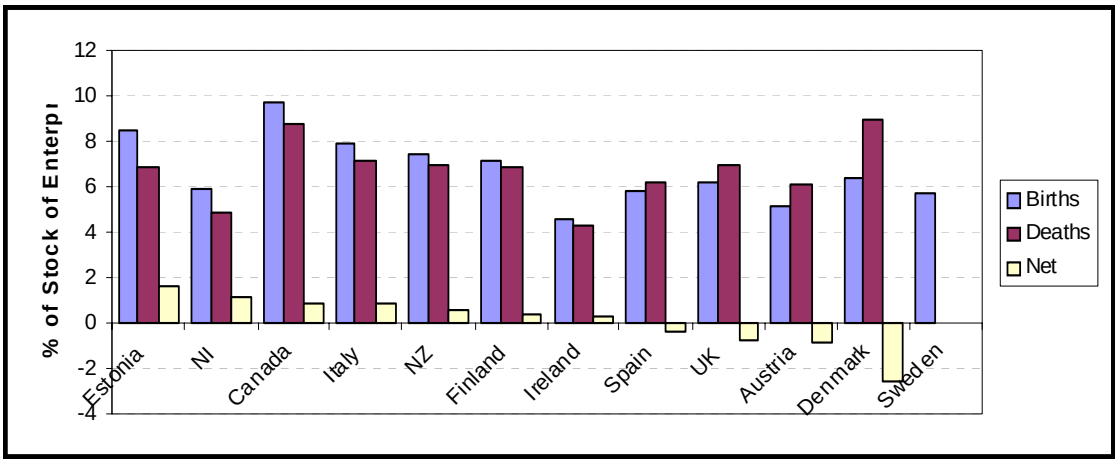
---

[30] Thurik, R. (2009), *Entreprenomics, Entrepreneurship, Economic Growth and Policy* in Acs, Z and Audretsch, D.B. and Strom, R (eds.) Entrepreneurship, growth and public policy Cambridge: Cambridge University Press

[31] Audretsch, D.B., 1995. *Innovation and Industry Evolution*. Cambridge, MA: MIT Press.

[32] Although the comparability may not be exact it should be close, since the threshold for VAT registration at a turnover of £65,000 is such that enterprises would normally have one employee as in the OECD definition.

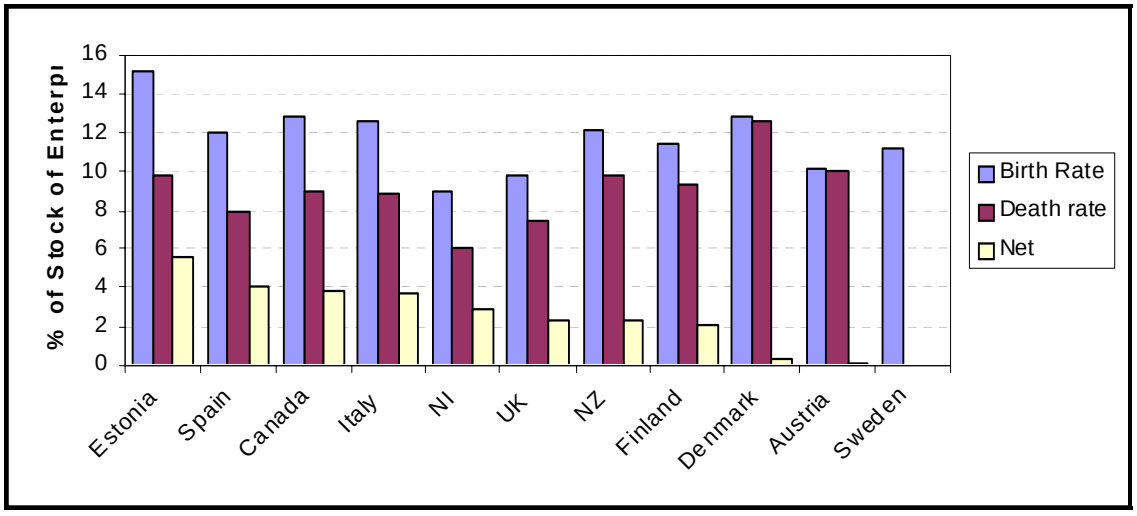
Figure 9: Enterprise birth and death rates in Manufacturing 2006 (% of population of active enterprises with at least one employee)



Source: OECD (2009) Measuring Entrepreneurship: A Collection of Indicators, a report to the OECD-Eurostat Entrepreneurship Programme, 2009 Edition.
Note: UK and NI have been added from national sources (VAT registrations). Deaths data for Sweden is unavailable. Data for Ireland includes only enterprises with 3 or more employees and hence is not fully comparable.

Birth rates are typically much higher in the services sector than in manufacturing, (Figure 12). Of the small peripheral economies, Estonia stands out with the second highest birth rate second only to Lithuania. These countries had particularly high birth rates in the wholesale and retail trades and in 'other services), perhaps reflecting a continuing adjustment to a free-enterprise economy. The UK, and especially NI, are again characterised by low birth rates and low death rates.

Figure 10: Enterprise birth and death rates in Private Services 2006 (% of population of active enterprises with at least one employee)



Source: OECD (2009) Measuring Entrepreneurship: A Collection of Indicators, a report to the OECD-Eurostat Entrepreneurship Programme, 2009 Edition
Note: UK and NI have been added from national sources (VAT registrations) Private Services are retail & wholesale distribution and repairs, transport, storage & communications, finance & business services. Deaths data for Sweden is unavailable. Data for Ireland is unavailable for the service sectors.

Constraints on Entrepreneurship

Survey data from the EC SME Observatory provides some insights on the extent and nature of constraints faced by new start-ups and existing SMEs.

- The cross-country differences in entrepreneurship reflect the impact of a variety of different constraints.
- The extent to which firms experience constraints tends to be more prevalent for the non-case-study economies compared with the case-study regions. The most serious constraint facing SMEs in the EU in 2005 would appear to be the lack of customer purchasing power. Constraints raised by regulatory regimes and the labour market also figure quite strongly.
- Access to finance would appear to be a much more prevalent constraint for the non-study economies.

Overall the OECD indicator measuring barriers to entrepreneurship shows a substantial decline in the decade 1998-2008 over the majority of the economies.

Implications for Northern Ireland

NI has a birth rate for new manufacturing companies which, although a little below the UK regional average, is close to average on the international spectrum. For service sector firms the birth rate in NI is low by international standards. Closure rates are, however, low in both sectors, reflecting a less competitive economy.

The UK has operated policies favourable to new start-ups for several decades and NI has benefitted from these. The range of potential constraints to new start-ups listed above suggests that NI has few constraints than other countries. However, the case study countries selected for this report have mostly adopted similar policies over recent decades. NI's main advantage appears to be in its low rates of closure of firms, and we ascribe this partly to low start-up rates (in the service sectors) but also to the grant regime of government support for investment and other activities.

We should note that little internationally comparative data is available on the contribution made by new and young firms to long term growth. This contribution depends on post-birth growth as on birth and death rates. The likelihood is that most European countries are well behind the USA in respect of fast growing young firms. Few Googles or Microsofts emerge in Europe, including the UK. Apparently new companies like Finland's Nokia turn out to have emerged form previously large although different companies. The UK evidence of league tables such as the Sunday Times Techtrack 100 suggests that NI lags behind other parts of the UK, and especially behind South East England[33]. NI rarely has more than one firm in the fastest growing 100 young firms despite having almost 3% of the UK's population. A small private sector is one factor, but even allowing for this the numbers are low. Policies to promote the growth of firms with high growth potential are needed. These may be the same range of policies listed above for R&D, education and FDI to stimulate high productivity throughout the economy.

[33] http://www.fasttrack.co.uk/fasttrack/leagues/tech100supplement.html

COMPETITION AND REGULATION

Economic theory differs in its expectation of the impact of regulation. Most approaches view regulation costs as a kind of tax which reduces returns on investment. The Solow model of economic growth predicts that higher regulation will depress the level of productivity but not the rate of growth. Endogenous growth models predict that technological change is influenced by learning by doing and in which high costs of regulation will depress returns to innovation and will slow the rate of growth of productivity. Empirical studies have focussed on product market regulation and labour market regulation.

Product Market regulation

Most major studies have found that light regulation is associated with higher productivity. An OECD study in 2003 concluded that if European countries adopted the light regulatory stance of the USA, productivity would rise by 1.1 percentage points over 10 years[34]. An IMF study found that a one standard deviation decrease in the OECD's regulation measures raised real GDP per head over four years by:

- 4.7% for trade
- 2.3% for tax reforms
- 7% for product market deregulation
- 1.9% for labour market deregulation

Other studies have shown that the main productivity gains from lower regulation were achieved through:

- Higher investment, particularly in utilities, transport and communications
- Higher entry of new firms

Regulation appears to have played a significant role in the difference between the USA and Europe in productivity growth in the late 1990s when US productivity surged, particularly in retailing. The ability of USA sectors to take full advantage of the IT revolution is related to the light regulation regime. Nicoletta and Scarpetta (2005) found that countries with stronger product market regulation had a lower contribution to productivity growth from ICT-using services[35].

Labour Market Regulation

A number of studies have examined the impact of employment legislation on productivity at the level of the whole economy and have generally found that the impact is small or insignificant. This may be because the impact varies considerably between sectors. The most recent and most extensive study of the impact of labour market regulation on productivity takes account of this possibility and also examines different types of legislation over the period 1982-2003[36]. The study finds that:

---

[34] Nicoletti G and Scarpetta S (2003) *Regulation, Productivity and Growth*. Economic Policy 36

[35] Nicoletti G and Scarpetta S (2005) *Regulation and economic performance: Product market reforms and productivity in the OECD*. OECD Economics Dept Working Paper no.460

[36] Basanini A, Nunziata L, and Venn D (2008) *Job Protection Legislation and productivity Growth in OECD Countries*, Institute For the Study of Labour (IZA) Discussion paper series no. 3555.

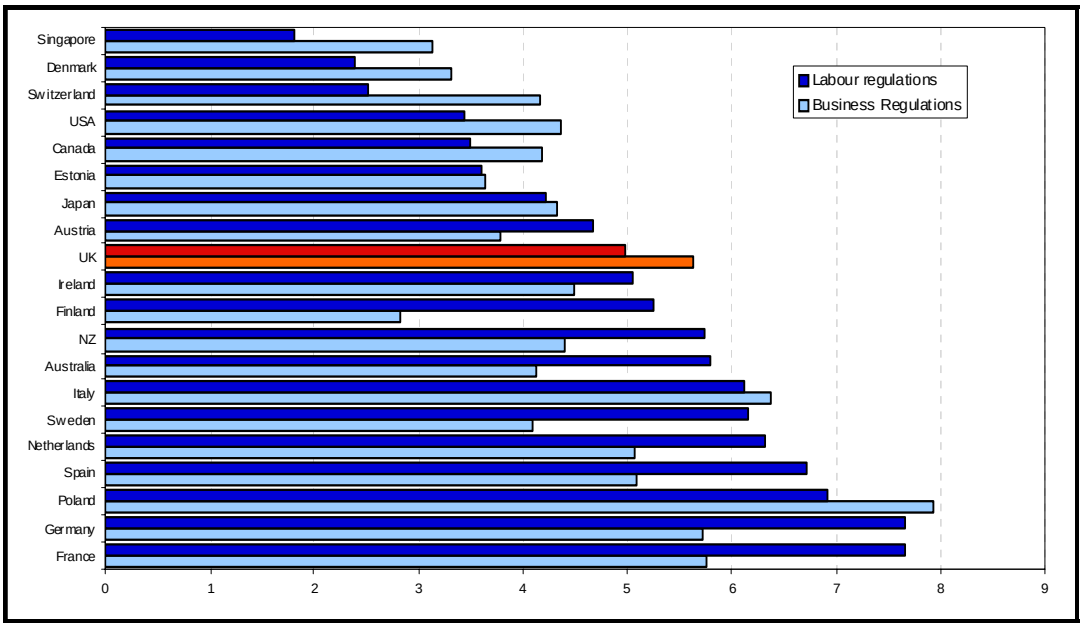
- Dismissal regulations depress total factor productivity in sectors where layoffs are more likely.
- The main impact of layoff restrictions is on efficiency improvements and technological change.
- Restrictions on the use of temporary labour have if anything a positive impact on productivity.
- No evidence that dismissal regulations affect the adoption of better capital equipment.

A one point difference on the 6-point OECD scale of employment regulation would lead to an increase in total factor productivity of around 0.15% per annum. A one point difference is approximately the gap between the USA and UK or half the gap between the USA and the EU. Most countries have done little to reform dismissal rules for full-time employees. Many have instead deregulated temporary contracts, but this study suggests that such changes will not raise the growth of productivity.

International Differences in Regulatory Strength

The UK, including NI is generally considered to be among the most lightly regulated of the OECD economies, following the Thatcher reforms of the 1980s. This view is supported by the OECD which measures product and labour market regulation on a 6 point scale. These measures place the UK close second only to the USA on lightness of product market regulation, and third after the USA and Canada on employment protection. However, these objective measures do not tell the whole story, since the stringency of enforcement and associated bureaucracy are also important. In more subjective surveys of businesses the UK emerges as intermediate among a wide range of countries for labour regulation but quite high for business regulation including planning laws (Figure 11).

Figure 11: Survey-based Measures of Regulatory Impact (Scale 1-10)



Source of data: IMD World Competitiveness Handbook 2005

Implications for Northern Ireland

For many purposes NI is part of the UK regulatory system which as indicated above has a low level of objectively measured regulation. IMD surveys of business however suggest that the UK is not regarded by business as particularly lightly regulated compared with other advanced economies. Many aspects of regulatory reform lie outside the competence of local policy makers, including for instance trade regulation and much environmental control which is decided at EU level. Important exceptions include planning and state ownership of businesses. The majority of evidence suggests that further removal of regulation would have a positive impact on productivity but that this improvement would be relatively small.

The evidence is that state ownership of businesses depresses productivity and that the wave of privatisations since the 1980s has raised productivity. This is certainly the case in NI where the data shows rapid convergence or overtaking of UK productivity levels following privatisations in the 1990s in:

- The utilities sector where NIE was privatized in 1992/3 and the private gas company Phoenix entered the market to provide North Sea gas

- Transport equipment where Harland and Wolff and Shorts were both sold to foreign owned private companies in 1989.

Finally, planning controls are often cited as one of the most restrictive aspects of UK regulation. The evidence is that planning decisions are slower in NI than in GB, although they may not be more restrictive in other respects[37]. McKinsey Global Institute (1998) argued that restrictive planning laws in GB reduced productivity especially in distribution, a sector which contributed much of the USA's productivity surge at this time. Restrictions on retail sites were initially less onerous in NI and several major supermarket companies took advantage to expand in NI when site constraints prevented new openings in GB. More recently, planning laws have been tightened in NI and major delays have occurred in a number of large retail developments including John Lewis at Sprucefield which has still not gone ahead. The statistical evidence is ambiguous on whether the large series of major investments in distribution by national or international companies has led to any convergence in NI productivity towards the UK average[38]. What is clear is that new developments can be associated with dramatic increases in labour productivity[39].

[37] See the Independent Review of Economic Policy in NI (2008) chapter 7 for evidence on longer delays in NI planning.

[38] Data on GDP covers restaurants, catering and vehicle maintenance alongside distribution, making it difficult to detect any impact of new distribution developments on productivity. In addition national retail companies may not fully report NI earned in NI.

[39] John Lewis' decision to relocate its GB distribution depot, for instance, led to a reduction of two-thirds in the depot's labour force.

SECTION 3 – EVIDENCE FROM CASE STUDIES

The introduction to this report has outlined the headline performance of the selected case studies which led to their inclusion in this study. As a reminder, the four selected economies are:

Table 2: Overview of Case Studies

	Population 2008	GDP per Capita, 2007 PPP (NI=100)
Finland	5.3m	125
Ireland	4.5m	130
Sweden	9.2m	131
Estonia	1.3m	73

The full report, which sits alongside this summary report, provides much greater detail on economic development in each of the four countries and the key organisations involved in this. The purpose of the following chapters is to present relevant information from the main report which underpins the conclusions identified in the final chapter.

Each chapter is structures as follows:

- **Background** on each of the countries
- A overview of the **role of policy** in economic success
- An outline of the **key organisations** in place
- Information on relevant **drivers of success**
- **Conclusions** on what have been the relevant key factors

LESSONS FROM FINLAND

Finland is one of the most remote of Europe's prosperous economies, lying a thousand miles from the core of Western Europe's major markets and twice as far away as Northern Ireland. Finland's history has many similarities with Ireland. It was historically a colony (of Sweden and then Russia) gaining its independence in 1917 immediately followed by civil war. It was a poor agricultural country which lost 15% of its population in Western Europe's last major famine in 1865. Its geographical position was however much more precarious than Ireland. It was invaded by the Soviet Union in 1939 and fought further wars in 1942 and 1945. With a post-war economy in the shadow of the Soviet Union it suffered badly from the loss of Soviet markets in 1989. Economic growth since the 1960's was initially slow but has blossomed as trade restrictions were dismantled, including within the EU which Finland joined in 1995. Finland's advantage may have been its proximity to Sweden which provided an important benchmark in home-grown economic success and the development of world-class companies. Unlike Ireland which adopted low taxes to attract British and US companies, the Finns copied and refined Swedish approaches to economic development with an emphasis on education and knowledge.

Traditionally a relatively poor country within the Nordic group of economies, Finland has steadily improved to become one of Europe's most prosperous countries. It has levels of productivity above the UK average, and much higher than in Northern Ireland. Finland maintains a public sector proportionately as large as that in NI, and has an egalitarian income structure and relatively high manual wages. It can maintain these because its private sector is highly competitive in international markets. Its economy recovered strongly from the major setback of the Scandinavian banking crisis and collapse of Soviet markets in the early 1990s, and as a result has attracted great interest abroad[40]. Unlike Ireland, all of this was achieved with little foreign direct investment. Unlike the UK Finland has retained a large manufacturing sector, despite significant off-shoring to the Far East. Also, unlike other EU states Finland has succeeded in developing a major global high-technology company. This company, Nokia, employs almost as many people as the entire NI manufacturing sector. Finnish success is however, much wider than Nokia, or even its large ICT sector. Finland thus provides a good benchmark for economies seeking to achieve high productivity through home grown businesses.

The Role of Policy

The key to Finnish economic success has been early and intelligent policy decisions in innovation policy, encouraging the production, dissemination and application of knowledge for the development of new products, production processes and forms of entrepreneurial organisation[41]. In this context Finnish policies on education, research and technology have provided essential support. Reforms in these areas have been planned and driven from the top. It is this rich mix of policy reforms that has brought success, but at the same time the complexity of the mix makes them difficult to replicate. The lessons from Finland are lessons in developing a policy eco-system. We believe that it is doubtful that copying individual policy initiatives alone would replicate Finland's success.

---

[40] *The Finnish System of Innovation: Lessons for Switzerland*. Swiss Academy of Engineering Sciences (SATW) Report no. 37 2004 Zurich. Although the Swiss economy has great competitive strengths it has been losing ground and has looked to Finland for lessons in economic change.

[41] In this context the early decision to promote the ICT sector, and radio telephony in particular, including collaboration on the world's first international mobile phone network was particularly important. Private companies, the government and the education sector all took part in realising this goal. Similarly, the Finnish paper sector's decision to focus on innovate high technology papers and finishes has worked out better than Sweden's decision to concentrate on high volume lower quality paper.

The high capacity for commercial R&D, and its results in terms of patents and innovations are not accidental. Ultimately a successful national economy is powered by innovative firms. In Finland firms, science, political parties and government have combined their efforts and made innovation their high level common goal. Issues of research, innovation and education receive attention at the highest levels to achieve this goal. The Finnish approach is solution-orientated and pragmatic at all levels of government. Both the government and the main companies, notably Nokia, set out a goal of building innovation into their fabric in the 1970's and 1980s. Both took notice of, and learned from, the Japanese successes of this period, including constant improvement and collaborative working. 'This solution-oriented approach of the public sector working closely with firms and academia, is a crucial element in Finland's success'[42]. Finland was the first European country to adopt the term 'innovation system' in its governance. Finnish decision makers have therefore been able to develop a shared concept of the factors affecting innovation and of the scope of policy to affect innovation.

Finland has been able to transform a mundane traditional economy dependent largely on exports of wood and paper products, into a high value-added 'knowledge-based economy'. As far as policy is concerned, success in developing an economy, with productivity levels to match large western European nations, has had three main constituents:

1. An impressive degree of focus on goals agreed through consensus. This is coordinated by the Research and Innovation Council (RIC, formerly the Science and Technology Policy Council) chaired by the Prime Minister.

2. Development of a set of large and well managed organizations to finance and deliver R&D in collaboration with each other and with the private sector. These include:

    - The Academy of Finland (to fund university research)
    - Tekes to fund R&D in companies and research institutes
    - VTT – Europe's largest public sector research institute
    - Other research institutes
    - 49 general and specialized universities and polytechnics[43]
    - SITRA to promote enterprise – mainly through venture capital

3. An excellent education system at school, FE and HE levels. This delivers a large and well educated population of young people able to support R&D throughout the economy, resulting in Finland having proportionately more researchers than any other country. The school system is widely recognized as generating the world's best results in the international PISA tests for 15 year olds. Almost 60% of school leavers go into higher education, the highest level of any country in the world,[44] and 25% of graduates are in engineering. The vocational training system is based on German best practice.

Overview of Key Organisations

Research and Innovation Council

[42] SATW op cit p 26

[43] Finland is ranked 5th in the world for the number of top ranked universities per head of population.

[44] See figure 3.15 in the main report

Policy co-ordination is headed by the Research and Innovation Council, originally founded in 1963 as the Science Policy Council, and renamed the Science and Technology Policy Council (STPC) in 1987. All of the relevant Ministers are members of the Council and it is important that the Prime Minister is the President of the Council. Ten other members represent the major research providers, public and private, plus employer and employee organizations. Every three years the RIC publishes a report defining the guidelines for innovation policy and attempting to improve synergies between the various sectors. The consensus reached in the RIC percolates throughout government, public organizations and companies. An important part of this is ensuring that the school and university systems play their role in providing the skilled manpower, and particularly the required numbers of engineers and technicians.

The consensus since the early 1980s has been consistently in favour of developing a knowledge-based society in Finland. In detail, the remit of the Council is to assist the Government and its ministries by:

- Monitoring international developments in research & technology and the implications for Finland

- Addressing:

    - Preparing plans and proposals on major matters of S&T policy
    - Overall development of scientific research and training
    - Development and utilisation of technology and analyses of impacts
    - Important aspects of international collaboration
    - Development and allocation of public funding for research & innovation
    - Legislative questions concerning research, technology and scientific education
    - Taking initiatives and advancing proposals within its remit

It is crucial that the RIC has access to world-class advice on innovation policy. This is provided through the Academy of Finland, Tekes, Sitra and other agencies as well as by large companies including Nokia.

Tekes

Formed in 1983, Tekes is the governmental body responsible for administering public support for private and public sector R&D and innovation in Finland. It employs 381 people in Finland and across the world, of whom 90 work in regional Economic and Economic Development Centres (T&E Centres). Most of the staff have master's degrees and 10% have PhDs[45], with half of the staff described as technology and business experts[46]. Spending by Tekes has grown sevenfold since its inception, from 80 million euros in 1983 to over 600 million euros in 2009.

Tekes activities include:

- Funding and expert services for R&D projects in Finnish companies and public research organizations;
- Promoting national and international networking;
- Directly planning, financing, and administering research projects that promote the development and utilization of technology;
- Funding and consulting in the development of products processes and services;

[45] Personal communication from Raine Hermanns Tekes. Feb 2010.

[46] Dahlman C J et al (2006) *Finland as a Knowledge Economy p44*

- Promoting widespread utilization of international know-how, co-operation and technology transfer; and
- Taking part in planning Finnish technology and innovation policy.

Tekes funds mainly small firms with almost 40% of company funding going to SMEs with less than 50 employees and less than 5% of funds going to firms with over 500 employees. Its funding accounts for around a third of all R&D spending in companies with less than 50 employees, but only 3% of spending by firms with more than 500 employees. A little under 60% of Tekes' funds go to companies, in grants and loans, and the rest goes to universities and research institutes. The majority of projects are collaborative between companies and universities, research institutes and international sources (over 100 million euros of projects in 2007 involved collaboration with the USA and a further 50-80 million euros each with Germany, UK and France).

In terms of support given, Tekes uses grants and loans to firms and grants for applied research (either technical or technology related) in public organisations in the following way:

- Industrial R&D grants – between 15-50% of eligible costs
- Capital R&D loans – between 35-60% of eligible costs
- Industrial loans – 45-70% of eligible costs

Tekes R&D projects are funded on a competitive basis with a 30% failure rate for applications in 2001. The technological challenge and novelty of the project, and the degree of internationalization of the firm, are important for applications to succeed. Invest NI was unable to inform the IREP of failure rate for grant applications. The implication was that failure rates were low, and that unsatisfactory applications were guided through the system. Any rejection of applications to Invest NI appears to have been made at early and informal stages, if at all. This is less satisfactory than Tekes' more formal and transparent procedures.

In total, Tekes administered €516m in R&D support in 2008 and saw the completion of 1,954 projects, of which:

- 294 euros were in grants (208 euros) and loans (85 euros) for corporate R&D projects;
- 223 euros were for public research projects; and
- 1352 projects were in companies and 631 in universities and research institutes.

Tekes is regarded as important by both large and small firms in Finland.[47] An OECD evaluation[48] published in 2006 showed that 60% of clients believe that Tekes funding improved their turnover, 40% believed that funding improved their profitability and more than half were helped to improve their networks of co-operation including their international links. Levels of additionality for Tekes projects are not found to differ significantly fro thomse found for similar projects in NI. The outputs of funding in 2008 included:

- 492 new or improved products and 447 new or improved services
- 272 new production processes
- 774 patent applications
- 1044 academic theses
- 2171 publications

[47] Veugelers (2009) op cit p 35.

[48] Hyvarinen J (2006) *Behavioural Additionality of Public R&D Spending in Finland in Governement R&D: Funding and Company Behaviour*. Measuring Behavioural Additionality OECD.

Tekes encourages national and international networking, as well as providing its services for strategically targeted industries. It works closely with the Academy of Finland and VTT through a series of meetings designed to institutionalise collaboration across the board within the country.[49] The collaboration in technology and innovation aims to ensure that each agency knows what the activities of the others are and how they fit within the national strategy. It should be noted however that, crucially, although the emphasis on collaboration is strong, all applications are on an open-tender, competition-based system. Both research institutions and companies bid for funding on the same competitive basis and must demonstrate the project's contribution to the Finnish economy in order to be considered eligible for funding. Tekes also works to build absorptive capacity using, amongst other initiatives, Technology Clinics. This initiative was introduced by Tekes to assist SMEs in improving their capacity to absorb new knowledge through improving their organisation, management and R&D. Firms approach Tekes with ideas, and costs are shared between the two.

In contrast with Northern Ireland, where the main industrial development body is an investment agency, Tekes is a dedicated innovation agency. This reflects the transition made by Finland away from an investment-led policy, and public funds have increasingly been channelled into R&D and innovation rather than into investment per se.

VTT – The Technical Research Institute of Finland

Established in 1942 and integral to Finland's innovation system, VTT has become the largest applied research organisation in Northern Europe. With a turnover of €245m and a workforce of 2,700, VTT focuses on developing technological solutions and applied technologies, with the focus on helping its clients improve their competitiveness. The organisation is not-for-profit and its income is comprised of 70% external sources and 30% basic government funding. VTT participates in national and international research programs and collaborative networks, promoting technology transfer through its use of global networking and basic research results of universities. In the last 20 years it has made 1000 domestic and 1,800 foreign patent applications, over 2,300 notifications of inventions and 49,774 publications.

VTT operates six research institutes across Finland. The main site is on the Otaniemi Science Park, five miles from Helsinki, which combines the Helsinki University of Technology with 11,000 undergraduates and 2,600 postgraduate students, a business hub, and 90 technology and service companies with 8,000 professional researchers. The University contains the National Physics Research Unit and the Helsinki Institute of Information Technology and accounts for half of the money Finland spends on high level technological research . A range of Finnish research organizations are also on the site including the Technical Geological Survey, as well as Innopoli a unit supporting young high-tech companies.

VTT's primary role is to carry out R&D work, technology transfer, and testing, with R&D work performed as projects. Its services are delivered through its different Research Institutes and on-line presence, and cover a myriad of different categories including:

- Formative (training, quality management and technology transfer through training and information dissemination);
- Informative (online information, publications, databases, libraries, etc);
- Consulting (covering research, development and technical issues), research (collaborative projects, strategy-driven and applied research, R&D services including technology transfer between interested parties);

[49] Yla-Antilla, P & Palmberg, C, *'Economic and Industrial Policy Transformations in Finland'*, Journal of Industry, Competition and Trade, 7, (2007), pp. 179 &185.

- Co-operative Projects (pilot projects for industrialisation, contract research and joint venture projects with clients and public counterparts) and physical facilities (design, simulation and testing facilities, optics and electronic manufacturing facilities, and technically advanced methods, equipment and material solutions).

VTT directs and develops its activities in close contact with industry, research institutes and universities and government authorities responsible for co-ordinating technology policy and the financing of R&D (Tekes, Academy of Finland, SITRA and Finpro more specifically, as well as government ministries). VTT's collaborations, both nationally and internationally, are one of its main strengths and focii. This has helped Finland continue to develop its knowledge-based economy, as well as attract foreign companies to the country to work on R&D activities in various targeted sectors of strategic value.

A Board of Members comprised of both public and private sector backgrounds directs VTT. This includes members from backgrounds such as the Ministry of Employment and the Economy, Verso Finland Oy (a food and biotechnology consulting business), the Finnish Association of Graduate Engineers and VTT itself. The organisation's central management and supporting activities are carried out by VTT Corporate Management and Services and are responsible for corporate management, planning and administration. VTT's main clients are corporations, institutions and public organisations, of which more than 60% are SMEs. VTT has a significant presence in the EU, Japan and the USA in which it conducts projects with research centres and universities.

NI has no equivalent of VTT (although it does have agricultural and marine research centres). This means that a higher proportion of research in NI has to be undertaken by universities where the research assessment criteria mean that publication concerns are always likely to be present, hence weakening the focus on commercialization. Finland spends a higher proportion of GDP on university research than NI, and more of Finland's university research is in collaborative programmes with industry.

Academy of Finland

Founded in 1948, the Academy of Finland is the main R&D funding body for university research. The Academy funds around €295m annually, accounting for 16% of all governmental R&D spending. Each year the Academy receives applications for funding of around €1.1bn. Funding responsibilities include:

- University research projects;
- Research training;
- Research programmes;
- Research posts;
- Centres of Excellence;
- Foreign visiting professors' work in Finland;
- International networking; and
- Research collaboration between universities research institutes and business companies.

In 2007, universities and university hospitals received 80.1% of Academy funds, 7.6% went to research institutes and 8.8% to foreign organisations and the remaining 3.5% to other research.[50]

[50] Academy of Finland Annual Report 2007, *pg. 19.*

SITRA – the Finnish Innovation Fund.

Founded in 1967 to mark the 50th anniversary of Finnish independence, SITRA was originally under the aegis of the bank of Finland. It is an independent, publicly-funded, venture capital fund to promote stable and balanced development in Finland, the qualitative and quantitative growth of its economy and its international competitiveness and co-operation. SITRA is funded by the Finnish Government but now operates independently under the auspices of the Finnish Parliament. Its operations have been specifically focused on the following programmes:

- Health Care;
- Municipal Programme (focused on the improvement in provision of municipal service models);
- Energy Programme (focused on improving the energy efficiency of the built environment); and
- The Growth Programme for the mechanical engineering industry.

Its head was the former Finnish Prime Minister Esko Aho between 2004-2008, before he left to become Executive Vice President, Corporate Relations and Responsibility at Nokia in November 2008.[51] SITRA works closely with other bodies as part of the 'Group of Six' organizations coordinated by the Ministry of Employment and the Economy. In particular it has developed joint instruments with Tekes for seed and start-up funding[52].

Finpro

Finpro was originally started in the back room of a shoe-shop in Turku, Southwest Finland in 1919, as the Finnish Export Association and became the Finnish Foreign Trade Association in 1938 before being renamed Finpro in 1999. Finpro is tasked with export promotion and, more broadly, speeding up the internationalisation of Finnish firms (particularly SMEs) whilst minimising the risks involved through co-operation with other service organisations including Tekes, Finnerva plc and SITRA. Finpro was recognised as the best trade promotion organisation in the world in 2007 by the International Trade Centre, a joint technical cooperative agency of the United Nations and the World Trade Organisation[53].

The total turnover of the agency was €18.3m in 2009[54]. Finpro has 47 overseas offices employing 258 employees, with a remaining eight offices in Finland employing 118 people[55]. The emphasis of Finpro is therefore very much on working abroad to promote Finnish companies. Over 550 companies are Finpro members across a range of key sectors, including ICT, energy, construction, defence and health. Members are charged an annual membership fee, with further charges for using services such as market analysts or consultants (with 967 assignments completed by consultants in 2009). The agency is also partly funded by the Finnish government.

Finpro provides a range of services similar to those currently provided by Invest NI, including information and knowledge on key markets, attendance at trade fairs and trade missions. In addition, the agency provides a range of fee-charging consultancy services and assists Finnish exporters in competing for international programmes. Finpro also has a 'networking' service

[51] http://www.nokia.com/press/press-releases/showpressrelease?newsid=1243842
[52] Gearghiou et al (2003) p82.
[53] http://www.finpro.fi/en-US/Media/PressReleases/News+2007/Finpro+awarded+as+the+best+Trade+Promotion+Organization+in+the+World.htm
[54] Finpro Annual Report 2009
[55] Finpro Financial Review 2009

available to companies for free. The Finnish Exporters Database contains information on around 1,300 Finnish exporters and is aimed at foreign companies looking for business contacts in Finland. The Business Leads Service allows Finnish exporters to view enquiries made by overseas companies for Finnish suppliers, co-operation partners or importers. Finpro has begun to use its overseas offices to provide information to innovation organisations (such as Tekes) on future market trends and business models that Finnish industry will encounter in the future.

Nokia

While not a government organisation, Nokia has become Finland's largest company and one of Europe's largest multi-nationals. This single company dominates the Finnish economy to a greater degree than any single company in any other European country. With 60,000 employees worldwide it is almost as large as the entire NI manufacturing sector, and some ten times larger than NI's largest manufacturing firm.

Nokia is one of Finland's oldest companies, formed as a paper company in the 19th century and subsequently becoming Finland's largest conglomerate company. Following a merger in 1967, the group made a hugely important, and bold, strategic decision in the early 1980s to move into high technology products to secure future growth. The 1980s ended with Nokia in financial difficulties as Soviet demand and Nordic consumer demand contracted, and Nokia over-extended due to its large-scale acquisitions of subsidiaries. Nokia radically changed its strategy in the early 1990s to one based on selling off all of its traditional businesses to focus solely on mobile telephony where Nokia already had 20% of the world market.

In the 1970s and 1980s, Nokia gained from heavy state investment in the development of domestic technology and production capacity in mobile and digital communications by:

- Funding collaborative research between firms, VTT and universities
- Targeting technologically-demanding government procurement to domestic firms
- Expanding university degree programmes in electronics and information technology

In particular, Nokia benefitted from the formation of Tekes in 1983. Tekes essentially set the national technology policy for Finland and Nokia was the main beneficiary. An average of 40% of research expenditure in the 1980s and 1990s was directed to ICT and mobile technology projects, and Tekes support contributed 8% of Nokia's research costs during this period. Many of the largest Tekes projects at this time were related to Nokia's needs, including the digital call centre system and the important GSM system. Tekes financing also helped maintain Nokia's R&D programme during the difficult recession years at the beginning of the 1990's.

As Nokia's strategy involved out-sourcing non-strategic components, Nokia depended heavily on sub-contract suppliers. By the late 1990's Nokia was the centre of a Finnish ICT cluster which included an estimated 15,000 suppliers including:

- Equipment, networks and related services (44,000 employees)
- Telecoms services (17,000 employees)
- Components and contract manufacture (10,000 employees)

Nokia has become the epitome of the research-based high-tech firm. By 2000, Nokia's R&D is estimated to have been equivalent to almost half of Finland's private sector's R&D expenditure, although not all of this is undertaken within Finland.[56] Nokia announced recently that it had spent

[56] *Fellman, S, 'Growth and Investment: Finnish Capitalism, 1850-2005' in Fellman et al, Creating Nordic Capitalism, (Palgrave, 2008), pg. 200.*

around $60bn on R&D in the last two decades. [57] By 2002, Nokia's influence in the Finnish economy was very clear, with the company accounting for:

- 1.1% of total employment, 30 % of the ICT cluster employment (25,000 employees in Finland out of a Nokia world-wide total of 60,000);
- 300 first-tier partnerships in Finland (18,000-20,000 employees), accounting for 10 % of Nokia's turnover;
- 24 % of exports, 80 % of ICT cluster exports;
- R&D spending equivalent to 30% of the total Finnish R&D, 43-47 % of the business enterprise sector; and
- 54 % of the company's R&D input is spent in Finland.

However, Nokia is coming under increasingly severe cost competition. Both Nokia and its Finnish suppliers have been closing factories in Finland, and elsewhere in Europe, to concentrate production in low cost countries including India and China. These new plants are highly productive as well as having access to low cost labour. Nokia's close network of Finnish suppliers, which worked closely to Nokia's exacting specifications and had few other customers, have also had to move production to low cost countries to stay close to both Nokia's assembly plants and to major markets.

Despite these pressures Nokia, and Finland more generally, have demonstrated huge success in developing globally competitive innovation-based manufacturing companies. Nokia's early investment in new technology was strongly collaborative with the state and especially Tekes, and was supported by the Finnish education system, both through teaching and research. The private ownership of Nokia was important in this success, and Finnish ICT has been an almost classic example of the functional clusters originally described by Michael Porter. Nokia's success shows that picking winners in technologies can work. Picking winners has rarely been successful in the UK, but Finland's experience was that state support for mobile telephone technology was an important, perhaps essential, component in Nokia's success.

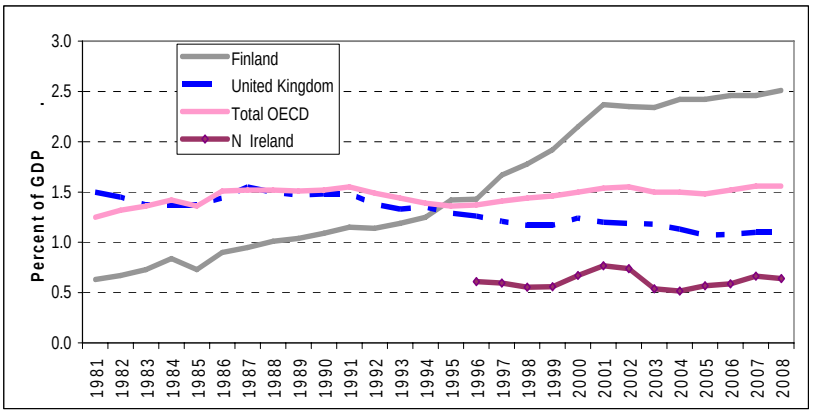
Key Drivers of Success

Innovation

Finland has the world's highest levels of public and private spending on R&D, as a percentage of GDP, second only to Sweden. Both are the only two countries ahead of the UK's Lisbon targets for R&D spending. Spending by business (BERD) is double that of the UK and almost five times the NI level (Figure 12). Unlike most OECD countries, Finland has increased its BERD levels fourfold over three decades.

[57] http://news.bbc.co.uk/1/hi/business/8321058.stm

Figure 12: BERD as Percentage of GDP, 1981-2008



Source: OECD Main Science and Technology Indicators Database 2008.
NI R&D Statistics DETI

The scale of R&D activity in Finland is much higher than in NI. Spending by Tekes is much higher than support for R&D and innovation through Invest NI. In 2008 Tekes programme spending was around £85 per head of population compared with £17 per head in NI[58]. The volume of Tekes' programme spending was similar to the total programme spending of Invest NI, however most Invest NI support is on grants for investment whereas Finland spends negligible amounts on supporting investment other than that connected with R&D.

Finland's latest innovation strategy (2008) emphasises 'pioneering research' as opposed to more routine R&D. The aim is to move Finland from an adapter of existing research ideas to a world-leading pioneer. It is not clear whether this can be achieved or how Finland might go about it, but Finland's intention is to reach the world frontier in at least some technologies. *Quality* of research has not been a significant issue in NI, since a more pressing aim is to raise the *quantity*. Since NI firms have access to world class research in UK universities this can perhaps be regarded as an issue for a later stage in an innovation strategy.

Finland also has the world's highest number of researchers in proportion to employment with over two per cent of employees working in research. The number of researchers is close to three times the UK figure and four times that in NI. As a result Finland applies for the third highest level of patents per head of population of any country. Almost half of patent applications come from Nokia (nearer a third for Nokia's Finland-based patents alone). Excluding these, Finland still has a patent-rate above the OECD average, although its ratio of patents to spending on R&D is only average.

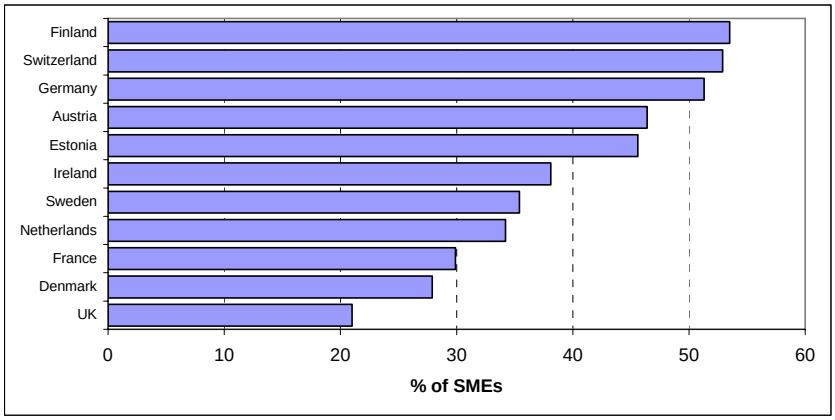
In addition, Finland spends three times as much per head of population on government research organisations (PROs) compared with NI. This includes VTT which receives around 60 million euros per annum through Tekes, and raises much more than this through contracts with local and foreign companies. Partly as a result, Finland has the highest ratio of researchers to population in the world. Researchers do not generate as many patents per head as in some other small countries, but do serve to substantially raise Finland's research capacity, and do produce a high level of patents through sheer weight of numbers.

Finland's small firms have one of Europe's best records in introducing new product or process innovations (Figure 13) among the innovating SMEs. Finland also has by far the highest rate of collaboration among innovative small firms (Figure 14). This is supported by Tekes, which

[58] IREP 2009 table 4.8 p 59

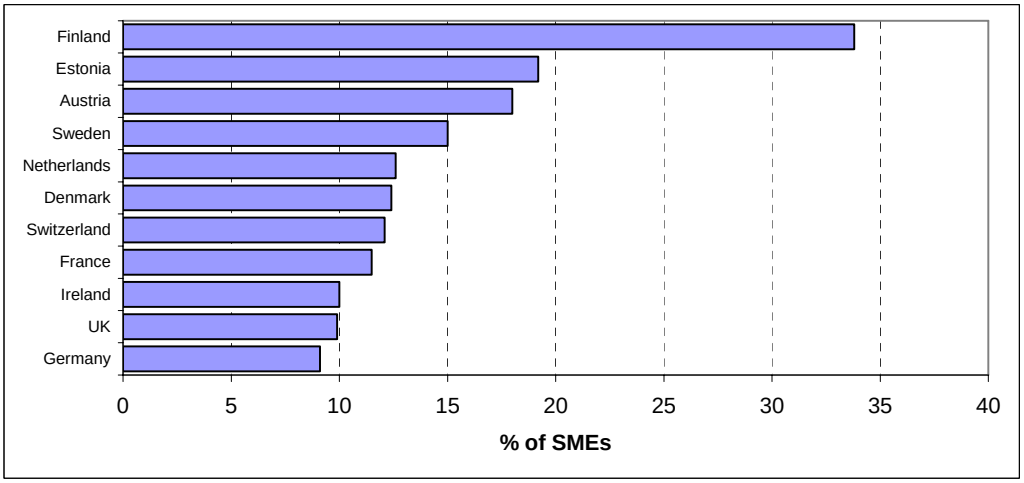
promotes R&D and innovation mainly in SMEs, and mainly through collaboration between small and large firms and between firms, universities and public sector research institutes. The use of Industry Clubs help enhance collaboration between universities and private sector through providing workshops and access to research including exclusive early access to results, and contribute towards university access to private sector research. Costs are supported by EU funds, with company contributions around €10,000 each.

Figure 13: SMEs Introducing Product or Process Innovations (% of SMEs) 2008



Source: European Innovation Scorecard 2008

Figure 14: Innovative SMEs collaborating with others (% all SMEs 2004-2007)



Source: European Innovation Scorecard 2008

As one example almost all master's theses in engineering in Finland are undertaken in collaboration with private firms. Tekes grants and loans to firms give priority to projects involving co-operation with research institutes, and around a quarter of applicants said that they enhanced such co-operation as a result. Tekes appears to have more success in enhancing such co-operation than does Invest NI. Invest NI might thus consider increasingly tying its grants to co-operation.

Finland's strong innovation performance is supported by a comprehensive network of 21 universities, 30 polytechnics and vocational schools, awarding degrees in over 100 different locations. This network is exceptionally dense, due to the Finnish aim of providing good and equal access to higher education. The university sector is particularly strong in research,

reflecting Finland's high expenditure on research and researchers. Finland has the third highest number of doctoral graduates per head of population after Sweden and Switzerland. Finland is one of the OECD's largest academic publishers, with a 250% increase in the last 20 years. University research is closely integrated into Finland's innovation system, with for instance 38 professors in paper and wood technology alone.

Over 60% of Finnish degrees are Masters or PhDs, and Finland has one of the world's highest proportion of tertiary graduates in STEM subjects at 38% of all graduates[59]. In 2003 only Korea had a significantly higher proportion (Germany was also slightly higher). The UK proportion in the same year was 27%. Science and engineering degrees account for close to 30% of the total for bachelors and masters degrees, while half of PhDs are in sciences, medicine or engineering.

Finland also has good research performance in its universities for the size of country. Among the top 300 universities Finland is ranked 19th in the world, and among the top 500 universities it is ranked 5th. This suggests that Finland's record is good at the top and in the 300-500 range, but lacks enough universities in the 100-300 to maintain its high overall ranking.

Finland has an active culture of evaluation of schemes and institutions, including a three-year cycle for evaluating the innovation system as a whole. Evaluations are undertaken very systematically and are encouraged by the Research and Innovation Council[60]. Major evaluations tend to be undertaken by senior academics or policy-makers from abroad, and this throws a regular fresh light on Finnish practice. We do not know to what extent evaluations are put into practice, but Heide (2007) concludes that 'evaluations of public organizations are often used to trigger desired renewal or change'[61]. At the very least Finland is much more open to external views than NI. Evaluations in NI are undertaken for individual schemes and these tend to be undertaken by local consultants with limited experience of external practice. Wider reviews of economic policy have in the past been largely ignored, but in the most recent review (IREP), DETI took considerable pains to involve academics and policy makers from the UK beyond NI.

School Education

A foundation of Finnish success has been a recognition that a highly productive economy in a small country needs to rely on a school system which establishes a solid base for mass higher education. This was recognized in Finland, and all of the stakeholders appear to have worked together to achieve the aim of excellent schools. As with innovation policy, the level of public expenditure devoted to the project was not particularly high. Public spending on education in Finland is no higher than in the UK, even though the results are much better. Once again the Finns had a successful model in nearby Sweden, but have been innovative in education policy and eventually have outshone even the Swedes in international test results. In the OECD's PISA tests for 15 years olds, Finland has excelled in all three rounds over the last 15 years (Table 3).

Table 3: PISA World Country Rankings (Average over 3 Subjects)

	Finland	UK	NI
2000	2.7	6.0	n/a
2003	1	n/a	n/a
2006	1.7	18.3	22.0

Source: PISA 2006: Science Competencies for Tomorrow's World

[59] Vartia and Yla-Antilla 2003 quoted in Dahlman et al (2006) P61.

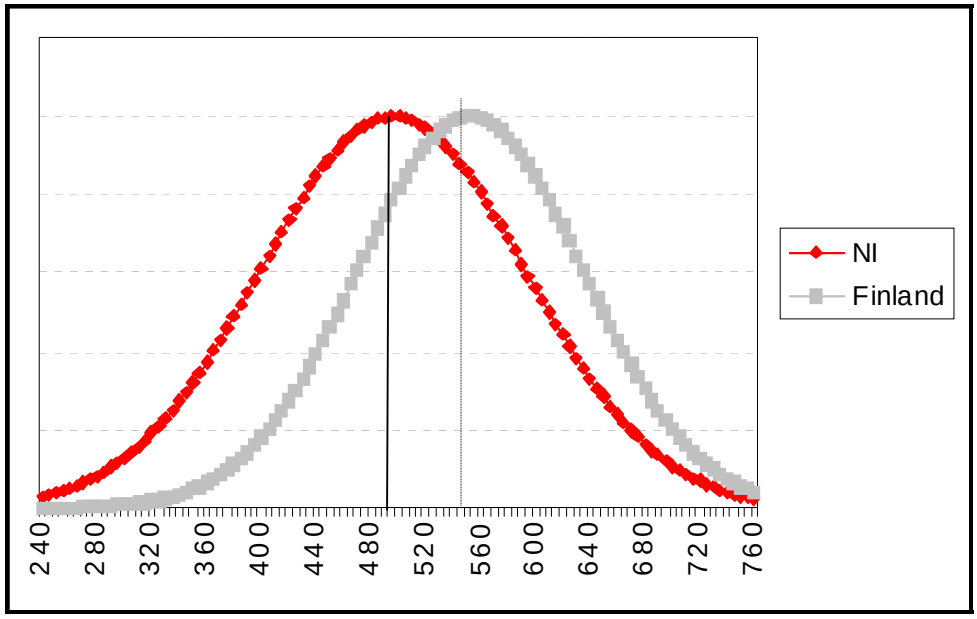
[60] De Heide M (2007) *Monitoring and Analysis of Policies and Public Financing Instruments.* Country Review Finland. United Nations University-MERIT p 33.

[61] Heide op cit p33.

Finland's ranked highest among countries in 2006 for science and second for maths and reading, giving an average ranking over the 3 subjects of 1.7. NI's average rank was 22. A comparison of Finland's PISA scores in 2006 with those of Northern Ireland shows a large contrast, with Finland's mean score 10% above that of NI. Finland also has higher scores for the top 5% of pupils in each of the three PISA subjects, but it at lower achievement levels that the most glaring discrepancies emerge. More than 70% of NI pupils scored below the Finnish average, and 20% of NI pupils scored below a level achieved by all but 5% of Finnish pupils (Figure 15). The Finns have thus largely succeeded in preventing test scores falling below a level which includes about a fifth of GB and NI pupils. Many school leavers in this ability range become the unemployed and inactive in GB and NI.

Although unemployment is relatively high in Finland for historical and social security reasons, there is less reason for Finnish school leavers to be considered difficult to employ as is the case for low achieving leavers in GB and NI. The smaller disparities between pupils in Finland reflects the world's smallest differences between schools in average scores. This has the huge advantage that there is little competition in Finland to get children into particular schools.

Figure 15: Distribution of Average PISA Test Scores 2006



Source: Project calculation from OECD PISA data 2006

Educational experts in Finland tend to ascribe their excellent school results to the highly egalitarian comprehensive system with virtually no private sector[62]. While this system attracts strong support within Finland it is much the same system as in many parts of GB, although in Britain the results are much less favourable. To get such good results from an unstreamed, comprehensive system with no inspection regime and no national curriculum, obviously requires other ingredients. Finland does demonstrate that good results can be achieved without higher levels of public spending on education. Finland spends no more, as a percentage of GDP than the UK, and hence less than NI. Three key factors appear to be important to this success:

- **Teachers:** Finnish society values teaching as a profession and it remains one of the preferred career choices for students with a strong commitment to the job by those who choose it as a profession. Finnish teachers are selected from some of the best students;

[62] Although we note that the CEO who did most to build up Nokia was educated at the internationally oriented Welsh public school, Atlantic College.

they are well paid, respected, highly trained and afforded a high level of autonomy. Decision-making is very localised and there is a great deal of trust in teachers. The success of pre-service education of teachers, the culture of the profession, and the strength of in-service training have all been identified as key components in the system's high performance levels.

- **No child left behind**: where students are underperforming, every student is entitled to individual support to ensure nobody falls too far behind the others. There is no system of national assessment and no schools or students are compared in any kind of ranking system. All individual assessment is based on encouragement, support and helping students develop. Learning is based on the principle of increasing knowledge and student well-being, and not on passing exams. Only 2% of pupils have to repeat a year, with most of this occurring within the first two years of Basic Education. Only 0.5% of pupils fail to complete Basic Education (up to age 16).

- **Flexibility and Consensus**: the education system is designed to be flexible to the needs of society and as such there is a high integration of relevant parties in the determination of curricula, vocational training and modes of assessment that involves education providers, parents, employers and education experts, with teachers remaining at the centre of the execution of the agreements. The consensual approach to moulding the education system is a result of the inclusive nature of its reorganisation in the 1990s which decentralised control to the local level, allowing for greater flexibility and responsiveness. The vocational part of the system is growing in importance with increasing numbers of students choosing it for their career paths and it has received considerable input from employers..

Conclusions on Finland

Finland provides profound lessons for Northern Ireland. The Finns have developed a highly competitive and home grown economy with limited reliance on new FDI unlike Ireland and NI. In this respect it resembles Sweden, Switzerland or the Netherlands, but it has developed more recently and under current conditions of globalised competition. This trajectory is something that NI achieved in the 19th century, but like other peripheral areas in the UK, NI appears to have largely lost this ability to generate home-grown competitive companies. Finland shows that a highly competitive domestic economy can be built on the foundations of a strong strand of R&D and innovation throughout the private sector, and a strong school and university system.

The development of these foundations themselves require a strong and consistent strategic sense and clear leadership to form a consensus and oversee its delivery. In Finland, high level leadership has been important in establishing a culture of innovation. The involvement of the Prime Minister and others key ministers in what is now called the Research and Innovation Council (RIC) has sent an important signal about government priorities since 1980. There is no equivalent in NI and leadership from government departments has not been sufficiently strong to implement an innovation-led policy.

Finland has an advanced innovation system and is currently engaged in a third generation revision of its innovation policy. The first generation involved grant giving, the second focused on collaborative targeted R&D projects while the third involves a greater focus on 'pioneering' (i.e. 'state of the art' research, on reallocating resources within and between companies and on the reform of higher education). Northern Ireland, in contrast, is stuck largely on a first generation grant-based programme.

To summarise the earlier sections, detailed lessons from R&D policy in Finland include the following:

- Spending on R&D is proportionately much higher than in NI
- Most support from Tekes is to small firms for collaborative projects
- Tekes staff have a strong orientation towards technology qualifications.
- Finland undertakes a high proportion of its public sector R&D in a single commercially oriented research organization – VTT.
- Finland has a strong culture of evaluation, with substantial external involvement and appears more likely than NI to act upon the results of strategic evaluations
- Finland success has been based on private firms – NI still has a number of state owned firms and co-operatives.
- The high level of support for R&D, and in particular for R&D in ICT sectors, has led to the formation of a classic ICT cluster. This may imply that clusters only emerge when investment in R&D is above a critical threshold.
- Picking winners among sectors in which R&D is supported has worked in the case of ICT in Finland and in particular in the case of radio telephony in collaboration with other Nordic countries.

Finland's educational success shows that high levels of attainment can be achieved with largely non-streamed, comprehensive, system without academic selection and with little private education. Similar systems in GB have however not generated such good results, and in NI's debate over the future of selection there has been limited belief that a comprehensive system is consistent with improved results. Finland also demonstrates that good results can be achieved without higher levels of public spending on education. Finland spends no more, as a percentage of GDP than the UK, and hence less than NI. Although there is pride in NI that examination performance is among the best in the UK, and that many schools are excellent, general performance in international tests falls far short of Finnish levels. This is particularly the case at lower levels of attainment, but is also true for the top 5-10% of attainment despite the retention of selective education in NI.

LESSONS FROM IRELAND

Ireland shares with a number of other small European countries a colonial background, gaining independence in 1921. In Ireland, protectionism was adopted with particular enthusiasm after De Valera's victory in 1935, based on cultural isolationism, particularly from the UK. Ireland retained protectionist policies for a decade later than most Western European countries. By the 1950's GDP growth rates were only a third of the Western European average. As a notable failure among the economies of north-west Europe in the 1950s, it was clear that economic policy needed to be completely overhauled, and Ireland began to change towards a more outward-looking and successful economy.

The first move towards a modern and successful economy came in the late 1950s when the Control of Manufactures Act, which prohibited foreign ownership, was abolished. Tariffs, which had been around four times as high as in their trading partners, were progressively reduced under the Anglo-Irish Free trade Agreement of 1966 and EU membership in 1973, finally being phased out in 1978. Very significantly, the First Programme for Economic Expansion in 1958 introduced a zero rate of profits tax for manufactured exports. This tax concession was initially intended to apply for ten years. However its immediate and obvious positive impact led it to be extended. EU restrictions on such export incentives were by-passed by changing it into a low profits tax for all manufacturers. When EU rules prevented single sector tax concessions it was applied to all companies in 2000-03 at a rate of 12.5%. Low corporation tax remains the keystone of Irish economic development policy[63].

Ireland has had the fastest growth in per capita GNP, and in labour productivity, of any European nation since 1980. Its rapid growth, colloquially known as the Celtic Tiger phenomenon, can reasonably be called an economic miracle. While Ireland had been left behind by most north-west European nations in its first 40 years of independence, its catch-up to UK and EU15 levels of prosperity, slowly from 1960 and more rapidly after 1986, has been phenomenal. In particular Ireland caught up and comprehensively overtook Northern Ireland in per capita GNP[64]. Ireland's record, at least up until the recent banking and property bubble, should in many ways stand as a model for Northern Ireland in seeking to accelerate its sluggish rate of productivity growth. This is particularly the case since Ireland and Northern Ireland share so many similar geographical and cultural traits. While currently overshadowed by the failure of Ireland's banks, Ireland's export base has continued to perform well and inward investment has continued at a high level, and it is important not to lose sight of these successes.

The Role of Policy

Unlike Finland, Sweden and several other successful small EU economies, Ireland's rapid growth has been driven by foreign direct investment largely attracted by a low rate of corporation tax. While some Eastern European and Far Eastern states have subsequently adopted a similar approach, Ireland was the first country to base economic reform directly on low company taxation.

There is a common tendency to ascribe rapid growth in Ireland's GDP and productivity to such factors as high educational standards or the effectiveness of the IDA. It is true that much had to change to support a successful policy of attracting FDI. For instance, when Ireland began its

---

[63] Ministerial Statement by Brian Lenihan, Department of Finance, Dublin. October 1st 2010.

[64] Ireland's national product is better measured as Gross National Product (GNP) than Gross Domestic Product (GDP) since that latter incs profits of multi-national firms, much of which is repatriated. Note that there is no GNP measure for NI. Hence we compare GNP in Ireland with GDP in NI.

policy of low profits tax over 50 years ago, only half of children remained at school beyond age 12 and only 20,000 people a year went into higher education, many of them to teacher training colleges. The proportion of people completing secondary education, at age 18, has risen from 20% in 1960 to over 80% today and Ireland now has close to the highest level of young people in vocational higher education of any OECD country. At the same time the IDA has developed effective strategies to attract many of the world's largest companies in IT and finance, and a system of social partnership has helped to secure good industrial relations. Using EU funds Ireland's poor transport infrastructure was steadily improved to a level attractive to FDI firms.

While improved education, and infrastructure and targeted strategies by the IDA were all necessary to maximise the volume of inward investment, there is no reason to think that these factors alone could have generated a much larger volume of investment than in Scotland wales or in Northern Ireland before (or since) the Troubles. Even with high educational standards, industrial relations, and transport infrastructure all of broadly equivalent standards to those now achieved in the Republic of Ireland, NI has still been unable to match either the quantity or quality of FDI attracted into the Republic. Since corporation tax is the incentive which most distinguishes the RoI from NI, it is a reasonable assumption that this factor is the most important explanation for the large difference in economic performance between the two areas. If Invest NI has proved less successful than the IDA in attracting FDI, and especially in attracting leading global firms in high value-added sectors, the main reason is likely to be the lack of the IDA's potent low tax incentive. The tactics evolved by the IDA were forged under a regime in which Ireland had a uniquely attractive incentive which was not available to Invest NI. The tendency of Irish politicians, officials and economists to under-emphasise the role of corporation tax, was sharply reversed as pressure from major EU countries to raise the tax rate mounted during negotiations over the financial bail-out.

Overview of Key Organisations

IDA Ireland[65]

Ireland's Industrial Development Agency (IDA) was set up within the Department of Industry & Commerce in 1949 to stimulate, support and develop export-led business. After the shift away from protectionism in the 1960s, it began to take on a more proactive promotional role. An external review, conducted in the 1960s by the consulting firm Arthur D. Little, Inc., recommended that it be taken out of the civil service and incorporated as an autonomous state sponsored body, with its own Board of Directors, and with responsibility for all aspects of industrial development. These changes were enacted in 1969, when the agency was granted the authority to identify and promote FDI and to target specific industries.

The IDA focused on job creation in its early years and did not concentrate on any particular sectors or types of firm. This changed in the 1970s to a more focused approach which McSharry and White describe as[66]:

- Identify growth sectors appropriate to Ireland's aims
- Find the strongest companies in these sectors and
- Persuade them to locate in Ireland

[65] This section is based on the work of Barry 2004 and 2006

[66] MacSharry R and White P (2000) *The Making of the Celtic Tiger. The Inside Story of Ireland's Booming Economy*. Dublin Mercier Press.

The emphasis remained on labour-intensive activities until the 1980s when the IDA began to focus on high tech sectors including electronics, software and biotechnology, with an emphasis on flagship projects to facilitate attracting lesser firms in the same sectors. Intel was targeted as a particularly important flagship company, and the IDA subsequently attracted most of the world's largest companies in pharmaceuticals, computers and packaged software. The IDA then focused on increasing the value added of plants as the original activities became obsolete or uncompetitive. Microsoft, Lotus and Oracle first established low skill duplication, distributing and marketing software supplied by the parent company. Over time this changed through adding translation and reprogramming with Ireland becoming their European hubs.

IDA Ireland has developed a trans-national strategic network consisting of its overseas offices and its relations with investors already in Ireland. The IDA opened its first overseas offices in the 1960s and currently has 13 foreign offices: 5 in the US, 5 in the Asia-Pacific region and 3 in Europe. All offices are tasked with identifying prospective investors in the region and meeting with prospective investors from targeted industries. The overseas offices thus gather information about trends in targeted sectors and about new emerging sectors that warrant the agency's attention. The resulting feedback to headquarters not only influences the industries or subsectors targeted by the IDA, it also guides efforts to inform and persuade the government about required legislative changes, necessary additions to infrastructure, and specific training programmes to serve the needs of targeted sectors.

Through an embedded process of external review, IDA Ireland has been transformed over the years into a widely referenced example of best practice in the investment promotion field, along with Singapore's Economic Development Board. Some aspects of its success are:

- **Autonomy**: a high degree of autonomy from government was important because it insulated IDA Ireland from pressures to locate industry on political grounds, and because it allowed the agency to build on its successes. This is also found internationally to be a condition for effectiveness in fulfilling an agency's development mandate. Reporting directly to the upper echelons of government strengthens the government's commitment, reinforces the agency's credibility in the eyes of business and allows the agency to develop sufficient bureaucratic, administrative and political 'clout' to ensure that it can effectively deliver on its promises. The Irish and Singaporean IPAs were effectively put in charge of development strategy, and could coordinate labour market changes to attract the technology-intensive FDI that both countries have targeted in recent decades.

- **Staffing**: the autonomy of the IDA from the civil service allowed it to recruit a different type of employee, many with extensive industry and international experience and with an interest in living and working overseas. The fact that agency employees did not have the employment guarantees that automatically came with long-term civil service employment, and the likelihood that staff would have to spend a period of service in one of the agency's foreign offices, may have attracted a more entrepreneurial type of personality. Effective investment promotion agencies (IPAs) are widely viewed as requiring a private-sector orientation rather than a bureaucratic one: '*a willingness to take risks, to make quick decisions, to engage in a style of negotiation alien to many civil service temperaments*'. The prestige attached to work with these agencies also contributes to the strong esprit de corps reportedly shared by staff.

- **Influence**: the IDA has intervened several times to change wider policies needed to support IDA's mainstream incentives. Two examples are important. In the late 1970s an inter-agency initiative led to the creation of 14 one-year courses to provide science graduates with electronics qualifications alongside 58 new or expanded courses in electrical engineering. A second example is the reform of telecommunications in Ireland. Several decades ago the Department of Posts and Telegraphs was reluctant to replace the existing weak phone system under pressure from the IDA which wanted to meet the needs of potential investors. The IDA persuaded the government to set up a new agency

to run the system on a commercial basis. The result was a huge investment package to develop a digital network, allowing the IDA to target a new range of industries dependent on advanced telecommunications.

MacSharry and White (2000) speculate as to why the powerful position of the Irish development agencies within the state bureaucracy may not be easily replicable elsewhere. Amongst the factors they identify are:

1. Institutional resistance on the part of Foreign Ministries to allowing other agencies to establish such a strong foreign presence,
2. Difficulties in securing the right calibre of pro-active people to run such agencies, and
3. The fact that governments rarely provide investment agencies with a clear development mandate, or the funds to carry out this mandate.

'Very few countries', they conclude, 'have been able to create the combination of circumstances and people to forge an effective national investment promotion agency'. McSharry and White tend, as expected, to strongly emphasise the role of the agency and its staff, including themselves, in the undoubted success of the organization. In our view they underplay the importance of Ireland's uniquely important incentive – low rates of corporation tax. It seems true that the IDA has energetically and intelligently exploited the advantage conferred by this incentive, but analysts fail to emphasise how much help that incentive has been.

Forfas

Established in 1994 as an agency of the Department of Enterprise, Trade and Employment after the passing of the Industrial Development Act 1994, Forfas is charged with advising national policies on enterprise, trade, innovation, science and technology. Employing 130 and operating on an annual budget of about Euros 68m, it is run by a board appointed by the Minister for Enterprise, Trade and Innovation (formerly the Minister for Enterprise, Trade and Employment). The Board includes the CEOs of the IDA, Enterprise Ireland and Science Foundation Ireland the Director General of The Training and Employment Authority (FAS), the Secretary General of the Department of Enterprise, Trade and Innovation and the Chairman of the National Competitiveness Council as well as several members taken from business and academia.[67] Around 95% of Forfas' budget comes from the Irish government with three main areas of expenditure in 2007 as follows:

- Administration and general expenses: 14.5m Euros
- Pension costs: 48m Euros
- Departmental Programmes: 5.3m Euros

Forfas has four main functions:

- To advise the Minister on matters relating to the development of industry in the State.
- Advise on the development and co-ordination of policy for Enterprise Ireland, IDA Ireland, Science Foundation Ireland and such other bodies (established by or under statute) as the Minister may by order designate.
- Encourage the development of industry, science and technology, innovation, marketing and human resources in the State.
- Encourage the establishment and development in the State of industrial undertakings from outside the State.

[67] http://www.forfas.ie/aboutus/ourpeople/board/

- Advise and co-ordinate Enterprise Ireland, IDA Ireland and Science Foundation Ireland in relation to their functions.[68]

Science Foundation Ireland (SFI)

Initially established in 2000 as a sub-group of Forfas, Science Foundation Ireland was formally established on a statutory basis by the Industrial Development (Science Foundation Ireland) Act in 2003. It finds its origins in a Technology Foresight Exercise organized by Forfas which asked client company executives what their views were on where their companies were headed over the next 10-15 years and what Ireland could do to respond to those changes. The response was with Ireland no longer being a low-cost manufacturing location it needed to train more engineers, research scientists and so forth to become a centre for innovation. SFI was subsequently founded to administer a Technology Foresight Fund (recommended by the Forfas exercise) to promote and finance new basic and applied scientific and technological research in Ireland.

Its current remit is based on the activities of the USA's National Science Foundation[69] in its focus on encouraging human capital through investment in researchers and research teams, a variety of programmes (a full list of which can be found in the main report), developing and supporting infrastructure and funding initiatives. SFI has a budget of 140m Euros for 2010, a decrease of 4.9% from the 2009 budget. By 2006, SFI had established:

- 204 research groups led by Principal Investigators, of whom 46 are new to Ireland. The groups employ 1,628 research staff - over a fifth of the entire research staff in Irish HEIs (2006).
- Six Centres for Science Engineering and Technology (CSETs) in core thematic areas.
- The CSETs bring together researchers from around the world in highly sophisticated, multi-faceted teams at Ireland's universities. These centres are now working with companies such as Bosch, GlaxoSmithKline, Hewlett-Packard, IMB, Intel and Medtronic.[70]

Key Drivers of Success

Inward Investment

An acceleration in FDI began almost immediately after the introduction of the low tax regime in the late 1950s and has continued ever since[71]. Table 4 below shows that FDI has continued to flow into Ireland at a high rate in recent years. The latest data, covering the recession years, shows FDI still at a higher rate than in NI. Most of the new jobs promoted in the period 2003-9, within export sectors were in the service sectors (Table 5), but around a third was still in manufacturing, unlike NI where manufacturers were rare among FDI firms new to NI. A number of

[68] EU/Cordis, Erawatch Report Ireland, Organisations.

[69] Barry, F, *'FDI and Irish Economic Development over Four Stages of European Integration'*, http://www.cepii.fr/anglaisgraph/communications/pdf/2006/09100206/barry.pdf

[70] Dagg, M, 'Public Investment in R&D in Ireland', Perspectives on Irish Productivity, (Forfas, 2007), pp 330-341

[71] For evidence of the immediate impact of low profits tax rates see: Moore et al, *Industrial Policy and Economic Development: the experience of Northern Ireland and the Republic of Ireland*, Cambridge Journal of Economics, 1978, (2), 99-114

studies examining economic growth over recent decades have shown that most of Ireland's growth advantage in manufacturing was due to new FDI. Comparisons of locally-owned firms usually showed little advantage over NI.

Table 4: Foreign Direct Investment in Companies New to the Country (2003-9)

	No. of Projects	No. of Jobs	Jobs (per 000 employed persons)
NI	76	8229	11.0
ROI	238	34452	17.6
UK	970	128856	4.6

Source: fDi Intelligence

Note: Export Sectors only

Table 5: Jobs Promoted in Ireland (2003-9)

Sector	Jobs
Manufacturing	10,677
Business Services	6,198
Customer Contact Centre	5,342
Sales, Marketing & Support	4,061
Shared Services Centre	2,572
Research & Development	2,322
Design, Development & Testing	1,448
Technical Support Centre	1,044
ICT & Internet Infrastructure	788
Total Export Sectors	**34,452**
Other Sectors (incl. HQs, retail & construction)	60,183
Total	**94,635**

Source: fDi Intelligence

The impact on GDP and GNP is more difficult to measure. Barry presents figures for net output per worker in several sectors dominated by foreign-owned firms (see Table 6). These show that recorded net output in Ireland averaged four times the EU average and in some sectors were over ten times higher. Much of this must be due to transfer pricing, but even assuming the EU average is the real level of productivity this would be well over double the average for the whole economy in Ireland. This suggests that FDI in export sectors adds at least 0.5% per annum to total GNP and twice that to GDP.

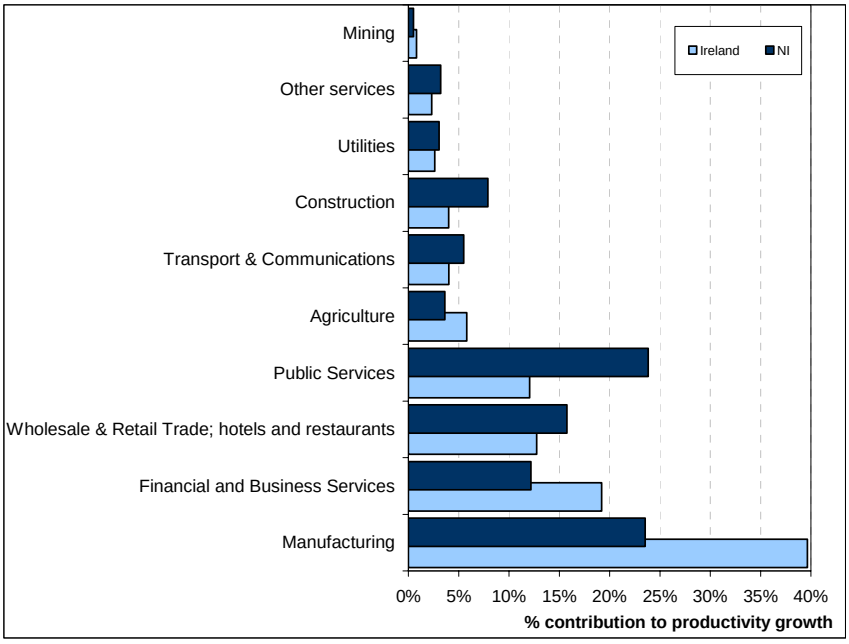
Foreign-owned companies account for the majority of increases in productivity (shown by sector in Figure 16). A recent calculation by McKinsey Consulting estimates that 70% of the rise in Irish productivity 1995-2002 was accounted for by four high-tech sectors dominated by foreign-owned firms. Domestically-owned manufacturing firms contributed only 11% of the overall increase in productivity, despite employing around half as many people as the foreign-owned manufacturing firms. The remaining service sectors accounted for the remaining 19% of the productivity increase.

Table 6: Net Output per Worker 1999 (*000s Irish pounds*)

	Ireland	EU average	Ratio
Computers	169	104	1.6
Electronic Components	230	104	2.2
Organic & basic chemicals	848	163	5.2
Software	728	84	8.7
Cola concentrates	1015	90	11.3
Weighted average of above	464	116	4.0

Source: Barry, F. (2004) FDI and the Host Economy. A Case Study of Ireland. In Navaretti and Venables. Multinational Firms in the World Economy. Princeton
Note: Barry's table states that the units are millions of pound but we assume that is a mistake.

Figure 16: Sector Composition of Productivity Growth, 1995-2005



Source: GVA national sources (OE database) EUKLEMS hours data

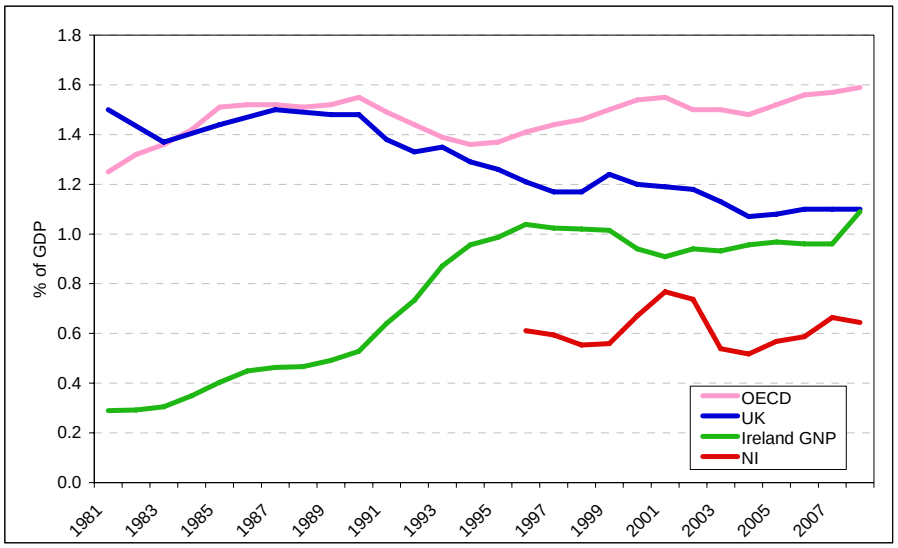
The question of how much was contributed to convergence in per capita GVA between Ireland and the UK by FDI is not easy to ascertain with precision. The impact on per capita GDP also depends on whether economic growth led to increases in population through in-migration. Until the last decade there was much surplus labour in Ireland and little need for net in-migration, although job creation through FDI may have prevented out-migration. Similarly in NI, jobs created through FDI were generally filled by local residents until the last decade when industrial expansion led to in-migration from Eastern Europe.

Innovation and R&D

In comparison with attracting foreign-owned companies, Ireland's record in supporting locally-owned firms has been less impressive, with levels of R&D low by international standards. However, in recent years Irish policymakers have accepted that Ireland is no longer a low cost country[72], and have sought to increase its innovation activities in combination with the need to ensure a steady inflow of FDI in the face of increasing competition from other low-tax countries.

Figure 17 shows that Irish BERD rose steadily as a percentage of GNP to 1995, but remained approximately steady at close to 1% between 1996 and 2007. Through this period it remained around two-thirds higher than in Northern Ireland and has recently caught up with the UK average.

Figure 17: BERD as percentage of GDP, 1981-2007



Source: OECD Main Science and Technology Indicators Database 2008.

The increased focus of Irish government policy on R&D since the early 1990's does not seem to have raised BERD further, although there was a further rise in 2008. The earlier increases were not associated with strong policy initiatives and seem likely to have been associated with inward investment and economic restructuring including growth in the software sector. However, only 30% of foreign-owned companies in Ireland spend anything on R&D, and only 15% spend more than 500,000 Euro per annum. As a result, foreign sources of finance for R&D conducted in Ireland account for less than 10% of BERD (see Figure 9.28 in main report). It seems that the policy of attracting inward investment to Ireland has had only a limited impact on raising levels of R&D, as many firms have R&D operations in the USA and elsewhere and do not need to undertake R&D in Ireland. This contrasts with the UK where foreign-owned companies play a larger role.

In 2004, *Building Ireland's Knowledge Economy: The Irish Action Plan for Promoting Investment in R&D to 2010* was published. This action plan endorsed the view that '*sustained investment in R&D is essential to maintain the competitiveness of the enterprise base and to develop Ireland as*

[72] EU/Cordis, Erawatch, Research Inventory Report: Ireland, 2009

a knowledge-based economy, so as to increase productivity growth'. It set a number of ambitious targets for 2010, which have been adapted in subsequent policy documents. These targets are:

- Total spending on R&D (GERD) should rise to 2.5% of GDP;
- BERD should rise to 1.7% of GDP;
- Public spending on R&D (HERD and GOVERD) should rise to 0.8% of GDP by 2010;
- The number of researchers should reach 9.3 per thousand employees;
- The number of indigenous companies spending more than 100,000 Euro per annum on R&D should double from 2000; and
- Foreign-owned companies spending more than 100,000 Euro per annum on R&D should double from 2001.

The current official strategy, the Strategy for Science, Technology and Innovation (or SSTI) was published in 2006. This included the broader 'vision' that *'Ireland by 2013 will be internationally renowned for the excellence of its research, and will be in the forefront of generating and using knowledge for economic and social progress, within an innovation-driven culture'.* The only specific target in the report is to double BERD to 2.5 million Euros by 2013 (i.e. an increase of around 6% p.a. in real term).

At present we have data only up to 2008. Even so, it seems clear that these targets will be missed by a large margin. GERD rose to only 1.7% in 2008 and BERD has remained close to 1% of GDP for a decade. The number of researchers was only at 6 per thousand employees in 2008. There has however been a steady increase in HERD, up from 0.28% of GDP in 2001 to 0.46% in 2008. Even so, it is obvious that Ireland's strategies for R&D and innovation have not been sufficiently effective to reach the target suggested in *Building Ireland's Knowledge Economy*, although time will tell whether they have a delayed impact.

In supporting improvements in science and technology, both the National Development Plans for 2000-2006 and 2007-12 have provided investment in this area. In particular, two major initiatives were taken forward in the 2000-06 plan – the establishment of the Science Foundation Ireland (SFI) and the expansion of the Programme of Research in Third Level Institutions (PRTLI). Ireland has also established a Cabinet Sub-committee on Science and Technology, led by the Taoiseach. The SFI and PRTLI initiatives are regarded as having made rapid progress in building a base of first class research in Ireland. The recent large budget cuts have largely, although not completely protected the research budget, as is the case in other countries, but it remains to be seen whether companies can be persuaded to invest more in R&D.

Education and Vocational Training

The development of the Irish education system began in the 1960s in response to the OECD report *Investment in Education*, and two major reviews of higher education in Ireland by the *Commission on Higher Education* and the *Steering Committee on Technical Education*. Reforms implemented in the 1960s included the:

- Up-grading of vocational schools and the
- Introduction of free post-primary education in 1967.
- The establishment of a strong binary (i.e. academic and vocational) system;
- The universities expanded,
- A non-university sector was developed. This consisted of a scheme of new regional technical colleges, the development of the Dublin Institute of Technology and the establishment of National Institutes of Higher Education in Limerick and Dublin.[73]

[73] Eurybase, Organisation of the Education Structure in Ireland, 2008/9, pg. 100.

- The Higher Education (HE) authority was established in 1968 to act as an intermediary between the state and the universities.

A relatively unique aspect of the reform in Irish education has been the development of Regional Technical Colleges (RTCs). The development of RTCs was motivated by the observation that technical manpower is essential to economic progress and that technological and higher technician roles needed to become 'status-carrying' in their own right[74]. There was a perception that universities were not adequately equipped to fulfil this objective for three reasons:

1. Universities are concerned with fundamental and theoretical studies, while technology is more practical and applied;

2. There is a natural academic bias within the university system; and

3. Universities function on an autonomous basis; the Irish government felt that the required technical institutions should be more amenable to its control and be equipped to respond rapidly to changes in technology and manpower needs.[75]

From an early stage attempts were made to ensure that education met economic needs. In 1978, the *Manpower Consultative Committee* (MCC) - a tripartite body representative of government departments, employer organisations, and the Irish Congress of Trade Unions - was established as a forum for dialogue between the Industrial Development Agency (IDA) and the education system. The committee investigated manpower levels in computer and other IT-related occupations and recommended that an expansionary programme be implemented urgently to alleviate shortages. The MCC was amongst the key committees that reported to ministers and government departments.[76]

A large proportion of the initial expansion came from European funds; during the early 1990s up to 80% of total funding for RTCs came from European Social funding.[77] State support for research in Irish higher education was traditionally very limited, but this altered greatly with large-scale investment from the late 1990s for competitive research proposals. New programmes were established for the distribution of funds for tertiary education research purposes, operated on a competitive basis, including:

- The Programme for Research in Third Level Institutions (PRTLI), operated by the HEA,
- The Irish Research Council for Science, Engineering and Technology (IRSCET),
- The Irish Research Council for the Humanities and Social Science (IRCHSS) and,
- The Technological Sector Research

In 1995, a policy of free fees for undergraduate courses was introduced. In 1998, the Regional Technical Colleges became Institutes of Technology (IoTs), and while they have delegated authority to grant some or all of their own awards, such authority is ultimately subject to validation by the Higher Education and Training Awards Council (HETAC).

In 2004 the Government commissioned the OECD to carry out a comprehensive review of and make recommendations on the future of Irish higher education. The OECD recommended a

---

[74] *Goal Enlargement and Differentiation: The evolution of the Binary Education System in Ireland'*, in C.Gellert (ed.) Higher Education in Europe' London and Philadelphia: Jessica Kingsley.

[75] Barry, F, *'Third-level Education, Foreign Direct Investment and Economic Boom in Ireland', Centre for Economic Research*, University College Dublin, May 2005.

[76] *http://nzdl.sadl.uleth.ca/cgi-bin/library?*

[77] Knowledge Economy Forum, '*Using Knowledge for Development in EU Accession Countries*'. World Bank Conference, Paris 21 February 2002. 'Miracles do happen – The story of recent Irish economic growth'. Tom Healey. Department of Education and Science.

significant programme of modernisation and reform for the sector, building on what was acknowledged to be considerable progress to date. The report also recognised that:

- There is a need for far greater investment in the sector,
- The higher education institutions require significantly increased funding if strategic aspirations for the sector are to be achieved.

The report recommended that the diverse roles of the universities and IoTs be maintained as part of a dynamic higher education system. This was an endorsement of the so-called binary structure of higher education which has operated in Ireland for many years. The Report emphasised that both sectors should have equal value and esteem in a unified strategy for higher education. As a result the 14 IoTs were brought within the remit of the HEA in 2006, providing for increased autonomy for the Institutes and for their strategic development on a more integrated basis with the universities. This appears to undermine one of the rationales for their introduction, namely to have HE institutions under the influence of government policy for future skills needs.

With regards to the performance of Ireland's education system, literacy scores from PISA 2006 were slightly above the OECD mean in each competency. The rankings were notably better for reading than for science and especially mathematics, suggesting that Ireland's strong literary culture has an impact in education. The OECD has increased the number of countries in each successive survey meaning Ireland's performance did not necessarily decline for example in science as much as suggested in Table 7, but that other countries with better performance became included (Estonia is one such example of this), pushing Ireland's ranking down the table. The relatively low rank in mathematics suggests that the school system is still biased against subjects which are important in supporting a knowledge-based economy.

Table 7: PISA Rankings, 2000-2006

Ireland	Reading	Science	Mathematics
2000	5	8	13
2003	17	6	17
2006	5	14	18

Source: OECD PISA 2000, 2003, 2006

While Ireland's education performance is not at the same level as the top OECD countries, the education system has been developed with impressive results:

- The proportion of 15-19 year olds who are enrolled in full or part-time education is 90%. This rate exceeds the OECD average (82%) and far exceeds the UK rate of only 71%.
- 84% of Ireland's 25-34 aged population have completed upper secondary education compared with 73% in the UK and a 78% OECD average.
- More of Ireland's population aged 18-25 graduate with academic qualifications (45% compared with 38% in the UK and OECD)
- Ireland is particularly good at vocational HE qualifications (24% of 18-25 year olds compared with 14% in the UK and an OECD average of 10%)
- The quality of Ireland's major HE institutions, measured by research papers has traditionally been behind NI but went ahead of NI in 2006
- Ireland spends less per student on HE than the UK but has higher teacher salaries at school than the UK

In summary, the Irish education system has undergone considerable reform since the 1960s in a process motivated by an increasing awareness of the economic importance of a well-educated workforce. The process of reform has been largely characterised by the development of a binary structure of higher education, comprising technical and vocational higher education pathways, in

addition to conventional universities. This was a relatively novel approach and has been associated with significant increases in third level participation and attainment. A recent review conducted by the OECD endorsed the Irish binary system, and emphasised the significance of both sectors having equal value and esteem in a unified strategy for higher education. More generally, the OECD has described Ireland as 'one of the first European countries to grasp the economic importance of education'[78].

It should be noted, however, that education has not totally escaped the budget cuts across the Irish system – the 2010 budget for Ireland saw total education commitments reduced by just over 5% to Euros 675m. Nonetheless, education has not suffered the scale of cuts seen elsewhere although spending in Ireland is comparably lower than many other European countries which has resulted in some criticism in the Irish press. Spending more on education is not a guarantee of success however – Finland is one of the lowest spenders on education but performs excellently in PISA scoring for example.

Conclusions

Despite the recent problems of its banking sector, Ireland's success over the last 40 years has been unparalleled in Western Europe. Although lagging economies can take advantage of new technology to assist in productivity catch-up, not all lagging economies converge on their richer neighbours and where this does happen it is well worth studying in detail. In Ireland's case per capita GNP not only caught up with but also overtook the UK, although it has fallen a little below the UK during the current recession. Our view is that Ireland's productivity catch-up has been primarily driven by FDI attracted through low corporation taxes. Such taxes are particularly attractive to profitable companies, especially those whose profits are generated through R&D and innovation (since such profits can easily be shifted between locations to take advantage of tax differences). The effectiveness of low corporation tax in attracting FDI could not have been as great if the Republic had not joined the EU in 1973, or if it had not brought its secondary and tertiary education systems, and transport and telecommunications networks, up to first world standards. Similarly the partnership approach to industrial relations improved industrial relations to the benefit of FDI. These are however aspects of policy which differ only in small degree from NI. The large remaining difference between NI and the Republic is the rate of corporation tax, and its is this that results in the greater quantity and higher quality of FDI into the Republic.

The main lessons for NI in education policy are that Irish experience suggests that more can be done to raise educational standards without major increases in expenditure. Ireland has higher rates of staying on education until age 18 than in NI, and better results in the international PISA tests. Its particular success in developing a major strand of vocational HE owes much to Ireland's ability to attract large volumes of high paying jobs in FDI companies in manufacturing, finance, software and other services. Unless NI can emulate the Republic's success increasing highly paid jobs, it is unlikely to attract as many people into vocational HE. This suggests that new policies for attracting high wage FDI firms should be a priority, and should be backed by an upgrading of vocational HE provision in NI. However, the recent placing of Ireland's Institutes of Technology under the Higher Education Authority, alongside universities, should not be emulated without careful thought as to the implications for economic development.

BERD in Ireland has tripled as a percentage of GDP and is now almost double the level in NI. One detects a seriousness of aspiration about raising R&D and innovation levels in the ROI under the Strategy for Science Technology and Innovation 2006-13, which include a target to raise BERD to 1.7% of GDP. Northern Ireland does not have a similar high level target for BERD, instead relying mainly on Invest NI to provide a range of R&D initiatives to businesses. Although we are not convinced that the action plan accompanying Ireland's Building a Knowledge

[78] OECD, *Reviews of National Policies for Education - Higher Education in Ireland*, (OECD, 2006), pg. 1.

Economy strategy will result in this target being attained, NI should nonetheless pay close attention to both successes and failures of Irish strategies.

The recent collapse of GDP and employment in the Republic since 2007 does not detract from these policy lessons. The huge and disproportionate expansion of the construction sector in the Republic, supported by unsustainable bank finance, was bound to collapse, taking parts of the finance sector with it. This 'bubble' aspect of the Republic's economic record was grafted on top of the more solid and sustainable policies to attract FDI. The bubble was exaggerated by very low interest rates within the Eurozone after 1999 and perhaps by unduly lax regulation of finance. The Republic's economy has paid a large price for this extravagance which for several years made the economy look artificially stronger than it really was. The reality is however that per capita GNP in the Republic will remain well ahead of that in NI, and the advantages of low corporation tax, which are continuing to attract FDI even in the depths of recession, will continue to underpin this prosperity.

LESSONS FROM SWEDEN

Sweden is the largest of the Nordic countries in both land mass and population. With a population of just over 9m it has nearly double the number of people of the next largest Nordic country, Finland, and contains about 40% of the total Nordic population. Sweden's emergence as a fully prosperous economy came early, once industrialization occurred in the late 19th century, and has been maintained ever since. Swedish education standards, like those of the USA were well ahead of the UK and have been the highest among rich countries at least since the 1960s[79]. As a result Sweden has long been surprisingly cosmopolitan for a country of only 8 million people speaking a minority language. Its contributions to English language popular music (through Abba), and to popular literature through Henning Mankell (Wallander) and more recently Stieg Larsson (Girl with the Dragon Tattoo), outshine the contributions of most other small European nations.

Sweden has a mature industrial economy based around a surprisingly large number of large and successful multi-national companies with a global reach. Even though Northern Ireland industrialised earlier than Sweden, it is Sweden that has the old established companies. In some respects Sweden is more like the USA, Germany, Netherlands or the UK in the variety and depth of its corporate strengths. Among nations with less than 10 million people only Switzerland can match Sweden for the number of home-grown world-class corporations.

The Role of Policy

Almost all of Sweden's successful world-class companies were home-grown enterprises and inward investment did not play an important role in their establishment. Even though Sweden has become more receptive to foreign ownership, and several of these companies have been taken over by US and other companies over the last 20 years, their origins and most of their development are clearly Swedish[80]. While Swedish firms continue to excel it is difficult to identify ongoing policy initiatives that are clearly responsible. More obvious is a virtuous inertia within an affluent country, in which the successful corporate sector marches on with only light support from their government as and when necessary. Sweden's direct government support for business R&D does not match the intensity of Finland, although Sweden's universities are strong. Similarly, Sweden's school education does not now produce results in international PISA tests that differ markedly from those in NI or GB.

One area where Swedish policy has clearly had an impact on economic performance was following the severe economic crisis in the 1990s. From a labour market performance considered by many as a 'remarkable success story' with unemployment at 1.5% at the end of the 1980s, Sweden suffered a rapid growth in unemployment with figures reaching double digits by the mid-1990s as a result of the economic crisis. In late 1992, the crisis was sparked by a real estate bubble that put strong pressure on the government budget leading to low economic growth during the early 1990s and a sharp increase in unemployment. GDP fell by 6% between 1990 and 1993.

---

[79] Coulombe S., Tremblay J.F. and Marchand (2004) 'International Adult Literacy Survey: Literary scores, human capital and growth across fourteen OECD countries.' Statistics Canada.

[80] FDI of companies new to Sweden in export sectors remains low. Over the period 2003-9 the number of jobs promoted in firms new to Sweden in export sectors was under a fifth of the Republic of Ireland rate and 20% below the UK average. Sweden's investment agency, Invest in Sweden (ISA) was judged first out of 125 investment promotion agencies by the World Bank in 2006, but it has few direct incentives to offer and is instead marketing an efficiently run country.

With crisis arrived opportunity however. The government embarked on a series of deregulations as its main policy focus during 1991-94 in order to boost business. Further, the financial crisis had the effect of rapidly eliminating many low-productivity firms, driving them out of business and temporarily raising the rate of productivity growth. As a result, those companies in ICT and telecoms that survived the crisis were well placed to take advantage of the boom in these industries in the mid-1990s. In 1995, Sweden joined the EU, formalizing the increasing internationalization of its industrial structure and giving many of its well-established companies unfettered access to the large EU market.

Overview of Key Organisations

R&D retains high-priority status in Swedish policy and political circles and is considered to be of national importance, but government stops short of actively directing R&D, preferring instead to delegate responsibility to universities and business. Sweden differs from Finland in that it has a larger number of successful multinational indigenous companies operating in the R&D sector although government policy is similarly focused on supporting the eco-system to encourage business investment in R&D. The Swedish system of public governance of the R&D sector is characterized by small ministries and large, autonomous agencies. Similar to the Republic of Ireland and Finland, Sweden also has a dedicated FDI promotion agency.

Swedish Research Policy Council

The main research council in Sweden is the Swedish Research Policy Council (Vetenskapsråd), which plays an important role in the new system by supporting basic research in all scientific fields in public institutions. It is part of the Ministry of Education and Research and was created in 2001 after the merger of the Swedish Council for Research in the Arts and Social Sciences, the Swedish Medical Research Council, the Swedish Natural Science Research Council, the Swedish Research Council for Engineering and Swedish Council for Planning and Coordination of Research. The mergers were a part of a comprehensive review of the Swedish innovation system.

The Swedish Research Council is funded by Ministry of Education and Research and is tasked with funding research across fields of natural and social sciences, medicine and education. The Council funds the majority of national basic research and offers analyses of research policy and advice on research issues to the government. The RPC also promotes Swedish participation in international research cooperation. There are three separate councils within the council, one for arts and social science, one for medicine and one for natural and engineering sciences, as well as two committees for education science and research infrastructures.

The RPC employs around 160 staff who are organized into departments for planning and co-ordination, research funding, research policy analysis, communication and administration. It has an annual budget of around £360m, equivalent to 47% of Sweden's spend on R&D in 2009. Its remit includes:

- Allocating funds for research;
- identifying research areas for strategic investment in consultation with other research funding agencies;
- Working on analysis, assessment and strategic matters in connection with research and research funding from a national and international perspective;

- Promoting communication between researchers and different academic areas, and between researchers and society in general;
- Promoting multi- and interdisciplinary research;
- Making research results accessible and making sure they reach the areas of society where they can be useful, for example within education, healthcare and within trade and industry;
- Advising the government on research-policy matters;
- Striving for increased national and international collaboration and benefits within the research community;
- Promoting gender perspectives in research;
- Having overarching responsibility for matters relating to ethical requirements in research;
- Working for equality between men and women in the research community; and
- Increasing understanding of the importance of basic research to society.

Two further research councils were also established in 2001 – FAS (The Swedish Research Council for Working Life and Social Sciences) in the field of social sciences, and FORMAS (The Swedish Council for Environment, Agriculture Sciences and Spatial Planning) in the field of environment. They promote and fund both basic research and problem-oriented research each in its area of responsibility.

Similar to the Research Policy Council, which advises the Ministry of Education and Research, the Innovation Policy Council was established in 2004 as part of the Ministry of Industry, Employment and Communication. The Minister for Industry, Employment and Communications chairs the IPC, providing a basis for communication between the minister and key stakeholders in innovation policy. The IPC gathers representatives from many areas, with the composition changing depending on what area is being addressed.

Vinnova

Vinnova is the government's main business agency[81] in the national innovation system and has a mission to *"Promote sustainable economic growth by financing needs-driven R&D and by developing innovation systems."*[82] The agency was established in 2001 alongside the Swedish Research Council (responsible for the universities' budget) after a comprehensive review of the Swedish National Innovation system that concluded that there were too many councils, resulting in the endorsement of the national innovation system perspective and the importance of recognizing the legitimacy of needs-driven research and innovation as a focus of governmental policy.[83]

Vinnova has an annual budget of approximately £162.8m and employs 190 staff of which 25% hold PhDs (2008 figures).[84] At the start of 2007, 1,345 projects were under way using Vinnova money, 700 of which were approved within the preceding 12 months. Vinnova is a far smaller organization than the Swedish Research Council in terms of funding, receiving only 7% of the

[81] Vinnova differs from the RPC in that it interacts closely with business and public research institutions whereas the RPC deals with higher education institutions only. The two are essentially assigned to deal with user-driven research and basic research respectively.

[82] Presentation by Per Eriksson, Director General of Vinnova to the Research Institute of Economy, Trade and Industry, Japan, September 2006.

[83] Presentation by Per Eriksson, Director General of Vinnova to the Research Institute of Economy, Trade and Industry, Japan, September 2006.

[84] Presentation by Anne Lidgard, Vinnova Director of Innovation Actors Division to the South Africa-EU Summit, 09/09/09.

government's R&D budget with the majority of the rest going to Swedish universities. Vinnova's budget is also much smaller than that of its predecessor, which accounted for 25% of spending in the national R&D budget.[85]

Vinnova is significant not in size, but in its approach within the 'Triple Helix' model (government, business and the universities) of the Swedish R&D and innovation system – it is in place to facilitate co-operation between basic research performers and companies seeking to use innovations for commercial gains. The Triple Helix model is important to Vinnova's own self-identity and the perception of it within the innovation system – its decision-making boards for assessing applications are composed of participants from each of government, business and the universities. Vinnova is a technology agency and does not invest in job creation although it does collaborate with other agencies to facilitate job creation where appropriate.[86] Its main areas of activity can be categorized as:

- Development of research and innovation strategies for specific fields and sectors in close dialogue with Swedish innovation systems;
- Strategic R&D-programmes in six major fields usually involving cooperation between universities and companies ; and
- Supporting the building up of strong research and innovation environments.

Vinnova spent 55.3m euros (£49.8m) on companies, with 40% of this on companies with more than 250 employees (£19.9m) and 51% (£25.4m) on companies with less than 50 employees, with the remainder going to medium sized enterprises. Between 2006 and 2010, Vinnova set aside £89.4m for sectorally targeted R&D programmes in the forestry, ICT, aerospace, vehicles, metallurgy and biotechnology industries. The intention of this was to ensure that these public funds were equally matched with private investments to ensure available funds for researchers were at least doubled. Vinnova usually requires co-financing from industry in order to make grants to universities or research institutes.[87]

As in Finland with Tekes, Vinnova has a strong international collaboration aspect to its activities organized through its International Collaboration and Networks Division. Vinnova is currently active in bilateral research projects taking place in India, the USA, the UK, Finland, Japan, China, Canada, Israel and Norway. Vinnova is also the national contact point for all programmes in the Seventh European Framework Programme (EFP) for R&D. Vinnova identifies international collaboration as 'crucial to the development of Swedish competitiveness'.[88]

Innovationsbron

Vinnova and other actors in the Swedish system identified weaknesses in the infrastructure for supporting commercialization of the research conducted in universities in the first half of the 2000s, believing it to be too fragmented and lacking in resources. As a result, Innovationsbron (The Innovation Bridge) was founded in 2005 with a mission to help identify R&D related ideas with commercial potential, help create university innovation start-up companies and help encourage networking in innovation fields. It is 84% state owned with the remainder owned by the Swedish Industrial Development Fund (Industrifonden)[89] a venture capital organization.[90]

---

[85] Interview with Lennart Elg, Senior Analyst at Vinnova, 10/02/2010.

[86] Presentation by Per Eriksson, Director General of Vinnova to the Research Institute of Economy, Trade and Industry, Japan, September 2006.

[87] Presentation by Per Eriksson, Director General of Vinnova to the Research Institute of Economy, Trade and Industry, Japan, September 2006.

[88] Vinnova Annual Report 2007 'Innovation and Leading Research' (Vinnova, 2008), pg. 24.

[89] *http://www.innovationsbron.se/Om-Innovationsbron/Innovationsbron-in-English/*

Innovationsbron is intended to contribute to the commercialization of university knowledge and ideas through provision of business development competence and early stage financing. The Swedish government has committed around £5m annually to Innovationsbron in order to increase the supply of risk capital in early stages.[91] It has a regional presence through its 7 subsidiaries[92], provides seed financing and operates within a National Incubation Program developed by Vinnova.[93] It also offers overseas help to Swedish businesses looking to internationalise their activities – for example, it has recently set up an office in San Diego in the US as part of its Acceleratus Program to help provide Swedish companies looking to find American partners in the R&D and knowledge sectors with a 'soft landing'. A physical presence in the US allows it to offer its services to companies that would otherwise face difficulties in establishing contacts in the innovation sector in what is a very important market.[94] This is typical of the Swedish (and Finnish) approach to encouraging companies to look abroad for growth in their activities whilst retaining a base in the home country by offering services that the market either does not or cannot provide.

Invest in Sweden

The main body tasked with encouraging inward investment in Sweden is the Invest in Sweden Agency (ISA). Based in Stockholm with offices in Swedish embassies around the world, ISA is charged with encouraging FDI through promotion of business and development opportunities in Sweden. Started in 1996, ISA is responsible to the Ministry for Foreign Affairs and commands a budget of £7m, of which 77% is funded by government, and employs 70 employees in 6 countries. ISA estimates that since 2001 it has made almost 1000 investments and created around 25,000 jobs; in 2007 it made 174 investments and estimates that it created about 2500 jobs.[95]

The organisation has been recognised for the effectiveness of its work by the World Bank / Multilateral Investment Guarantee Agency (MIGA) where it scored 1st out of 125 agencies in their 2006 assessment of Investment Promotion Agencies.[96] ISA is also considered as one of the six best practice investment promotion agencies in the OECD alongside the UK, Austria, Germany, France and Canada according to the MIGA assessments.[97]

ISA offers a range of services to foreign investors including:

- Sectoral experts
- Detailed breakdowns of the tax system in Sweden
- Regional financial incentives, employment legislation
- Social security and pension legislation
- An introduction to the legal requirements of setting up and running a business in Sweden
- The various costs associated with entering the Swedish market

Access to these services is freely available from its website as part of its overall strategy of attempting to attract companies and individuals looking to locate in the country. When a

---

[90] Industrifonden is covered in more detail in the Enterprise section in the main report

[91] Swedish Budget Statement from the Budget Bill 2010, Government Offices of Sweden (2009), pg. 54.

[92] *http://www.swedenbio.com/en/MembersCompanies/Innovationsbron/*

[93] Presentation by Per Eriksson, Director General of Vinnova to the Research Institute of Economy, Trade and Industry, Japan, September 2006.

[94] *http://www.xconomy.com/san-diego/2009/03/31/sweden's-innovation-bridge-sets-up-"soft-landing"-in-san-diego/*

[95] ISA Presentation, 29/10/2008, www.isa.se

[96] ISA Presentation, 29/10/2008, www.isa.se

[97] Miga Report 'Global Investment Promotion Benchmarking 2009: Summary Report', pg. 62.

company or individual takes the decision to locate in Sweden there are sectoral and regional experts on hand to advise on the most appropriate location as well as markets that the inward investor should look to focus on. ISA particularly stresses the simplicity of the Swedish tax system, the strength of its innovation sector, access to the Nordic and EU markets, quality of life, the country's high productivity levels and its modern infrastructure. ISA also provides case studies of companies which have been successful in locating in Sweden as a result of its help illustrating the ways in which it has helped clients and their reasons for choosing Sweden.

ISA offers two main forms of grant support detailed below:

- **Investment grants**: regional development aid can be allocated to companies within certain sectors operating within development areas for financing investments. The grant is maximized to a certain percentage of the investment, in most cases between 20-35%. of the total investment cost. There are three determining factors: type of investment, type of company and the regional development area in which the company operates. Each application is individually assessed taking into account potential employment, economic growth and overall importance to regional development. Activities eligible for grants are industry and industry-like operations, industrial service operations, service operations aimed at more than a purely local or regional market, tourism, construction of buildings to let and other business development activities.

- **Regional Employment Grants:** these are dependent on Regional Development Areas (RDAs) and subject to a series of other criteria being met also. The grants are offered on a per job created basis to a maximum of £6,140 per year in RDA A (west and north of Sweden) and £3,720 per year in RDA B (east and central Sweden). In RDA A, a grant can be awarded for starting a new business or for other employment increases deemed strategically important or especially significant for regional development. In RDA B, a grant can only be awarded for starting a new business. Subsidies for the years after Year 1 are granted under condition that the employment increase continues.

ISA also offers a series of other loans and grants to companies looking to establish or expand operations in Sweden linked to both national and regional schemes. National schemes include the Nordic industrial grants, which are given to research and development projects of up to 50% of the project costs, but normally not more than £0.5bn, for a maximum term of 3 years. Regional schemes include rural grants, given to SMEs for both investments in both capital and soft investments (skills and knowledge), and the Norrland Fund, which provides risk capital loans for SMEs in Sweden's five northernmost counties for establishments and investments in new products, markets, machinery and buildings, as well as for development of new methods of production as well as for working capital.

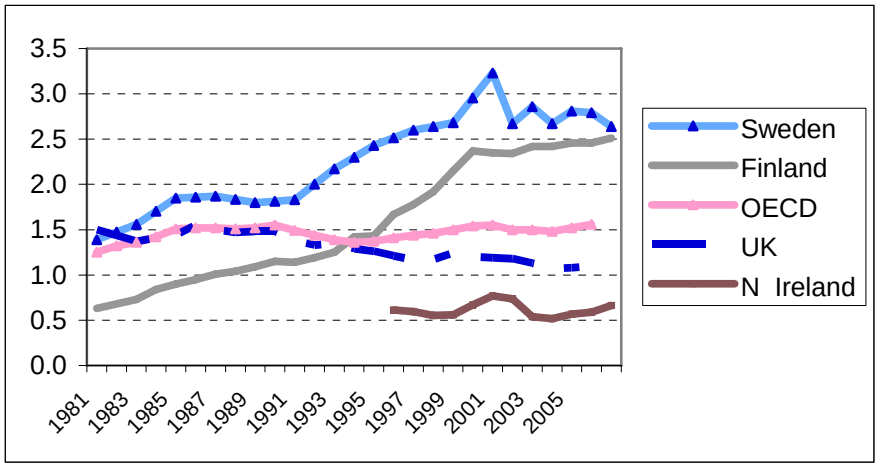
Key Drivers of Success

Innovation and R&D

Sweden spends more on R&D per capita than any other country and has the second highest per capita rate of patenting after Switzerland. Figure 18 shows spending in BERD as a percentage of GDP in Sweden compared to the OECD and UK. Sweden started out at a similar level to the OECD and UK but then outstripped both quite substantially throughout the period since 1980. Although Sweden invests more in R&D relative to GDP than any other EU country, spending in real terms has decreased since its peak in 2001 from 4.2% to 3.7% in 2006. Within this total

BERD has decreased from 3.2% of GDP in 2001 to 2.8% in 2006. About 95% of all private R&D in Sweden is performed within multinational enterprises.

Figure 18: BERD as percentage of GDP, 1981-2007



Source: OECD Main Science and Technology Indicators Database 2008.

While it is true that Sweden has a high rate of spending on university research, the level of government support of business research is only average. Sweden's technology agency, Vinnova, spends proportionately similar amounts on supporting R&D as Invest NI's R&D division and, as outlined above, employs only 190 people, a quarter of whom have PhDs. The great majority of Swedish government spending on R&D goes to universities and other research institutes rather than to companies. Moreover, only 10% of Vinnova's total support goes to large companies and only 15% to small firms. The rest is channelled into universities and research institutes. The universities also have a high degree of independence, and their research is not mainly applied research in collaboration with firms. Some of our interviewees took the view that there was no strong R&D strategy in Sweden. It is the firms themselves that determine research strategy. Several companies spend enormous amounts on R&D. Ericsson's annual research budget of almost £1 billion dwarfs the entire public and private spend of under £300 million in NI.

The Swedish government played a greater role in developing a strong R&D base in the past. Several sources cited the development couples policy in which state owned monopolies and defence were 'coupled' with Swedish firms to provide equipment and to undertake research under conditions of guaranteed returns. Vinnova states that:

> *"such interaction between public sector users and private industry accounts for a major share of the impressive growth of large firms and private R&D spending in Sweden.*[98]*"*

According to Olof Sandberg, Senior Research Policy Coordinator in the Swedish Education Ministry, 75% of current research spending is by a few companies arising from the 'development couples' policy. Sandberg also stated that in the 1980s industrialists argued against government funding of research activities, arguing that it 'polluted' their activities resulting in an agreement being made that government would act as a facilitator by controlling the power of the unions in return for business pursuing R&D activities commensurate with national interests in pursuing high value-added manufacturing strategies.[99] Preferential arrangements on the 'couples' model would

[98] Vinnova, *"End of an Era? Governance of Swedish Innovation Policy"*, (Vinnova, 2006), pg. 12.
[99] Interview with Olof Sandberg, Ministry of Education, 09/02/2010

no longer be possible under EU competition policy, but the R&D strengths of Swedish firms were already well developed by the time Sweden joined the EU in 1995. The ongoing support from Vinnova is unlikely to play a major part in supporting R&D in large companies although its support for strategic research programmes involving collaboration between public and private sectors may play a long-term role.

As a result, the Innovationsbron approach has been taken to address this disconnect and bring more innovations to market more quickly. The Swedish government is keen to ensure that innovations are commercialized in order to better realize the economic benefits from its spending. However, universities are still largely autonomous in their activities regarding research and take little direction from government in how to conduct research and where money is directed, although this is beginning to change in response to growing concerns over commercialization with increased competition in research budget allocation becoming more commonplace.

Most recently Swedish policy towards research and innovation has been largely laissez faire and more dependent on businesses conducting R&D without government guidance. Vinnova's role, whilst important in a strategic sense, has diminished in recent years alongside its budgetary provisions. However, there is no question that policy played a very important role in getting Sweden to the stage it finds itself at now, particularly the 'development couples' policies in the post-war period. Current policy is less prescriptive than in the period of the 'development couples' and is now better understood as smoothing the pathways for increased co-operation between the basic research performers in the universities and the market-driven needs of companies.

Education Policy

Sweden's industrial competitiveness has been built on a base of high educational standards. Like the USA high standards were achieved throughout much of the 20th century at a time when tertiary education in the UK was confined to a relatively small elite. The data from the International Adult Literacy Survey analysed by Coulombe et al (2004) suggests that by 1960 Sweden's educational outcomes were above all other major countries[100]. Since then, and like the USA the advantage has diminished, but unlike the USA even by 1995 Sweden's adult literacy test scores were still the highest of any country in the survey. Most recently concern has risen in Sweden about standards in schools including the quality of school teachers. A number of reforms in school education have been put in place, mostly moving in the direction of private provision and centralised state supervision of standards.

In particular, a 'free school' sector has grown up since 1992. This is based on an implicit voucher system in which private groups can establish schools, and parents are free to take their children to any school including free schools. All Swedish schools, including free schools, are non-selective, and entry is on a first come first served basis. There are now more than 900 free schools with a further 1500 applications granted. Free schools currently educate 10% of pupils in Sweden. They are typically smaller than state schools and generate better exam results. Although free schools are attracting international attention, including proposals to introduce them into England, it is not clear whether their good results are generated through de facto selection. One concern in Sweden is that free schools are established to avoid children going to schools with high immigrant intakes.

Sweden spends a higher proportion of its GDP on education than the UK. Class sizes are generally smaller except at sixth form level, although teachers pay is similar to the UK. Recent results in international PISA tests have been unimpressive. Sweden was ranked 18th among

[100] Coulombe S., Tremblay J.F. and Marchand (2004) 'International Adult Literacy Survey: Literary scores, human capital and growth across fourteen OECD countries.' Statistics Canada

participating countries in 2006, similar to the UK and only a little above NI (Table 8, page 23). Performance was even poorer in science and maths[101]. As a result new legislation was introduced in 2007 to improve international comparability with attempts to emulate parts of the Finnish system including better teacher training and more focus on special education. In contrast to Finland the government is moving away from an absence of national testing with a commitment to introduce more exams and more school inspections.

Table 8: PISA Rankings, 2000-2006

	Sweden				UK Average	NI Average
	Reading	Science	Maths	Average		
2000	9	13	14	12	6	n/a
2003	7	13	14	11	n/a	n/a
2006	10	23	21	18	19	22

Source: OECD Factbook 2009, PISA 2006: Science Competencies for Tomorrow's World

Higher education has long been a Swedish strength. Sweden has 14 state universities, 22 state HE colleges and 3 private institutions. Sweden has the highest number of universities ranked in the top 500 per head of population. It is the second ranked country for universities in the world top 300 (after Switzerland) and is third for top 100-ranked universities per head (after Switzerland and Denmark). It also has the world's 5th highest spending on higher education as a percent of GDP (UK is 13th) and the 4th highest spending per student (due largely to high spending on research). The UK is 9th for spending per student. Even so, Sweden is not far ahead of the UK in the proportion of 25-34 year-olds attaining higher education (39% compared with the UK's 37%).

Conclusions on Sweden

Sweden's economic competitiveness first emerged in the late 19th century and early 20th century but what is impressive is the way in which it has been maintained over subsequent decades through changing technical and market conditions. Sweden has intelligently adapted to changing conditions. Measures include deregulation of its originally highly regulated product markets, and membership of international trade agreements, including the EU in 1995. Sweden had stayed out of the Euro, which helps it maintain export competitiveness in ways not open to for instance to the Republic of Ireland. Macro-economic stability has not always been maintained, with a financial crisis in 1992 as well as in 2008/9. but these have had a limited impact on Sweden's largest multi-national firms which long ago outgrew Swedish markets.

It has proven more difficult to draw lessons from Sweden than from either Finland or Ireland. The issues currently facing Sweden thus differ consideriably from those most relevant to NI. Sweden does not face Northern Ireland's task of rebuilding a private sector economy with new or expanded firms, in high value-added sectors. While NI urgently needs to rebuild its private sector with internationally competitive companies in high value-added sectors, Sweden already has this strong base. NI's need to attract new foreign-owned companies is also much less relevant to Sweden, although foreign ownership of locally owned Swedish firms has been encouraged in recent decades to allow expansion of spending on R&D in technologies in which investment costs can be huge.

[101] In the survey of schools which accompanied the 2006 PISA tests Swedish schools reported much lower levels of constraints to high achievement through overcrowding, shortages of books or computers, high teacher turnover, low teacher morale or absenteeism. In these respects Swedish schools appeared similar to the Finnish schools described in Table 7.10 of the main report. However Swedish schools reported similar levels to the UK in incidence of a lack of parental support or poor home background.

The main lessons from Sweden are generally not at the level of the development agency or the individual initiative. Sweden does relatively little that is new or extensive in these respects, although its Invest in Sweden agency has been recognised by the World Bank as one of the most effective despite having few incentives to offer. More broadly, the structures observed in Sweden, with dedicated agencies for R&D funding and FDI promotion, mirror those elsewhere, while high level innovation policy councils have been established to advise relevant Ministers. Wider lessons would include:

- One of the world's best school systems over many decades. Standards appear to have been slipping in recent years and the reforms to Sweden's school system are unproven. They only partly emulate Finland's school system which has a better record in international tests for 15 year olds.
- Perhaps the worlds best university system for a country of its small size, as judged by international citations of its research.
- The key to Sweden's success has been its large number of highly competitive multi-national companies. Only Switzerland has more MNE's per head of population. Thirty five years ago Patten showed that these had much higher productivity than similar UK companies, with more capital, more specialised products, better quality management, and more investment in new and improved products[102]. This is the base on which Sweden's current collection of global companies has been built. The subsequent spread of international ownership in both the UK and Sweden is likely to mean that these contrasts have diminished in some respects but even if this were true the advantages from past successes in building a competitive base of companies will last a long time.
- The development of a large sector of home grown MNE's is time-consuming, difficult and not well understood. Attraction of FDI, through low corporation tax as in the Republic of Ireland may help locally-based MNE's to develop through emulating management skills, but Sweden has developed its MNE base largely without FDI.
- Policies such as Sweden's 'development couples', pairing local champions with national monopolies and defence authorities, is more difficult inside the EU, but potential MNE's should be given all government help possible. Such assistance needs to be more tailored to individual company circumstances, than is currently available under NI's grant and advice system delivered by Invest NI.

[102] Pratten C (1976) *A Comparison of the performance of Swedish and UK Companies*. CUP

LESSONS FROM ESTONIA

Estonia is a small country with a population broadly similar in magnitude to that of Northern Ireland but with a landmass approximately twice as large[103]. Like most East European Countries its history provides a stark lesson in the damage caused by an economic system with inappropriate incentives. Estonia is estimated to have had living standards in the 1930s close to those of its near neighbour Finland, but at the end of 45 years within the Soviet system per capita GDP was around one third of Finland (or the UK). Estonia proclaimed full independence on August 20th 1991. Estonia's first government, formed after elections in September 1992, was led by a 32 year old historian, Mart Laar. His government created the most open, free market economy of all the former Soviet Union countries, and reoriented trade away from Russia towards Finland and other Western countries.

Estonia has been one of the fastest growing European economies since 1995 with an average growth rate of 9% per annum. Such a high rate of growth is possible because Estonia has grown from a very low base from a planned economy to become a market based economy. This growth has occurred largely in new service industries. However, the manufacturing sector was restructured and is now larger, in proportion to GDP than the EU average, and much larger than in NI. The public sector was reduced in size and has remained small, as do sectors depending directly on consumer spending.

Despite Estonia's low level of productivity, we have included it as a comparator for Northern Ireland partly because of its rapid catch-up since independence in 1991 and partly because its education and R&D systems demonstrate characteristics of interest to NI. Although catch up will take some time, the speed of productivity growth, and Estonia's potential to overtake NI within 15 years, suggest that important lessons can be learned[104].

The Role of Policy

Immediately after independence Estonia set a goal of catching up with western living standards and has taken a radical approach to realising this aim taking advice from a range of free enterprise think-tanks in the USA and UK and from Finland and Sweden. With a very young government, several in their 20s, a decision was made to move rapidly and decisively in the direction of a market economy. Estonia linked its currency to the Deutschmark, abolished all subsidies for companies, and set a flat income and corporation tax of 26% (later reduced to 21%). Inward investment was strongly encouraged and the corporation tax rate was set at zero for re-invested profits. This approach has worked, with a significant level of new FDI especially from Finland (which shares a related language) and Sweden.

Estonia was also successful in creating a business environment that favours both local domestic investment and foreign investment without making any distinction between them. In the mid-1990's Estonia went from an almost unknown position in the world for foreign investors to being a popular destination. Estonia received more foreign direct investment per capita in the second half of the 1990's than any other country in Central and Eastern Europe. Estonia also became the first former communist economy to rise to the status of a free economy in the annual index of

[103] Estonia's population in 2010 is 1.34 million compared with Northern Ireland's 1.79 million.

[104] GDP per Hour worked grew by 6.1% per annum from 1992-2007 compared with 2.4% in NI. At this rate of progress it would take 15 years for Estonia to catch up with NI from its 2007 level, although the deeper recession in 2008/9 may delay catch up.

economic freedom, published by the Heritage Foundation and The Wall Street Journal. By 2007, Estonia was ranked as the 16th freest economy in the world[105].

In designing the tax system the government decided that the entire tax system should favour savings and investments and encourage people to create new wealth. The tax regime is simple, with a flat rate personal income tax introduced in 1994. The Estonian experience with the flat tax was so successful that other countries – first Lithuania and now Latvia and then Russia in 2001 – have copied it. Ukraine, Georgia, Slovenia and Romania have also since introduced flat tax rates. The single income tax rate has fallen from 26% in 2004 to 21% in 2008, and the present government plans to reduce the income take rate by one percentage point a year until 2011. Corporate tax is levied at the same rate as income tax and is levied only on distributed profits.

Key Organisations and Initiatives

Research and Development Council

Estonia looks to Finland and Sweden as its role models for R&D policy and Finnish officials have assisted in its development. A key element of this Nordic approach is a Research and Development Council, chaired by the prime Minister. The Council advises the Government on matters relating to research and development strategy, thereby directing the systematic development of the national research, development and innovation system. The tasks of the Council and the bases for its formation are specified in the Organisation of Research and Development Act. The key tasks of the council are:

- Advising the Government on matters relating to research and development strategy;
- Presenting its opinion to the Government on national research and development programmes presented by the ministries;
- Submitting a report on research and development in Estonia and the objectives of research and development policy for the forthcoming period to the Government of the Republic each year;
- Advising the Government on the preparation of the draft state budget in respect to the amounts prescribed for research and development and with regard to the different ministries and types of financing for research and development;
- Advising the Government on the establishment and reorganisation of research and development institutions and the termination of their activities;
- Advising the Government on establishing the conditions and procedures for the evaluation of research and development;
- Performing other functions assigned by law or by the Government.

The Research and Development Council collaborates closely with the Ministry of Education and Research and the Ministry of Economic Affairs and Communications. These two Ministries are responsible for infrastructure development for research and innovation, as well as for funding research in their areas of expertise. The Ministries prepare proposals for approval by the Council and the Cabinet in collaboration with the Strategy Office of the State Chancellery.

The Council is an instrumental expert body that brings together all the important organisations and stakeholders involved in and affected by research and innovation policy. It is chaired by the Prime Minister, and also includes the three other most relevant ministers for research and

[105] Miller, T. & Holmes, K.R. (2010) *Index of Economic Freedom* (Washington DC:The Heritage Foundation and Dow Jones Company,Inc.).

innovation policy – the Ministers of Education and Research, Economic Affairs and Communications and Finance. (It is not known whether the Minister of Finance attends regularly, or as in Finland tends to keep away in order to maintain fiscal independence). The logic is that if these four ministers manage to agree on a policy proposal along with most important academic and industry experts, then the proposal has a good chance of being approved by the Cabinet. The Council also includes the President of the Academy of Sciences, rectors of the two main universities, the President of Estonian Chamber of Commerce and Industry and other experts, to provide views from academia and business as well as government.

Enterprise Estonia

Estonia's main economic development agency is Enterprise Estonia. This has a wide remit to promote investment and competitiveness and is the main R&D and innovation financing agency in the national institutional system. It actively operates in the following areas:

- Enhancement of the competitiveness of Estonian enterprises in foreign markets;
- Attraction of foreign direct investment;
- Development of tourism exports and indigenous tourism;
- Development of Estonian enterprises; and
- Enhancement of entrepreneurship.

Enterprise Estonia was founded in 2000 by the Ministry of Economic Affairs. One of the predecessors of Enterprise Estonia was ESTAG, the Estonian Technology Agency which was established in 1998. The strategic and operational planning of ESTAG was supported by a senior director of the Finnish Technology Agency (TEKES). In 2000, seven former solely operating public agencies, including ESTAG, were merged into one organisation - Enterprise Estonia. Organisational restructuring of Enterprise Estonia took place in 2002-2003 and new structure started to operate in full on 1 October 2003.

Enterprise Estonia operates initiatives mainly in the areas of R&D and innovation and the attraction of foreign direct investment. In supporting R&D, Enterprise Estonia finances mostly innovation and applied research, but partially also the infrastructure expenses on R&D institutions. Some of the main policy initiatives are:

- **The R&D Financing programme** (€18.4m over 5 years) offers funding for feasibility studies, applied research and product development for Estonian enterprises and R&D organisations. The programme was launched by Enterprise Estonia in 2001 in response to the need to advance the business competitiveness of Estonian companies through introducing more knowledge-intensive products and services. Public consultations with the main potential beneficiaries (companies) identified a lack of capacity and infrastructure for a truly innovative product development environment, and a lack of interest to transfer knowledge from academic research to industries. The programme was very much inspired by similar programmes abroad (particularly in Finland).

- **The Competence Centre programme** (€9.1m over 3 years) was initiated in 2003, in order to increase strategic cooperation between the research and enterprise sector, develop research capacity in specific technology fields and promote the internationalisation of R&D. In contrast to the criteria in Northern Ireland, Estonian Competence Centres must be established and operated together by at least three enterprises and one R&D institution. The Programme has funded 5 competence centres in Electronics, Information & Communication Technologies; Food and Fermentation technologies; Healthy Dairy Products; Nanotechnologies and Cancer

research. Competence Centres are independent profit making organizations which collaborate largely with small firms.

- The **SPINNO programme** (€4.2m 2004–2006) targets universities and research institutes in order to strengthen their business orientation, entrepreneurial spirit, technology transfer activities and collaborations with domestic and foreign enterprises. In 2003 and 2007, interim evaluations of the programme were carried out and found to be successful in the development of innovation services and the establishment of spin-off companies. A new round of the Programme for 2008-2013, called SPINNO+, was launched in August 2008.

In terms of FDI, Enterprise Estonia has a subsidiary division – the Estonian Investment and Trade Agency – to raise the profile of Estonia among key audiences, and to establish and develop business relationships with international companies. They offer little by way of financial incentives, with support mainly in the form of information and services for:

- Organizing site visits and fact-finding missions
- Identifying potential partners in Estonia
- Assistance with developing market entry strategies
- Identification of specific investment opportunities
- Site search and advice on project financing
- Negotiations with relevant authorities
- Assistance in project implementations
- Assistance with EU grant applications
- Supply chain development
- Establishing university linkages
- Cluster development

Enterprise Estonia also has a range of support measures across its other areas of responsibilities (e.g. providing start-up grants) which reflects its broad remit. The agency is the closest in structure to Invest NI in the four case study countries as it does not have dedicated autonomous agencies in different areas of economic development. This is because the Estonian government, with encouragement from the EU, wished to adopt a clearer, more focused approach. However, a recent evaluation of the R&D system identified that Enterprise Estonia is overly bureaucratic, "which significantly impedes the communication with clients".

Estonian Development Fund

The Estonian Development Fund was founded by the Estonian Parliament in 2006 to initiate and support changes in the Estonian economy and society, to help in upgrading the economic structure, ensuring export growth, and in creating new highly qualified jobs. In order to achieve these goals, the Estonian Development Fund organises foresight projects and, in cooperation with private investors, makes venture capital investments in Estonian companies that are innovative, expanding and have international potential. It therefore helps to address the need for encouraging the establishment and growth of new technology based companies in Estonia. It is based on the Finnish organization – Sitra.

The Development Fund undertakes risk capital investments in start-up and growth-oriented technology companies, in collaboration with the private sector. It has a key strategic role in conducting foresight exercises. The focal point of the Development Fund's foresight work during the first years of its operation is to shape Estonia's economic policy vision building. The first areas that the fund examined include:

- The re-structuring of the manufacturing sector of Estonia;
- The development of knowledge-intensive services; and
- Potential for expanding Estonian ICT development.

The second area of activity for the Development fund is in the area of Venture Capital Investments. Estonia's venture capital market has traditionally been underdeveloped and entrepreneurs found it difficult to obtain investments for projects with a higher risk profile, through relatively small volumes. Venture capital investments executed by the Estonian development Fund's Division serve to overcome this obstacle through two principal courses of action:

- To invest in Estonian companies showing potential for rapid growth and international success; and
- To activate and develop Estonia's venture capital market by re-engaging co-investors in the investment projects of the development Fund and consolidating cooperation between market players.

The objective of the fund in this area is to introduce successful Estonian start-up companies to the international field and endorse the image of venture capital investors, so that entrepreneurs would regard them as an efficient facility for expanding their business. This should also serve to boost venture investments in the local market and spread venture capital know-how and good investment practice.

KredEX

A key body providing enterprise support to businesses is KredEx (The Credit and Export Guarantee Fund). KredEx was founded in 2001 by the Ministry of Economic Affairs and Communications with the aim to improve the financing of enterprises in Estonia, decrease export-related credit risks, enable people to build or renovate their homes and promote energy efficiency in Estonia. The mission of KredEx is to help raise the competitiveness of Estonian enterprises and the improvement of living conditions. The vision of KredEx is to offer financial solutions based on the best practices from the world.

KredEx operates in 2 main areas:

1. **Entrepreneurship:** KredEx offers financial products for newly launched and existing small and medium sized companies in the form of equity loans and guarantees for investment, start-up, leasing and banks;
2. **Exports:** KredEx helps to increase the competitiveness of an exporter by offering export guarantees to lower credit risk. This facilitates the offering of products or services under credit terms and secures the payment of the bill irrespective of the reasons why the money was not received from the buyer.

KredEx offers Estonian entrepreneurs short-term and long-term export guarantees, production risk guarantees and investment guarantees. The coverage of export guarantees is up to 100% for political risks, i.e. risks caused by the activity of a foreign country, and up to 90% for commercial risks, i.e. risks caused by the activity of a foreign buyer. Export guarantees enable companies to increase their client base, enter riskier markets and offer more flexible sales opportunities. An entrepreneur has the possibility of using a guarantee for export of consumer products, raw material (deliveries with short payment term), capital and durable goods and machines and devices (deliveries with medium and long term credit period). Export guarantees work similarly to insurance: loss caused by a political or commercial risk shall be compensated for in the amount of guarantee coverage.

Estonian Science Foundation

The Estonian Science Foundation is an expert research-funding organisation. Its main goal is to support the most promising research initiatives in all fields of basic and applied research and it was established as a public funding agency in July 1990 by the Estonian Government. The Estonian Science Foundation is monitored and financed by the Ministry of Education and Research. It allocates more than 120 million EEK (nearly 7.7 million euros) to high-level research annually, which represents about one-fifth of the total of the Estonian government's research funding. The objectives of the Estonian Science Foundation are:

- To foster the development of basic and applied research in the main areas of scientific strength and in fields of special importance for the Estonian economy and society;
- To support the most qualified and successful researchers and research groups; and
- To involve post-graduate and doctoral students in active research to facilitate international cooperation and mobility of researchers.

The funding for Estonia's range of economic development agencies, listed above, is generally very small compared with funding levels in Northern Ireland. We have few direct measures of the impact of these policies but we can note that such high-levels indicators as the level of business expenditure on R&D (BERD) and the volume of FDI both show rapid improvement.

Key Drivers of Success

Foreign Direct Investment

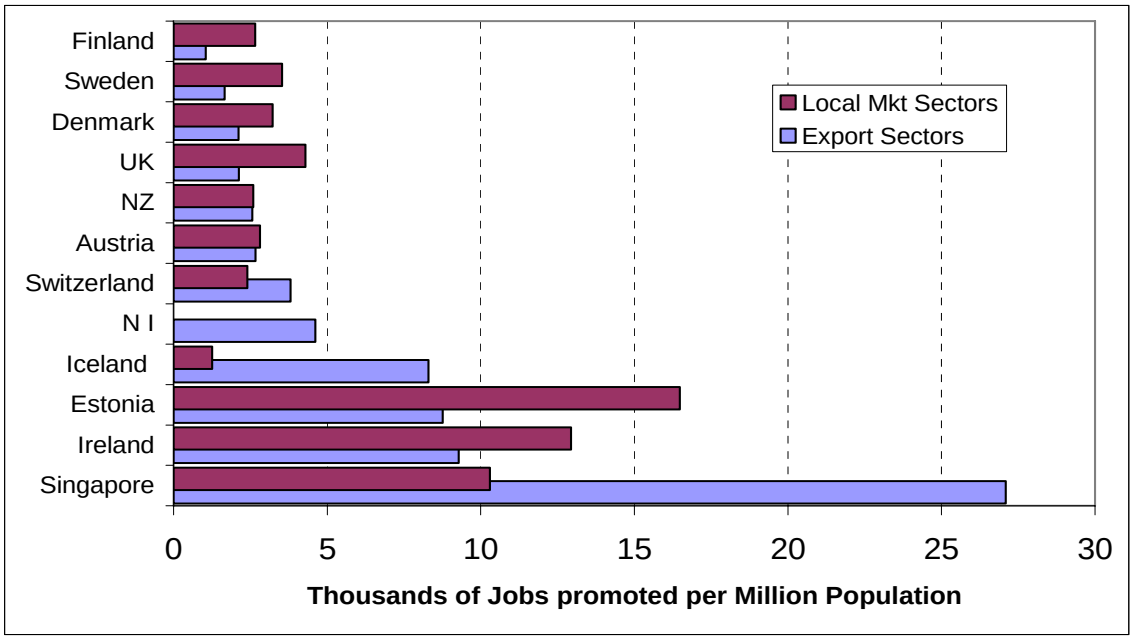
Estonia has been successful at attracting FDI. In the period 1992–96, the main reason for foreign investments was privatization with foreign companies buying formerly state-owned enterprises. From 1997 acquisition of private Estonian firms by foreign firms started to play a major role. The biggest acquisitions occurred in the Estonian banking system in 1998 and in telecommunications in 1999. In the 1990s, the investments into equity capital dominated; but since 1997, reinvested earnings have grown to 50–70 percent of total annual FDI, aided by Estonia's zero rate of corporate tax on reinvested profits. Another trend has been an increase of loan capital in FDI. Equity capital was a majority of FDI in 2005 due to the takeover of the remaining shares of Hansapank the largest commercial bank in Estonia, by Swedbank.

The total value of financial FDI in Estonia was €9.6 billion at the end of 2006. The most attractive fields of activity for FDI in Estonia have been real estate, renting, and business activities (29.8 percent) and financial intermediation (28.1 percent). The other important fields of activity were manufacturing (17.5 percent); wholesale and retail trade (10.4 percent); and transport, storage, and communication (7.0 percent). Two-thirds of this FDI came from Sweden (39.5 percent) and Finland (26.4 percent) and the Estonian economy is closely connected to the economies of Finland and Sweden via trade linkages. Finland and Sweden have specialized in high-tech industries and have been looking increasingly toward Central and Eastern European (CEE) economies for new high-growth markets as well as sources of labor and raw materials.

Estonia's rate of FDI jobs promoted in new green-field firms in export sectors, including manufacturing and call centres, is third among the countries included in Figure 19. Only Singapore and Ireland had proportionately higher rates of attraction. Estonia is internationally competitive in having low corporation tax, low wages and light regulation of labour markets. The

analysis in the FDI chapter of section 2 above suggested that each of these three factors had a significant positive influence in attracting FDI. Figure 19 shows that FDI into Estonia's local market sector has been proportionately greater than for any of the other countries listed. This is to be expected for a country emerging from the Soviet block with previously limited investment in distribution, hotels, catering and house-building.

Figure 19: FDI Jobs Promoted by FDI per Million Population (2003-9)



Source: fDi Intelligence Ltd

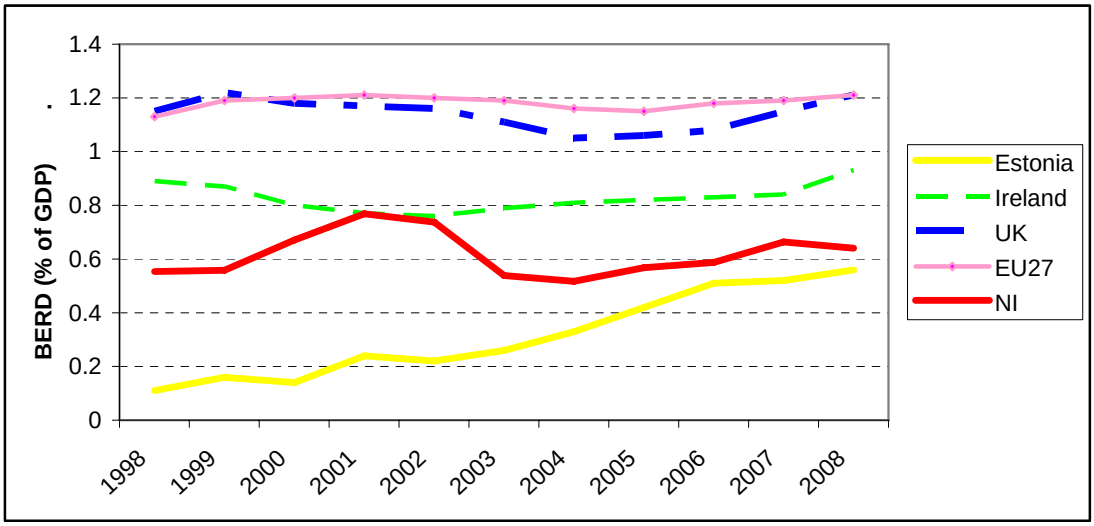
Interviews suggested that there is a significant amount of networking between existing firms in Estonia. Such networking includes expansion of the existing foreign-owned enterprises through initiating new subcontracting orders to domestic firms and also more active cooperation between foreign-owned firms themselves. Networking also is important for FDI-based companies bringing together foreign capital and local R&D. Particular areas of strength for Estonia are information technology, biomedicine, and material technologies. The network of companies, some of them working on projects within the Spinno programme, increases innovation in companies and promotes cooperation between industry and the science community. The Tartu Science Park, working closely with the University of Tartu and the Tallinn University of Technology Innovation Center, is another example of such networks.

Innovation and R&D

After almost a century inside the Soviet Block with little competition between firms and limited need for product or process innovation, it is not surprising that business expenditure on R&D was very low. Even by 2001, total expenditure on R&D (GERD) was little over half of the NI level at 0.7% of GDP (see Figure 20). Expenditure by businesses (BERD) was only one fifth of the NI level a decade ago. However, expenditure has risen rapidly and by 2008 was above the NI level of 1.2% of GDP. The number of researchers per thousand employees was around 10% below that in NI, and average wages were much lower, hence BERD per head of population was much lower.

Business expenditure (BERD) has risen rapidly and by 2008 was close to the NI level at 0.6% of GDP. Like Finland and Sweden, Estonia spends little on direct subsidies to business R&D. Only 7% of BERD in Estonia is comprised of direct government support, unlike NI where the Figure is close to 12%. Wages for R&D personnel are very low and the number of patents filed each year is only a fifth of the UK level in proportion to population. The implication is that the effectiveness of R&D spending by businesses in Estonia is low. The latest Community Innovation Survey (2006) shows that the proportion of Estonian firms (49%) carrying out Innovative activities[106] is above the EU average (42%).

Figure 20: Business Expenditure on R&D (BERD)



Source: Eurostat

Most research and development in Estonia is performed at the public universities. The largest public research university is the University of Tartu, followed by the Tallinn University of Technology, Tallinn University and the Estonian University of Life Sciences. Although there are several private universities in Estonia, they are largely focused on education. R&D activity in the higher education sector is largely comprised of research carried out by Estonia's public sector universities. There are also a small number of public research institutes/centres that perform research in specific science fields (for instance, the National Institute of Chemical Physics and Biophysics and the Estonian Biocentre). Within businesses, technology companies, including biotechnology and information and communications (ITC) are the sectors where research activities are most visible.

In the years since independence, Estonia has successfully developed a number of institutions and instruments of R&D and innovation policy through[107]:

- The formulation of R&D and Innovation strategies for the periods 2002-06 and 2007-2013.

- The rapid set up of a R&D and Innovation policy system and related policy instruments which is modelled after European best-practice examples (with Finland and Sweden being role models in many instances)

[106] An innovation is a new or significantly improved product (good or service) introduced to the market or the introduction within an enterprise of a new or significantly improved process.

[107] OMC (2007) *Policy Mix Report for Estonia*

- A substantial increase in R&D expenditures in absolute terms in recent years; and
- Successful implementation of e-government strategy that has brought Estonia to the top of the rankings of the development of the information society.

Until recently, Estonian R&D policy has lacked a well-balanced co-ordination between the research policy issues (governed by the Ministry of Education and Research) and the innovation policy development (Ministry of Economic Affairs and Communications). In 2006 an effort was made to join the two strands of policy together in a revised Research, Development and Innovation strategy. Additionally, some new national support programmes have been introduced to foster links between academic and business research[108].

The Estonian research system has gone through major restructuring in the past 15 years. The structural changes are continuing and are now focusing on the new collaborative research systems (Centres of Scientific Excellence and Competence Centres) and with further consolidation of the university system.

Education

It was one of the paradoxes of the Soviet system that educational standards were generally high but the impact on productivity in the economy was small due to a lack of competition and few incentives to innovate. Estonia has the best school results of any post Soviet republic and with standards now among the highest in the world (Table 9). Indeed in Science Estonia was fifth in the world after Finland and Canada. Estonia's scores were also well ahead of NI in every subject.

Table 9: PISA Country rankings 2006

	Estonia	UK	NI	Sweden	Finland	Ireland
Maths	14	25	27	21	2	22
Science	5	14	21	29	1	20
Reading	13	17	18	10	2	6
Total	11	19	22	18	1	16

Source: OECD Factbook 2009

Like Finland, Estonia has been successful in raising PISA test scores for the lowest ability ranges. The average PISA scores for the threshold for the lowest 5% of the ability range were 18% above the NI level. Whereas 5% of Estonian pupils were below this level, in NI 10% of pupils were below the level. The school system is similar to that in Finland, and Finnish experts have advised on curriculum and other matters. The system is based on comprehensive schools with little private education, with a split between academic and vocational education at upper secondary (sixth form) level. In Finland PISA results for the top 5% of the attainment spectrum were above those in NI despite the unstreamed and comprehensive nature of Finnish schools. This is not the case in Estonia where the average PISA score for the top 5% threshold is 2% below the NI score. Class sizes in Estonia are smaller than in the UK except at upper secondary level, following the Nordic practice, but teachers pay is only a third of UK levels.

With a population smaller than NI, Estonia has 4 major public universities, seven small universities and 21 professional HE institutes, with a high degree of institutional autonomy. Together these institutes had an enrolment of 68,000 students in 2005. By comparison NI, with a population a quarter larger than Estonia, had 45,000 full-time and 17,000 part-time students in UK HE institutes in 2008/9. Estonia has a higher proportion of its population with HE qualifications

[108] European Commission (2009) *ERAWATCH Research Inventory Report for Estonia*

than the UK, but for the 25-34 age group it has fallen behind the UK. Almost a quarter of HE qualifications in Estonia are in business and administration, and another third are in professional qualifications and humanities. Maths and sciences account for under 5% with engineering at another 5%.

In conclusion, Estonia is like Finland in having excellent school results achieved from a comprehensive system, with particular strengths at the lower levels of the attainment range. It is less outstanding than Finland at the top end of the attainment range and the proportion of young people with HE qualifications is now a little below the UK average. In addition only 10% of HE qualifications are in STEM subjects. Our conclusion is that the strengths of the school system are only partly reflected at HE level. The educational basis for a successful innovation system appears to be lacking, but this may reflect a current low demand for STEM qualifications.

Conclusions on Estonia

Although Estonia remains a relatively low income economy, it has demonstrated considerable growth and reform in the years since its independence in 1991. Estonia has the best record among the 10 new EU member states (8th among the EU25, and 23rd in the world) on the IMD economic competitiveness scoreboard[109]. The country continues to be characterized by efficient institutions, well-functioning markets, and strong uptake of new technologies. Young and ambitious leaders were key to this, implementing a raft of unprecedented reforms at a rapid pace upon independence. Most of the politicians making up the cabinet were in their 20's and 30's and were not afraid to introduce policies that were unpopular at the time, which they believed would be to the benefit of the Estonian economy in the long run. Estonia has already caught up with NI in the proportion of its GDP devoted to business expenditure on R&D, and it has better school attainment at age 15. A continuation of Estonia's rapid productivity growth in the 1992-2007 period suggests that Estonian productivity could overtake that in NI within two decades. However, HE attainment has fallen behind NI levels especially in STEM subjects and this may retrain future productivity growth.

The chief lesson for NI is one of aspiration and ambition. Estonia's economy was badly damaged by 45 years within the Soviet system, but its current role models are Finland and Sweden, both of which maintain high productivity through excellent innovation systems. Although Estonia has scored quite well on innovation scoreboards, it appears that much of this is attributable to catch-up rather than demonstrating a strong indigenous capacity for more strategic, radical or breakthrough innovation. However, it nonetheless demonstrates that being a "technology follower" in under developed markets can make a significant impact and contribute to productivity growth.

Much of Estonia's economic growth has been driven by a high inflow of FDI, especially from Sweden and Finland, which accounts for almost two-thirds of the FDI stock in Estonia. It must be noted that inward investments are generally towards the lower end of the value scale. Nonetheless, the inward investment from these countries has provided investment and employment that have helped the economy to grow at a vital time in its development. The Estonian experience demonstrates the importance and benefits that can be gained by taking advantage of opportunities presented through high growth neighbouring economies. These companies have been attracted by:

- Low corporation tax (0% on retained profits)

[109] Institute for Management Development (2008) *World Competitiveness Scoreboard,* http://www.imd.ch/research/publications/wcy/competitiviness_scoreboard.cfm

- Low wages (Manual wages in manufacturing in 2007 were 17% of UK average)[110]
- Low level of business regulation (3.6 on rebased OECD scale 0-10 in 2005, UK=5.6, USA=4.4)[111]

One final example however shows how difficult it can be to retain the benefits of a good innovation and educations systems in a globalised world. The programming work for the highly innovative Skype computer telephony system was undertaken in Estonia, largely because of particular qualities of the programmers involved as well as the low cost of their work. The original idea however came from a Swede and a Dane, and the resulting highly successful company was set up in Luxemburg close to the source of the initial venture capital funding. The company is now US owned[112]. In establishing new companies with global reach, local skills are not enough. Entrepreneurial vision is vital, and in Skype's case it seems that the location of finance was critical to its ultimate location.

[110] Source of data US Bureau of Labour Statistics.

[111] Crafts N. *Regulation and Productivity Performance*. Oxford Review of Economic Policy Vol 22 no. 2 Table 4

[112] Interview with Niklas Zennstrom September 2010.

SECTION 4 – CONCLUSIONS

A Programme for the Northern Ireland Economy

Northern Ireland's emergence as a world class and high productivity manufacturing economy in the 19th century was unlike that of most other UK regions in that it was achieved without local resources of coal or iron ore. The loss of economic pre-eminence over the 20th century has been unfortunate and may have been avoidable, but has been shared with much of northern England and Wales. Northern Ireland's productivity is among the lowest in the UK along with parts of northern England and Wales. This suggests that the issues are connected with a wider failure of UK policy to fully address the problems of peripheral post-industrial regional economies. One issue is that the UK is a highly centralized economy with centrally determined tax and benefit rates as well as a single interest and exchange rate. This means that regions have few means of differentiating themselves in the struggle to attract new investment.

The main instrument of regional policy within the UK, and especially in NI, has been investment grants. In NI, grants reduce the cost of all investment made in export sectors by between 10-25%. The result has been to attract new companies and to induce higher investment by local companies raising growth in GDP by between 1-2% per annum. As a result the manufacturing sector is around 25% larger than would other wise be the case, and a substantial number of call centres and similar activities have developed especially in Belfast[113]. Only some of this additional investment has been in high value-added activities and average productivity has lagged behind the UK average[114]. Instead much of the additional investment has generated new jobs at average or low productivity and these jobs have reduced unemployment and out-migration, and have attracted new migrants from Eastern Europe. The economy is thus larger than would be the case in the absence of grants but has not converged towards UK or EU average levels of productivity. The imposition of EU State Aid Rules, and the possibility that NI may not be permitted to give investment grants after 2013, provides an important potential constraint on future policy.

The shared experience of slow growth in a number of UK regions, together with a longstanding failure of current grant-based policies to close the productivity gap with GB, means that it is inappropriate to look to elsewhere in the UK for role models. This report has looked instead at small peripheral EU states which have been successful either in attaining high levels of productivity, or have experienced rapid growth in productivity over recent years. Key aspects of their success have been:

- **Finland** has focused on developing an R&D-intensive economy underpinned by a strong skills base. It has an advanced innovation system with considerable interaction between business, universities and government and significant resources invested in developing R&D capacity. To support this, strategic direction on innovation has been provided from the top of government. Considerable support has been given in the past to develop Nokia into a world-class firm, which has been used as an 'anchor' around which Finland's large and competitive ICT has been built. Other sectors are also highly competitive, including high technology wood and paper products. In each case the quality of Finnish education has been very important in underpinning economic success.

- **Sweden** is a mature economy which is also based around high expenditure on R&D. R&D and innovation is driven by an impressive number of large multi-national firms

[113] See for instance Independent Review of Economic Policy 2009 para 4.56 DETI

[114] IREP op cit para 4.12

and the universities. For a small country Sweden has a large number of successful international firms. These have been well managed and highly competitive for many decades, with Sweden's success built on the base of long-established high standards in education at both school and tertiary levels. Almost all of Sweden's multi-national firms are indigenous, although some have been taken over by foreign owners over recent decades. These firms dominate much of Sweden's economic performance. In contrast, current policy has only little impact on developing business R&D directly with most government support given to universities with limited direction on which research should be conducted. Deregulation has also been important for the economy, with a wave of changes made in the wake of the financial crisis in the early 1990s leading to productivity increases. Sweden has a very outward looking economy and has become more open to foreign investment. However FDI has played a more limited role in economic development than in the UK or Ireland.

- **Ireland** achieved rapid economic growth in recent decades due to high levels of inward investment. The main reason for this success was a low rate of Corporation Tax, from 1957 in manufacturing which made Ireland attractive to foreign investors especially those in highly profitable and R&D-intensive sectors. This FDI strategy also required investment in skills development and infrastructure, and an effective investment agency to work with global companies and influence wider economic policy when required. However, this strategy has not had the expected impact on R&D levels (which remain relatively low) and it is uncertain to what extent to which local SMEs have benefited. These underlying successes remain in place despite the current problems associated with the 21st century property and banking bubble.

- **Estonia** has achieved rapid growth in productivity since 1990 although it is currently still a relatively low income economy. On pre-recession rates of growth Estonian productivity will overtake that in NI within 15 years. Estonia has used Finland and Sweden as role models, setting up a number of similar institutions and programmes, to support large increases in R&D. Estonia has also been successful at attracting significant levels of FDI, again mostly from Finland and Sweden. This has been influenced by a low rate Corporation Tax, a low cost base and a permissive regulatory regime. Estonia is possibly one of the most interesting case studies for Northern Ireland, as it shares some of the same structural economic problems and has already set up institutions and programmes based on best practice elsewhere.

As a region rather than a sovereign state, NI lacks some policy levers available to the countries listed above. However, devolution has brought the prospect of a range of additional policy options similar to those of independent states, especially states within the Eurozone that lack independent monetary policies. The remainder of this section outlines a set of policy initiatives that could constitute a rounded programme of economic development policies based on the experience of the case study economies.

Direction of Economic Policy

While each of the four case studies has achieved economic success in a unique manner, they do highlight two broad approaches relevant for Northern Ireland in developing a successful small economy:

1. **Focus on promoting R&D and innovation**: this is a long-term strategy which depends critically on building up a substantial R&D capacity in export companies. This requires significant government intervention both in providing funding to companies (at least in the early stages) and in developing the necessary institutions (universities, research organisations) to support this. It also requires a first class school education system to

provide the technical staff, and a first class university system able to undertake world-class research in collaboration with companies. Finland and Sweden have been the main proponents of this model, although Estonia is also attempting to replicate their success. Finland is the clearest example of the importance of strategic leadership from the top of government is setting clear aims and in promoting collaborative progress between various sectors, Estonia is following this path and its business expenditure on R&D has already converged with that in NI.

2. **Attract significant levels of inward investment in high productivity sectors**: this strategy 'imports' multi-national companies on the basis that they are assumed to be more productive, export-intensive and R&D-focused with benefits over the short, medium and longer term. Ireland has depended very heavily on this approach and its Finance Minister recently described the low corporation tax incentive for FDI as 'the cornerstone of Irish industrial development policy'. Estonia has also adopted this approach, again with low corporation tax incentives, but it is combining this approach with a Nordic focus on high technology home grown firms.

The remainder of this chapter will focus on lessons in these two areas, along with consideration of the structure of economic development agencies in the case study economies. This includes education which was also found to be important in the case studies with all four countries exhibiting good performances on OECD international tests for 15 year olds and in vocational education. This chapter will thus also briefly discuss any relevant key findings for education. Finally, little has been said in this overview report about enterprise and support for small and medium-sized firms. This is because we found little evidence that other countries had more effective enterprise policies than NI.

R&D and Innovation

Both Sweden and Finland have developed a high productivity base of locally-owned internationally competitive firms with relatively low levels of FDI. A high trust social culture may have contributed in both cases since a string base of large firms tends to be confined to societies which Fukuyama defines as being based on high trust relationships[115]. In Sweden's case many of its impressive array of home-grown multi-national companies were formed over a period of 130 years, although many have been more recently bought over by foreign owners. Finland's important ICT industry, centred on Nokia, is a creation of the last 30 years. Finland's experience is particularly interesting because it emerged from a lower productivity past over a few decades to become one of Europe's technological leaders. Estonia has had some success in this area through adopting best practice from these two economies, while Ireland has placed a greater focus on science and innovation policy in recent years.

Leadership

In promoting R&D, technology and innovation, the case study countries have not achieved their success mainly by offering grants. Instead, a wider promotion of innovation as the most important goal of economic development policy, led by the most senior politicians, appears to be an important factor. Indeed, leadership from the top appears essential to drive reforms once the national determination is in place.

[115] Fukuyama F (1995). Trust. The New Foundations of Global Prosperity. New York. Free Press

Finland offers the best practice example, with its Research and Innovation Council being chaired by its Prime Minister to provide strategic direction on innovation-relevant issues. Estonia has duplicated this approach in setting up the Research and Development Council, also chaired by the Prime Minister. Sweden has also recently established an Innovation Policy Council for the Minister of Industry, Employment and Communication to communicate with key stakeholders on innovation policy. Ireland has a Cabinet sub-committee on Science and Technology which reports to the Cabinet Committee on Economic Renewal (chaired by the Taoiseach). At present, Northern Ireland does not have a comparable high-level body focused on providing strategic direction from the top of government on innovation policy. An Executive Sub-committee on the Economy, chaired by the Minister of Enterprise, Trade and Investment, has recently been established but has a wider focus than innovation policy alone.

The NI executive should establish the equivalent of Finland's Research and Innovation Council. This should be chaired by the First Minister with support from other Ministers and from major organisations and companies in NI connected with innovation policy. This would be wider than the executive sub-committee recommended by IREP and more focused on R&D and innovation. The easiest way forward may be to focus the existing Executive sub-committee on research and innovation, following the wider IREP recommendation that policy should move in this direction. The Council's role should be to oversee the development of an innovation system in NI including:

- Creating awareness and common understanding of the main aspects of innovation policy;
- Making strategic decisions for innovation policy;
- Formulating guidelines for education in support of innovation;
- Strengthening collaboration between companies, universities and other public sector research organisations.

Building Research Capability

Finland has developed a strong research capability in key areas through significant investment in university research and the establishment of a commercially focused research institute in VTT, which is the largest of its kind in Europe. Sweden has also built up research strengths through focusing funding on university research and having a large number of smaller research institutes. The approach in Estonia and Ireland has been slightly different, although with the similar aim of developing research strengths. The Estonia Science Foundation is an expert research funding organisation which aims to support researchers and research initiatives in areas of scientific strength. Similarly, Science Foundation Ireland was established in 2000 to invest in researchers and research centres in key areas.

Northern Ireland currently has a range of research strengths spread across universities, companies and public research institutes. In comparison to Finland, where much research activity is consolidated under VTT, this results in a much more fragmented approach. While the Finnish example supports the establishment of an institute to developed commercially focused research, it would be very difficult for Northern Ireland to replicate this and build a similar institution from nothing, given the size and scale of VTT which took over half a century to reach its current size.

Therefore, in order to build research capacity in Northern Ireland, we recommend the following:

- Given that NI has a strong university sector, **a new institute should be established to act as a conduit for research ideas between universities and firms as well as undertaking some of its own research**. There could also be interchange of staff between a new institute and both universities and companies. The advantage of such an institute over universities would be a stronger focus on commercial application,

and freedom from the strong publication pressures that determine academic promotion. This is likely to be a better alternative for NI than expanding commercially-oriented research within existing universities. New UK arrangements for the funding of university research do now give more credit for commercially and socially useful research than in the past, and this could be further developed in Northern Ireland. However, in our view it will always be difficult for academic researchers to give sufficient priority to commercial aims, and an independent halfway house is likely to be more effective in this respect. Such an institution should have the role of convincing firms of the value of R&D and innovation as well as helping to design the Research itself. State owned research institutes can easily become ineffective and well designed staff incentives will be essential. Further study of VTT's management practices can help in this respect.

- **A major inducement to new FDI should be research collaborations with local public sector research organizations**, using public funds to target research on appropriate research specialisms. As a first step, DETI and DEL should carry out an initial scoping exercise to identify what research strengths Northern Ireland currently has in priority investment sectors, with an aim of developing a cohesive promotional tool of research capabilities for potential investors.

Supporting Business R&D

Finland's research success highlights best practice in providing support to companies for R&D and innovation. Tekes' support to firms is now mainly focused on SME's[116], and the majority of projects are collaborative, funded by a mix of grants and loans. Sweden has less focus on providing support to companies, with the majority of government funding directed at universities for basic research. Sweden's Vinnova works to support applied research in business and enhance collaboration with universities. Both Tekes and Vinnova have a strong international dimension to their activities, and the skill levels of staff are very high, with many having Masters and PHD's. Estonia and Ireland do not have dedicated agencies to provide R&D funding to business which is instead incorporated into Enterprise Estonia and Enterprise Ireland respectively. Their support tends to be more similar to Invest NI in offering support programmes to companies.

It should be noted that the innovation system and R&D capability of firms in Northern Ireland are much less well developed in comparison to Finland and Sweden. Because of this, it is not entirely appropriate to apply criteria to support for firms in Northern Ireland based on the case studies. Nevertheless, any lessons on supporting business R&D should be viewed as a longer-term direction on how R&D support should be provided in Northern Ireland. These include:

- **Innovation support:** the economic development agencies in Finland, Sweden and Estonia do not give grants (or indeed other financial support) for company investment. In Ireland this is now a minor part of industrial policy. Instead the focus in the Baltic countries is firmly on support for R&D and innovation. Their success in promoting high business spending on R&D and success in developing indigenous technology firms suggests that this is a fruitful approach. The recommendation of the IREP that Invest NI should move in the direction of supporting R&D rather than investment per se is thus supported by this evidence. **The logical conclusion is that' Invest NI' should eventually become 'Innovate NI'. If the capacity to award investment grants is withdrawn after 2013 this will become an imperative.**

[116] Although it should be recognised that a large amount of assistance has been directed at Nokia in the past to build them into the leading company they are today.

- **Supporting SMEs:** Tekes is able to direct its support at SMEs since large firms in Finland have sufficient R&D capacity and will invest large amounts in R&D without assistance. This is not the case in Northern Ireland, where R&D capacity is much lower and large firms do not drive BERD in the same manner as other economies. Also, Sweden does not have this focus on SMEs and substantial support is given to large firms. The case studies would suggest Invest NI should have a long-term view of sufficiently building R&D capacity in local large firms to the point where assistance can then be mainly directed at SMEs. However, such support in the past has not yet led to any significant rise in NI's low ratio of BERD to GDP. **DETI should give priority to examining ways of raising BERD in both small and larger firms..**

- **Encouraging collaboration:** much of Tekes' and Vinnova's support is based around collaboration, particularly with universities and research institutes. This is to take advantage of the large investment in building research capability in these areas, something which has not happened to the same extent in Northern Ireland. Invest NI has moved in the direction of requiring collaboration in Competence Centres, although most support is still provided to individual firms under the Grant for R&D programme. Best practice suggests that **Invest NI should continue to encourage collaboration in R&D projects and increasingly require this as a criteria for providing support, particularly as public research strengths are developed.** This should include encouragement of collaboration in universities and public institutions as well as in companies. Both sides need to be enthusiastic about the process.

- **Technological focus:** key technology companies in Finland and Sweden were encouraged through purchasing and contracts from government departments and public monopolies, and the development of the world's first cross-border mobile system. This is difficult to achieve now within the EU rules, but **as much assistance as possible should be given to local firms which could be built into leading ICT companies and are capable of taking part in future technology networks**.

- **Picking winners:** both Tekes and Vinnova direct their support to some extent onto particular technologies. Finland's strategy of backing ICT and radio telephony was a spectacular success. Experience in NI is more limited although national Foresight exercises and the Matrix project both attempt to focus on technologies with particular potential for growth. Picking winners in this way has a very mixed record of success in the UK but **more could be learned from the Nordic experience about how to make technological selection a more effective element of industrial policy and how this can be supported across the full range of relevant agencies**

- **Using loans:** Tekes provides a mix of grants and loans in supporting firms' R&D expenditure, in contrast to Northern Ireland where grants are almost exclusively used to support R&D. Given that R&D projects are inherently risky, there is the potential that moving to the use of loans could dissuade companies from carrying out R&D. However, loans in Finland are designed to carry little risk for firms, as they are only repaid if the project is successful and around 10% of loans are written off. This suggests that **while the majority of Invest NI R&D support should remain in the form of grants, there may be potential to also offer loans which only need to be repaid when the project is completed and if it has been successful.**

- **Qualified staff:** Both Tekes and Vinnova have a highly-qualified complement of technically-qualified staff that can lead research programmes rather than solely provide administration to businesses when they come forward with proposals. Invest NI has taken a positive step in recruiting staff with specific capabilities with the appointment of a global innovation advisor. Best practice suggests that **Invest NI**

should try to identify further opportunities to recruit highly-qualified staff with technical skills in supporting R&D projects.

- **Evaluation focus:** Finland has an extensive evaluation culture which is used to guide reforms in the innovation system and feeds into decision-making at RIC and other high levels. In general, the case study countries exhibited a strong focus on achieving economic goals, particularly in relation to BERD and other innovation measures. This indicates that **evaluation of policies and programmes in Northern Ireland should mainly be focused on whether economic objectives have been achieved,** whilst still remaining cognisant of important issues such as deadweight and market failure.

Individual Programmes

The review of case studies highlights that there is not just one single programme which Northern Ireland could adopt which will lead to economic success. Many of the countries have similar programmes, not only similar to each other but to Northern Ireland. Nevertheless, the case studies do highlight some initiatives which DETI and Invest NI may wish to consider in supporting R&D and innovation:

- **Industry clubs:** these enhance collaboration between universities and the private sector through providing workshops and access to research including exclusive early access to results. Clubs contribute towards university access to private sector research. Costs are supported by EU funds, with company contributions around €10,000 each[117]. Something similar in Northern Ireland could potentially enhance research collaboration.

- **Technology clinics:** this initiative was introduced by Tekes to assist SMEs in improving their capacity to absorb new knowledge throughout improving their organisation, management and R&D. Firms approach Tekes with ideas, and costs are shared between the two. A similar initiative in Northern Ireland could potentially help build capacity in the economy.

- **Innovationsbron:** the Innovation Bridge was founded in 2005 to help identify R&D related ideas with commercial potential, support university innovation start-up companies and provide financing. It also offers overseas help to Swedish businesses looking to conduct international research activities. A programme in Northern Ireland to identify R&D ideas with commercial potential (and provide subsequent assistance) may help in commercialising university research.

- **Estonian Development Fund:** this is based on SITRA in Sweden and provides two key roles. First, it carries out foresight activities to identify market opportunities in growth sectors and subsequently shape economic policy. Second, it provides venture capital to high growth-potential firms and engages co-investors, thus facilitating the growth of the underdeveloped venture capital market rather than government providing funds directly. A similar initiative in Northern Ireland could provide a co-ordinated and independent approach to foresight activity, whilst also help to develop to facilitate the development of the local venture capital.

- **Competence Centres:** while Northern Ireland has a similar programme, the approach taken differs from Estonia, where centres must be established and operated by a minimum of three companies and one R&D institution. This facilitates

[117] See SATW op cit p 39 for an example of a Finnish Industry Club.

more companies becoming involved in the programme and exploits the research base. While Invest NI has moved further in this direction in the latest Competence Centres (which requires company involvement in all projects), the criteria could continue to evolve in future Competence Centre programmes to include multiple firms and research institutions.

- **KredEX (Estonia):** whilst not specifically an R&D programme (it is mainly aimed at exports), KredEX aims to improve access to finance for companies and encourages a more entrepreneurial economy. It provides loan guarantees, along with export and investment guarantees, for higher risk start-ups and SMEs which find it difficult to raise finance. A KredEX type model could be implemented in Northern Ireland to help encourage a shift away from dependence upon state grants and develop a more risk-taking culture.

Foreign Direct Investment

The case study economies have had varying degrees of success in attracting FDI, with Ireland achieving the most success, followed by Estonia, Sweden and Finland. The different approaches taken in these countries suggest a number of ways in which Northern Ireland could raise levels of inward investment:

1. **Corporation Tax:** the evidence suggests that countries with weak local export sectors, and a large productivity gap, use low corporation tax to attract internationally competitive companies in high technology sectors. This therefore appears to be the most effective method for a small economy to attract high levels of FDI based on the experiences of Ireland and Estonia. While this is not a devolved matter within the powers of the NI Executive, a unique situation has emerged in which the UK government is actively supporting a full examination of the possibility of devolving authority for corporation tax to Northern Ireland. At the same time the Irish Republic is under strong pressure from a number of important EU member states to abandon its low rate of corporation tax. The situation thus remains fluid, but there can be little doubt that a low rate of corporation tax in NI would stimulate higher levels of FDI. However, these gains would have to be balanced against cuts in public spending which would necessarily accompany any associated loss in tax revenues.

2. **Low costs:** are an important incentive by Estonia in conjunction with low corporate tax rates. While a key part of the Northern Ireland value proposition is based on being relatively cost competitive, it is not a 'true' low cost location when compared with Eastern European or Asian competitors and, would be unlikely to achieve much additional success on this basis. Since an important policy aim in NI is reduce the productivity gap with GB (excluding the Greater South East) any policy based on low wages is likely to be self-defeating. Low costs are however useful in attracting additional jobs to combat high unemployment during the current recession.

3. **Develop indigenous firms:** both Sweden and Finland have successfully built prosperous and competitive economies on the basis of indigenous world-class companies even if some have subsequently gone into foreign ownership. This was achieved over a century or more in Sweden which has an impressively large group of such firms. Finnish experience has been much recent and is thus more relevant to NI. The history of Finland's Nokia is described in detail in the Finland annex, but there are few easy lessons for NI. Government purchasing and government support for the world's first international mobile system were important factors that are not of direct relevance in NI. However, **a high level unit could be set up within Invest NI focussed particularly on how government could assist some of NI's outstanding indigenously-owned**

companies to become larger and even more competitive. This will require a high degree of collaboration from firms and not all firms may wish to take part.

4. **R&D and skills:** despite being one of the world's top performing economies in terms of R&D expenditure and skill levels, Finland has attracted relatively little FDI. This would suggest that, for a small economy such as Northern Ireland, outstanding R&D capacity and excellent skills are in themselves unlikely to attract significant amounts of FDI without other incentives. However we should note that Finland has higher labour costs than NI and is significantly more remote from major European markets.

Of the four approaches outlined above, adopting a low Corporation Tax rate appears to have the greatest potential benefits for Northern Ireland over the short to medium term. Therefore, **if NI gains the power to vary corporate tax rates, the NI Executive should give serious consideration to accepting this and setting a rate comparable with Ireland, dependent on the costs involved.**

Should Northern Ireland not have a lower rate of Corporation Tax, the case studies suggest a range of measures which may help to increase the attractiveness of NI to foreign investors. These are all areas which Northern Ireland would want to improve even with a lower rate of Corporation Tax, and are:

- **Ensure that Northern Ireland has an effective and focused FDI promotion agency similar to Sweden or Ireland.** This may require further work by Invest NI to compare how the Swedish organisation promotes Sweden with relatively few financial incentives for FDI. Alternative incentives might include the possibility of R&D capacity in NI tailored to the needs of incoming firms

- **Develop the R&D capability in key technology sectors similar to Sweden and Finland.** This might require further work to understand what research strengths Northern Ireland currently has and may need significant investment in building capabilities in these areas.

- **Ensure a well skilled labour force (as in Finland), particularly in specialist areas likely to be required by foreign investors.** This requires a stronger understanding of the skills needed by inward investors and better co-ordination between DETI (and Invest NI), DEL, DE and both the higher and further education sectors. The focus should be specialised skills which will help firms in NI to upgrade their capacity in high value-added activities.

Economic Development Agencies

Evidence from the case studies suggests that the optimal structure of supporting businesses is to have separate organisations for different areas of economic development. Table 10 below highlights the key organisations in the areas of providing R&D funding to business, attracting FDI and promoting exports.

Table 10: Overview of Economic Development Agencies

	FDI Promotion	R&D Funding	Export Assistance
Finland	Invest in Finland	Tekes	Finpro
Sweden	Invest in Sweden	Vinnova	Swedish Trade Council
Ireland	IDA Ireland	Enterprise Ireland	
Estonia	Enterprise Estonia		

Note: This is not an exhaustive list and does not include areas such as R&D funding for universities, research organisations and wider enterprise support. The Estonian Investment and Trade Agency is responsible for FDI promotion in Estonia but is a division of Enterprise Estonia rather than a separate agency.

The international best practice organisations in these countries are those which have a dedicated focus – Tekes on R&D funding, Invest in Sweden and IDA Ireland on FDI promotion, and Finpro on export assistance. In contrast, Enterprise Estonia (which oversees a broad remit of economic development including the respective investment and trade agencies) is found to be overly bureaucratic.

In Northern Ireland, Invest NI has a wide remit of economic development issues similar to that in Enterprise Estonia. While there may be advantages to one agency providing a wide range of services, the structures observed in best practice examples suggest that Northern Ireland would benefit from separate agencies devoted to providing R&D funding and attracting FDI due to the specific skills needed for these activities. **This chapter has already recommended that Invest NI should eventually become 'Innovate NI'. In addition, NI should also establish a small organisation (perhaps named 'Locate in NI') dedicated to attracting FDI in a low-grant environment, should this become necessary after 2013.**

We do, however, acknowledge that Northern Ireland had a similar structure to this until the creation of Invest NI in 2002, and that it would take a number of years to establish these separate organisations. Therefore, in the short to medium term, **Invest NI should take further steps to clearly delineate the areas of attracting FDI and promoting R&D and innovation from its wider business support.**

Education

Each of the countries examined in detail in this report have underpinned their economic success with an excellent school education system, and often a good higher education system. Vocational education also seems to be better than in NI in most cases, but this was not examined in sufficient depth to be definitive. Of the four economies reviewed, Finland clearly demonstrates best practice in education. It highlights that:

1. High levels of attainment can be achieved with a largely non-streamed, comprehensive system, without academic selection and with little private education;

2. Good results can be achieved without higher levels of public spending on education. Finland spends no more, as a percentage of GDP than the UK, and hence less than NI;

3. The status of teachers can be higher than it currently is in NI; and

4. 'No child left behind' policies can be more effective than they currently are in NI. In Finland only 5% of pupils perform as poorly as the worst 20% in NI.

Although NI is rightly proud of its education record compared with the rest of the UK, this report has highlighted that the UK is not outstanding in world education league tables. A broad message we would put forward is that Northern Ireland needs to look at other national role models for education standards, such as Finland, rather than focusing solely on comparisons within the UK. With regard to specific lessons for education, this is an area outside the remit of DETI and we have focused areas such as promoting R&D and attracting FDI. Nevertheless, **both DE and DEL should consider how the findings of this report can inform further work into how Northern Ireland could improve standards of education in line with international best practice.**