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An Assessment of International Trends in Occupational Forecasting and Skills Research: How Does Northern Ireland Compare?

A report prepared by the Priority Skills Unit,
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EXECUTIVE SUMMARY

- This report reviews current international best practice in the area of skills planning and forecasting and provides an assessment of Northern Irelands position within this context. The work reviews the various methodologies and approaches that can be applied and makes recommendations with respect to the existing framework in Northern Ireland.

- From a global perspective, countries such as Australia, Austria, Canada, France, Germany, Great Britain, Japan, Netherlands, the Northern Ireland region, Republic of Ireland, Spain, Sweden and the USA, expend considerable resources on manpower forecasting models.

- Skill shortages are important to policy makers as they can, potentially, be very detrimental to productivity growth, particularly when they occur in key sectors of the economy. Existing research confirms that such costs are likely to be significant and emphasizes the value of taking measures to prevent such problems occurring.

- In General, policy makers in developed economies rely on occupational forecasting models to predict the future direction of skills demand. The research concludes that such models have become increasingly accurate over time, however, it is stressed that for occupational forecasts to be of value, precision is less important than the ability of the data to be interpreted and made use of by a range of interest groups.

- Increasingly, the role of employers in skills research and training has been emphasized within many economies. Countries such as Germany and the Netherlands represent the gold standard in this sense, in that employers are heavily involved in the design of training and bear a proportion of its cost. The UK has moved towards a model of greater employer involvement with the establishment of the Sector Skills Councils (SSCs), however, whilst such initiatives are likely to be highly successful in harnessing the interests of employers, there appears no plans to date to move towards a more formalised system of employer contributions.

- The majority of countries appear to rely on multi-sectoral macroeconomic models of occupational forecasting to predict future skills demand. Whilst in some countries, such as Canada, Netherlands, ROI and the USA, the output of such models appear to be widely disseminated and used, they appear to be significantly under-utilised in countries such as France, Germany, Great Britain, Spain, Australia and Japan. There is little evidence to suggest, from an international context, that occupational forecasting models exert a large influence on public policy.

- In terms of the various methodologies that are available, a sectoral approach is concluded to be most beneficial and in this respect it would appear that NI is, to some extent, ahead of the game. Whilst the UK formally moved towards a sectoral approach to skills analysis with the process of establishing the SSCs beginning in 2002, sectoral skills studies have been conducted in NI since 1999.

- Whilst skills research in NI is well developed, there is still room for improvement and specifically, there is a need for a more formalised approach to be adopted when prioritising the contribution of the various sectors to the economy and thus, the potential costs that are likely to arise as a consequence of skill shortages. In terms of a framework for prioritisation of the sectors, we recommend an indicator based framework which will firstly, measure the significance of the sectors to the NI economy and secondly, identify the skill needs in each of the sectors.

1 INTRODUCTION

This report assesses current international practice in skills planning and forecasting. Amongst the issues considered here is the rationale behind skills forecasting studies and the extent to which they are a consequence of market failures, the methodologies they employ and the extent to which they are utilised by policy makers. The report will then go on to consider how the NI approach sits within the international context and propose some recommendations with respect to the most appropriate framework for skills planning policy within the region.

2 SETTING THE CONTEXT

It is now common practice for Governments and policy makers to try to predict how the demand for skilled labour is likely to change over time. The development of skills forecasting / projection models enables policy makers to institute changes within the education and training system within a timely fashion and therefore avoids a "fire-fighting" approach to training provision which could be a consequence of relying entirely on the wage rate as a signalling device for changing labour market conditions. Consequently, countries such as Australia, Austria, Canada, France, Germany, Great Britain, Japan, Netherlands, Northern Ireland, Republic of Ireland, Spain, Sweden and the USA expend considerable efforts and resources in forecasting changes in the composition of demand for skilled labour over time as a means of limiting the extent of skill shortages within the economy.

The rationale behind attempts to forecast skills arises from concerns about the potential costs to the economy associated with skill shortages. According to the GB 2001 Employer Skill Survey (ESS), skills related problems can arise because of skill shortages or skill gaps. Skill shortages refer to a straightforward labour market shortage i.e. where there are simply not enough individuals with the required skills within the economy, whereas skill gaps refer to deficiencies in the skill levels of the existing workforce. It should also be noted that skill shortages can also be defined in terms of both unfilled and hard-to-fill vacancies. The 2001 ESS study concluded that skill shortages were more commonly associated with skilled occupations with more substantial education and

training requirements, whilst according to the Reed Skills Index, occupations such as IT, engineering and accounting were particularly affected[1]. In terms of skills gaps, the ESS study found that these were more heavily related to Human Resource Management (HRM) practices such as a lack of staff training and poor labour retention. There is some debate as to what extent the different measurement approaches are a consequence of the same drivers and / or result in the same costs to the firm and macro economy more generally. Whilst Green et al (1998), and Haskel and Martin (2001) conclude that all measures are quite closely correlated, Haskel and Holt (1999), recommend caution when interpreting firms answers to survey questions on the consequence of skill problems.

Bearing such potential subjective bias in mind, McGuinness and Bonner (2002), in a study of the mechanical engineering sector, found that skills gaps and shortages have somewhat differing consequences in relation to firm level performance. In addition, McGuinness and Bennett (2006) in a study of service sector small to medium size enterprises (SME's) found little relationship with respect to the determinants of unfilled and hard-to-fill vacancies; in contrast Bennett and McGuinness (2005) found a high degree of consistency with respect to the drivers of these measures using data on a group of high-tech firms. Therefore, it is probably reasonable to conclude that, in terms of the impacts and determinants of the various measures of skill shortage, whilst they are generally well correlated, the strength of the relationship is likely to vary by sector.

[1] The index also carries out sub-regional analysis and its 2001 results report that NI and the RoI were two of the most severely affected regions in terms of skill shortages.

2.1 Why are skill shortages a problem?

Even given the above context, occupational skills forecasting models will only serve a useful purpose if a) skill shortages impose real costs on the economy and b) the market mechanism is an inadequate indicator of changing labour market conditions. Dealing firstly with the costs of skill shortages, there is now substantial literature in this area. From a theoretical perspective, we might expect that skill shortages might lead to a loss of competitiveness as wage rates are bid up within industries where skill problems exist. Productivity may also be impaired as firms may be forced to place lower skilled workers in skilled positions and / or if workers in the shortage area use their position to alter their terms and conditions in a way that is inefficient from a productivity perspective. Finegold and Soskice (1988), and Haskel and Holt (1999), take the analysis a step further by describing a scenario whereby skill shortages can lead to a low skill equilibrium within the economy. They describe a situation whereby firms react to skill shortages by investing in technologies that complement the low skilled element of the workforce resulting in an economy characterised by low wages and a low demand for high-skilled labour. As a consequence of the low demand for high wage / high skilled workers within the labour market, individuals will no longer invest in their own human capital thus perpetuating the low skilled equilibrium position. Moreover, Frogner (2002) contends that it is now generally accepted that skill shortages are important with respect to their impact on productivity, GDP growth and earnings, and cites descriptive evidence from the 2001 ESS to support this in terms of the productivity impact, however, the evidence with respect to earnings was more limited. A study by the National Institute of Economic

and Social Research (NIESR) (Daly et al, (1985), Mason et al, (1993)) reported that relative to German plants, output per worker in British firms was over 60 per cent lower with the authors arguing that this productivity gap was a consequence of lower skill levels. Furthermore, Haskel and Martin (1996), suggest that skill shortages reduced productivity growth in the UK by 0.4 per cent over the period 1983-1999, whilst the Leitch review (2005) concluded that the changing proportions of graduates and individuals with no qualifications within the working age population will increase annual productivity growth by 0.2 per cent per annum. In relation to productivity corollaries, Nickell and Nicolitsas (1997) estimate that a permanent rise of 10 per cent in the number of firms reporting skill shortages lowers investment proportionately, and R&D by a temporary 4 per cent. Finally, evidence from more sectorally specific studies include that of Bennett and McGuinness (2006) who report that, after controlling for the influence of selection bias, output per worker was lower in high-tech firms experiencing both hard-to-fill and unfilled vacancies.

2.2 Why might market failures occur in relation to skills provision?

The above evidence suggests that, on balance, it is reasonable to conclude that skill shortages can be potentially very costly to the economy by restricting productivity growth in key sectors. As a consequence, governments have generally reacted by instituting forecasting / projection models in order to provide a timely warning mechanism of future labour market shortfalls. The very fact that forecasting models are used suggests that policy makers must intervene in order to compensate for the market's failure to provide

workers with sufficient skill levels in the appropriate areas. Haskel and Holt (1999) point out that the idea of market under-provision of skills can be traced back to Pigou (1912) who argued that the additional transferable skills associated with training will raise the probability that a worker will be poached, thus reducing the likelihood that training will take place. At an individual level, under-investment may also take place due to perceived high training costs, coupled with uncertain returns (Booth and Snower, 1996). Finally, institutional factors may also prevent the labour market from clearing; for instance, centralized wage bargaining systems may be unable to take account of sectoral or regional based changes in demand, whilst information gaps may contribute to sluggish labour market mobility which can also lead to imbalances (Neugart and Schomann, 2002). Similarly, if students expectations with respect to the future returns associated with various paths of study turn out to be incorrect, this may also contribute to skill imbalances. Finally, if we accept, for any of the various reasons, that the market will fail to clear, another question arises with respect to the extent to which the wage mechanism is sufficient to provide an effective signal of changing labour market conditions. The evidence is somewhat mixed; Finegold and Soskice (1988) suggest that relative to other countries, individuals in Britain are less likely to increase training in reaction to a rise in labour price. However, Connolly (1996), using data from the National Child Development Survey (NCDS), suggests that the demand for training is responsive to changes in price.

In relation to firms, the evidence from skill survey work seems to suggest that additional training is just one of many strategies that firms are likely to react to when faced with a

rising wage rate. Notwithstanding all of the above, the principal problem with respect to the market mechanism arises from the often substantial training time-lag associated with producing skilled labour, implying that the market signal usually occurs too late to facilitate a timely policy response.

2.3 How useful are skills forecasting models likely to be?

The potential benefits of accurate labour market forecasts and labour market intelligence more generally, are many. From an individual perspective they will reduce the level of uncertainty associated with educational returns which might otherwise deter human capital investment, whilst from a firm perspective, they will enable companies to facilitate timely training initiatives that prevent labour market related bottlenecks occurring. Perhaps most importantly, they provide policy makers with the information necessary to initiate changes in the structure of post-compulsory education and training provision (PCET). Thus, substantial benefits can potentially accrue to individuals, firms and governments and as such, it can be argued that the provision of labour market information is a public good given the potential wide ranging societal benefits associated with them (Neugart and Schomann, 2002).

However, forecasting is a very uncertain activity and within the context of the labour market, it is particularly hazardous, and potential end users need to be realistic about its accuracy. Wilson, Woolard and Lee (2004) make a useful distinction between forecasts, projections and scenarios. They state that, a forecast is a **very precise prediction** of

certain events; a projection is a quantitative **assessment of what might occur**; whilst scenarios are a qualitative **assessment of what the future might look like**. The distinction between forecasts, projections and scenarios is often blurred and it is also the case that the desired outputs of any model will be utilised in different ways by policy makers, individuals and firms, for instance, policy makers may find scenarios a more useful approach as they can then develop a range of options in the circumstance of certain events occurring, whilst future university students might be more interested in identifying skills for which there is a rising demand. Therefore, it would seem that the question of accuracy in this context is less important than considering whether the framework is of use in terms of providing both the policy maker and the individual student (and indeed any other of the potential end users) with the broad indicators necessary for them to make their decisions. In reviewing data on labour market forecasting projection models over a 30 year period, Wilson, Woolard and Lee (2004) conclude that models are becoming increasingly accurate but that substantial margins of error remain, however, these are assessed to be no larger than in other types of forecasting. Moreover, the principal point is that for forecasts to be useful, they need not be extremely accurate but merely provide a good indication of the future direction of the demand for skilled labour.

3 WHAT IS THE ROLE OF EMPLOYERS IN SKILLS DEVELOPMENT?

It is becoming increasingly evident that employers must recognize that they too have a responsibility with regards to skills development. Many employers already invest heavily in training but governments in many countries are realizing the importance of employer's views when it comes to the design and delivery of training programmes. For example, in countries such as Japan, Germany and the Netherlands, employers have traditionally taken principal responsibility for training their staff. In Japan, employers provide extensive training to recent school leavers after hiring them, whilst in Germany, the "dual system" implies that training is provided and financed by both companies and the state. Finally, in the Netherlands, there is a strong tradition of employer and union involvement with the tripartite sectoral school system whereby employer involvement in training provision is incentivised in the form of significant tax advantages (Snug et. al, 2005). As pointed out by Stern, Bailey & Merritt (1996), these countries set the gold standard in terms of employer involvement in the training of young people and policymakers throughout the world are now attempting to emulate their examples. For example, in Australia, the establishment of 10 new Industry Skills Councils in 2003 has been described by the Department of Education, Science and Training as giving employers "a hotline to the vocational education and training (VET) system". Similarly, the Sector Councils in Canada give employers the opportunity to work with educators and trainers in order to make the Canadian learning system more responsive to the needs of the labour market. Within the UK, the process of establishing the 25 Sector Skill Councils (SSCs), which began in 2002, also provides employers greater opportunities to express the skills

and productivity needs of greatest importance in their specific sector. However, whilst these initiatives are likely to be successful in harnessing the involvement of employers in training, there is no evidence of any movement towards a system whereby employers will contribute to the cost of training. On the other hand, it is always going to prove difficult to make employers pay as it is not always evident that they recognize that they have a responsibility in this respect. The argument that employers may be reluctant to provide sufficient training for their staff in fear of employees being poached stems back almost 100 years (Pigou, 1912) and it was this train of thought that brought about the Industrial Training Boards in the 1960s whereby firms paid a training levy to the industry boards in return for grants. In general the levy system does appear to have encouraged employers to engage in more training; however the effects differ between countries and sectors (SSDA, 2005). What is a certainty however is that employers will only engage in training when the benefits to the firm are clear. Nevertheless, in more and more countries, employers are adopting an increasingly active role in the area of skills development.

4 APPROACHES TO SKILLS FORECASTING

The standard approach to skills forecasting is to utilise macroeconomic models which decompose activity in terms of standard industries in order to forecast the change in the relative employment share of the various sectors and the changing employment share of occupations within each sector. This approach thus generates forecasts of the changing demand for various occupations within the aggregate economy. Whilst the underlying macroeconomic model is typically complex, the occupational forecasts are generally derived by extrapolating historical occupational trends by industry, thus the determinants of occupational change are not modelled explicitly. Therefore, for the standard approach to be adopted, it is necessary that a reliable macroeconomic model exists and that there is detailed historical data on occupational trends by industry; these requirements often make it difficult to engage in occupational forecasting for regions as notwithstanding the potential absence of regional macroeconomic models, it is often very difficult to get reliable historical data on occupation by industry for smaller geographical units. The occupational forecasts are used as a proxy for skills on the grounds that occupational classification systems are usually defined in terms of their skill content, however, an obvious flaw within this approach is that it takes no account of the changing skill levels that take place within occupations over time. For instance, Green et al (1998) and Felstead et al (1998) estimate that 50 per cent of the rise in skill requirements between 1986 and 1997 were due to upgrading within occupations. Moreover, it is unlikely to be able to capture any rapid change in the demand for various occupations. The analysis can then be further extended to the demand for qualifications by considering the educational

make-up of the various occupational groupings that have been forecast. However, the wisdom of such an extension is somewhat questionable. It could be argued that such an analysis necessarily assumes that the labour market is in complete equilibrium and ignores the fact that the rising educational content of many occupations may merely reflect a supply side surplus or deficient demand, in other words ignoring the well documented problem of overeducation[2]. Nor do occupational forecasts provide an indication of the level of skill shortages within the economy since unfilled or hard-to-fill vacancies are not considered.

Thus the standard forecasting approach can be criticised on the grounds that it is highly mechanistic and cannot adequately take account of rapidly changing skill demands in occupations and the fact that supply side imbalances might be distorting the true demand for various qualifications. Wilson, Woolard and Lee (2004) carried out an assessment of alternative approaches to projecting skills demand which include employer surveys, sectoral studies and qualitative methods. They argue that employer studies seem the most natural approach to investigating the issue of skill deficiencies and anticipated future change. The obvious advantage of the technique is that it can more readily encompass changing occupational or qualifications demand than the more mechanical approach, also, it enables the collection of information on skill shortages and skill deficiencies. The potential drawbacks of the approach, however, are that it may be prone to subjective bias in that the employers may feel that it is in their interest to exaggerate their demand for skilled labour and / or the extent to which they are experiencing skill shortages. In

[2] In relation to the Northern Ireland labour market, the issue has been examined by McGuinness & Bennett, (forthcoming); McGuinness (forthcoming); McGuinness (2003).

addition, if the approach is designed to cover the entire economy, then a general occupational classification framework must again be adopted. Sectoral studies involve both quantitative and qualitative methodologies and actors in order to form a view of key skill issues within the sector. Wilson, Woolard and Lee (2004) point out that in recent years such studies have also tended to have a strong geographical focus (such has been the case in Northern Ireland). The obvious advantage to the sectoral based analysis over and above that of the more general employer based surveys is that the occupational and educational groupings considered can be specified directly in terms of the exact industry skill requirements. Finally, qualitative methods involve attempting to reach an assessment of skill needs through in-depth interviews with key stakeholders such as policy makers, and of course, employers. Wilson, Woolard and Lee (2004) conclude that where the data permits, standard occupational forecasts should be produced regularly, complemented by the more qualitative approaches, to produce a more rounded and enriched view of changing skill needs. From a UK policy based perspective and in particular, the establishment of the 25 SSCs, it would appear that the sectoral approach to skill assessments and forecasting is likely to become increasingly popular. Again, given the data constraints and the likelihood that the analysis will be conducted at a regional level, one would assume that the standard macro model based approach would be unsuitable as, even if the requisite SIC/SOC historical cross tabulated data were available, the occupational classification system may not be adequate to reflect the skill composition of the various industries. For instance, within the IT sector, the framework is not sufficiently flexible to disaggregate employment into occupational aggregates important within the sector such as project managers, graduates with technical experience

operating below project manager, new graduates, HNC qualified technical support, NVQ level 3 qualified technical support etc.

4.1 Country Profiles

As we know, it is now common practice in a number of countries to try to predict how the demand for skilled labour is likely to change over time. In this section, we will present an overview of the forecasting methodologies employed in different countries with a view to identifying the scope and coverage of the projections e.g. sectors, occupations or qualifications; the specific methodological approach adopted, data sources and implementation. The countries most commonly associated with labour market forecasting are Australia, Austria, Canada, France, Germany, Great Britain, Japan, Netherlands, the Northern Ireland region, Republic of Ireland, Spain, Sweden and the USA. To a lesser extent, Cyprus and South Africa also make use of skills forecasting models.

The majority of countries (Australia, Austria, Canada, France, Great Britain, Japan, Republic of Ireland, USA) generate their forecasts using a multi-sectoral macroeconomic model over a time horizon of between five and ten years with updates usually every 2-5 years. Almost half the countries we examined use both official data sources i.e. census and labour force data as well as, for example, data from national accounts, social security records and companies' databases. Sweden is the only country that appears to base their forecasts only on data collected from questionnaires. Only Japan, Great Britain and the

Northern Ireland region appear to combine the use of official data sources with industrial data derived from establishment (or employer) based surveys. Barnow (2002) demonstrates how this additional source of data can be applied to enrich forecasts whilst Wilson, Woolard and Lee (2004) also note that employer surveys, when used as complementary to quantitative employment projections, enable a richer and subtler picture of changing employment patterns to be produced. In several countries, the forecasts are carried out by an independent research institute and the Ministry of Labour (or equivalent body) provides the funding. However, in a number of countries (Canada, Cyprus, France, Japan, Spain, Sweden and the USA) the main forecasts are carried out by an internal department / research institute within the ministry. However, it should also be noted that in several of these countries, the ministry forecasts are conducted in tandem with those from independent research institutes.

In Canada, Netherlands, the Northern Ireland region, Republic of Ireland and the USA, the forecasts appear to be more widely disseminated and are used not only by government officials but also career counsellors, firms and individuals. In contrast to this, in much of Europe (France, Germany, Great Britain and Spain), Australia and Japan, the forecasts are less widely disseminated and appear to be limited to government officials, expert groups, specialized committees or social partners. Neugart and Schomann (2002) believe that this is due to a number of reasons, namely the scarce availability of online facilities; delays in providing printed material to the public and a general lack of effort to provide individuals with this much sought after information. The other countries examined, (Austria, Cyprus, Sweden and South Africa), appear to have, to date, no major users of

their forecast results[3]. This is particularly strange for Austria and Sweden as researchers in these countries have been conducting forecasts for many years.

Neugart and Schomann (2002) have stated that in Canada, Great Britain and the USA, responsibility for implementation is at the regional level. However, in Great Britain at least, this assertion seems questionable as we have found limited evidence of any systematic regionally based policy responses within the English regions, Scotland or Wales to the findings of any occupational forecasting model. In Canada, (as in the USA) projections are produced at a regional level, however while implementation is essentially a regional responsibility, the regional and national forecasts are compared systematically in order to identify any region specific imbalances. In Germany and France, however, there are no links for the use of regional and national forecasts and implementation differs across all regions depending on the decisions of the regional committees. Nevertheless, the discussions and subsequent decisions of these committees are based on the national, and in some cases, additional regional forecasts (Neugart and Schomann, 2002). In Japan, Netherlands, Republic of Ireland and Spain, implementation is a national concern with many also involving the social partners at an early stage. The Republic of Ireland appears to be the only country to produce forecasts that differentiate between men and women. Somewhat unsurprisingly though, despite all of the above evidence relating to the extent to which governments and other interest bodies analyse and disseminate the data, there is little or no evidence of labour market policies being modified in response to the discovery of any imbalances or the extent to which this varies across countries. Thus, to a large extent, the actual policy impact of labour market

[3] It is probably too early to assess the situation with respect to Cyprus and South Africa.

forecasting models remains unknown. See **Table 1** for summary information on the utilisation of forecasting data at a country level.

Table 1: Country Profiles – An Overview of the Forecasts

	Australia	Austria	Canada	Cyprus	France
Data sources utilized	Census and a large number of sample surveys conducted by the Australian Bureau of Statistics	Census, socio-economic database, national accounts, companies databases, micro-data from unemployment insurance and social security systems	National census data, monthly labour force survey	Census of the Cyprus Statistical Service (conducted every 5 years) and, the labour force survey	Census; Labour force survey; national accounts. In addition, employment surveys and the Vocational Training Qualification Survey; annual and compulsory surveys on continuing vocational training in companies; and irregular surveys of companies
Who does the forecast?	Centre of Policy Studies at Monash University (CoPS)	Austrian Academy of Science, the Austrian Institute for Economic Research (WIFO) and the Institute for Advanced Studies (HIS) – all independent academic research institutes	Human Resource Development Canada (HRDC). Independent research institutes also produce both federal forecasts and regional and sectoral forecasts	The Human Resource Development Authority - mainly based on the methodologies of those developed in the UK and Ireland	Statistical and Economic Research Department of the Ministry of Employment and Solidarity. At the national level, the Institute of Economic Forecasting (BIPE) carries out forecasting of occupational employment for the Ministry of Education. Forecasts at a local level fall to the Regional Employment and Training Observatories (OREF)
Who pays for the forecast?	Among the subscribers are the Australian National Training Authority (ANTA) and the 5 state training authorities	The former Ministry for Science and Research and the Austrian Labour Market Service (ALMS)	Labour Ministry (HRDC)	Human Resource Development Authority of Cyprus	Ministry of Employment in internal research service department
Who uses the forecast?	The Australian National Training Authority (ANTA) and the 5 state training authorities	Quite a low demand for formal forecasting results	Federal government for training programmes; sector councils to assess training needs, develop the syllabus and occupational standards, and to evaluate the effectiveness of training efforts; career counselors (CD-ROMs are distributed to schools) and individuals	Unknown	State and regional government, social partners and specialized committees
Implementation	Unknown	Only weak implementation of results	The Federal and Provincial Labour Ministries and Ministries of Education	Unknown	National Ministry of Education and regional governments in charge of further training policies
Policy Impact	Unknown	Unknown	Unknown	Unknown	Unknown

	Germany	Great Britain	Japan	Netherlands	Northern Ireland
Data sources utilized	Labour force survey, National census, Microcensus, Additional data by the Federal Office of Statistics, Data on national accounting, expert interviews, social security records	Census, labour force survey, establishment-based surveys. Employer skill survey (ESS)	Census, basic survey of employment structure	Labour force survey (EBB). Data from Statistics Netherlands and follow-up surveys of school leavers conducted by ROA. Registered data or surveys on unemployment	Labour force survey, IDBR, employer surveys, training data.
Who does the forecast?	Mainly the Institute for Labour Market and Vocational Research (IAB), but also, the Federal Institute of Employment and the Federal Institute for Vocational Training (BiBB)	The Institute for Employment Research (IER) – an independent research institute	Ministry of Labour (MOL), Research Committee of Employment Policy	Research Centre for Education and the Labour Market in Maastricht University (ROA) – an independent research centre	Priority Skills Unit (PSU) at the Economic Research Institute of Northern Ireland – an independent research institute
Who pays for the forecast?	Federal and regional governments	Department for Education and Skills (DfES) (and its predecessor the Department for Education and Employment (DfEE))	Ministry of Labour	Ministries of Research, Labour and Agriculture; Central Employment Board; LDC Expertise Centre for Career Issues	Department for Employment and Learning
Who uses the forecast?	Federal and regional governments	Government bodies, training and enterprise councils (TECs), local authorities	Used widely by government and in tripartite situations involving social partners. They are used as a major resource for the discussion of employment measures	Ministries of Research, Labour and Agriculture; individuals for educational choices; firms to forecast supply shortages; employment offices	Department for Employment and Learning; Sector Skills Councils, NI Expert Group on Skills, Career counselors.
Implementation	Differs between regions; no apparent link for use of regional and national forecasts	Department for Education and Skills delegates responsibility to profit making local partners that receive public funding	Government, social partners	Ministries with involvement of social partners	
Policy Impact	Unknown	Unknown but presumably the data is used by SSCs to influence policy	Unknown	Unknown	Through SSCs and Expert Group on Skills (NI)

	Republic of Ireland	South Africa	Spain	Sweden	USA
Data sources utilized	Census of Population, Labour force survey, (now referred to as quarterly national household survey)	Employer surveys, Manpower Survey, Labour force survey	Labour force survey, national accounts. Institutional INEM data on employment, unemployment benefits, administration of active employment policies, occupational training etc.	Data collected from questionnaires	Census Bureau of Population, Labour force data and employment statistics
Who does the forecast?	Economic and Social Research Institute (ESRI) – an independent research institute	Human Sciences Research Council (HSRC), Bureau of Market Research (BMR), Individual sector studies by the Sector Education and Training Authority's (SETAs)	The National's Institute of Employment (INEM) Occupational Observatory, National Institute of Qualifications Observatory	Mainly, Statistics Sweden (SCB) and the National Labour Market Administration (AMV). Country labour boards and the local employment services carry out the short-term forecasts regularly. Other forecasters are, the National Agency for Education and the Swedish Business Development Agency.	The Bureau of Labour Statistics (BLS)
Who pays for the forecast?	National Training and Employment Authority (FAS)	Previously, the EU, the Department of Labour, Department of Trade and Industry	Foundation, and a regional government in case of regional forecasts	Unknown	Ministry of Labour
Who uses the forecast?	Government and state agencies for planning employment and education policies; guidance for science, technology and innovation policies; firms and trade unions, career counselors and individuals	To date, no "official" forecasts have been produced for use. Much of the work to date has just demonstrated the feasibility of carrying out such work in South Africa	Only Expert groups to date	Short-term forecast findings are published in a report series called "where is the jobs"	Government agencies concerned with training, education and immigration policies. Career counselors, individuals and firms
Implementation	Department of Enterprise, Trade and Employment; Department of Education and Science; social partners are also represented on the board of FAS	None	Mostly through national training institutes and local governments	Unknown	Governments at the state level have responsibility as every state is required to produce state employment projections
Policy Impact	Through the Expert Group on Skills and FAS.	Unknown	Unknown	Unknown	Unknown

5 THE NORTHERN IRELAND APPROACH TO SKILLS RESEARCH AND DEVELOPMENT

Turning to Northern Ireland, the Department for Employment and Learning has expended substantial resources on the area of skills research since 1999 with the establishment of the Priority Skills Unit (PSU) at the Northern Ireland Economic Research Centre (NIERC)[4] and the launch of the NI Skills Monitoring Survey (SMS) in 2000. In relation to skills forecasting, the methodology adopted is based around a sectoral approach and incorporates employer survey information and, where possible, time series models to project future labour market trends under a range of scenarios. Whilst researchers did have access to a reliable macro-economic model[5], due to substantial sampling problems associated with the NI labour force survey (LFS), it became very quickly apparent that there was a lack of reliable time-series data on occupations by industry. Moreover, it was generally accepted that costly productivity constraints arising as a result of skill shortages were not evenly spread across the economy as they were more likely to occur within certain industries, thus pointing to the need for a more sectorally specific approach. The adoption of sectoral studies had the obvious advantage in that they would overcome many of the problems associated with the standard macro based approach in that the use of employer surveys would ensure that changing skill levels within occupations and / or rapidly changing demand for various occupations could be more readily picked up. Also, rather than having to adopt the generic SOC based approach to defining skills, and the associated problems with extending this to the demand for qualifications, conducting sectoral studies within the context of a detailed employer survey meant that the

[4] This became the Economic Research Institute of Northern Ireland in 2004.
[5] The NIERC Oxford Economic Forecasting (OEF) model was available at the launch of the PSU research programme in 1999.

occupational and qualification framework could be tailored to the industry concerned. The approach generated high, medium and low growth projection scenarios in order to assess the adequacy of educational provision to the sectors under examination within a range of outcomes. The various growth scenarios considered under the NI approach were developed by altering the assumptions underpinning a model based on employer expectations, in addition, where possible, causal time series models are also incorporated into the scenario based framework; these models endeavour to explain and predict sectoral growth in terms of a number of key variables as opposed to the macro based approach which is usually based on simply extrapolating historical trends (see NIERC 2001; 2002; 2003; and ERINI 2005). Finally, as recommended by a number of authors, the NI approach complements its projection models with detailed survey information on a number of key indicators such as unfilled / hard-to-fill vacancies and their perceived drivers / consequences, occupational wage rates, inter-firm poaching, training etc which are ultimately incorporated into econometric models which attempt to explain the incidence and consequences of skill shortages thus giving a more complete picture of labour market conditions.

In addition to having a number of clear advantages from a methodological perspective, the sectoral approach to skills research has become increasingly relevant within the context of UK policy generally given the establishment of the SSC's. The SSC's were established in 2002 as independent, UK wide organisations related to sectors of economic or strategic significance. Each SSC is employer-led and actively involves trade unions, professional bodies and other stakeholders in the sector. Together the SSC's cover

approximately 85 per cent of the UK workforce. Each SSC provides employers with a unique opportunity to express the different skills and productivity needs important in their specific sector thereby, indirectly, giving employers greater dialogue with government and thus greater impact on policies affecting skills and productivity; increased influence with education and training partners and also, substantial public investment.

The four key goals of each SSC are:

- Reducing skill gaps and shortages
- Improving productivity, business and public service performance
- Increasing opportunities to boost the skills and productivity of everyone in the sectors workforce, including action on equal opportunities.
- Improving learning supply, including apprenticeships, higher education and national occupational standards.

The Sector Skills Development Agency (SSDA) is a non-departmental public body responsible for funding, supporting and monitoring the network of the SSC's. Their responsibilities include: ensuring skills provision is designed to meet sector needs; ensuring generic skills are effectively covered in the work of the SSC's; and collecting high quality labour market intelligence and making sure this is available. The SSCs and the SSDA are part of the Skills for Business (SfB) Network which is ultimately responsible for improving skills and productivity within the UK. Thus, from a general

policy perspective it is clear that the sectoral approach adopted in NI is entirely consistent with the general national approach and, indeed in many respects, it pre-dated it.

However, due to the fact that the NI approach preceded the SSC's the sectors examined did not follow the SSC framework, moreover, it could be argued that the process by which sectors were selected for examination was somewhat ad-hoc in nature and lacked any clear criteria. Under previous arrangements a Skills Task Force took a decision with respect to the sectors that constituted a priority skill area and whilst in most cases, such as with IT, Electronics, Mechanical Engineering and Construction, the sectors chosen for examination were beyond dispute in terms of their strategic importance to the economy as defined by their high-skill, high value added content, in other instances, such as the decision to examine the Hotel and Catering sector, the rationale behind the selection was less clear. Given that arrangements are currently underway to reconstitute the NI Skills Task Force under the aegis of the NI Skills Expert Group (NISEG), it would seem an opportune time to develop a clear criteria that will enable the body to make appropriate and informed decisions on those sectors that are considered a significant priority from a skills perspective in NI.

5.1 Further refining the NI approach

The Economic Vision for NI (published in 2005) identifies, in relation to long term economic objectives, the need to enhance productivity and competitiveness, increase skill levels and improve participation in education and training. It is widely recognised that

key to the economic well being of the economy is the need to ensure that individuals have the right skills to meet future employment opportunities. The recently published Skills Strategy for Northern Ireland (DEL, 2006) puts in place a plan of action aimed at enhancing the skills base in Northern Ireland and to ensure that education and training providers are focused very much on meeting skill demands. This indicates a strong commitment on the part of government to enhance the skill levels of the workforce through a range of actions including the development of a successful SfB network in NI. However there is also recognition that Northern Ireland is a relatively small regional economy (with an estimated 737,000 persons of working age in employment) and that there are constraints on the resources available to deliver policy goals. For these reasons, the identification of priority skill areas in Northern Ireland is an important step so that resources can be deployed most effectively. To help inform these decisions, the NISEG was established by the Department for Employment and Learning (DEL). Its responsibilities include the identification of emerging skill needs and advising government on projected requirements and potential training strategies. However decisions on which areas are of priority cannot be taken lightly and it is of utmost importance that the NISEG is able to identify, with accuracy, the priority skill areas for NI.

In order to provide a meaningful framework for identifying the priority skill sectors, it is useful to think in terms of the indicators that are available and what they might proxy. However, we must also be mindful of the fact that the approach will be heavily dependent

upon the availability of data and will necessarily imply a high level of co-operation from government departments and data providers.

A potential approach is to set our framework within the context of general UK government policy, and more specifically, the five drivers of productivity performance i.e. skills, innovation, investment, competitive environment and enterprise. However, a further regional refinement is possible by adopting the four NI specific productivity drivers of innovation, enterprise, skills and infrastructure developed by the Economic Development Forum (EDF) in 2004 in its Economic Vision for NI. There is widespread recognition that improving the skill levels of the workforce is key to achieving this vision and that there are strong interdependencies between the skills driver and the other drivers of productivity. However, although our aim is to identify the priority sectors in terms of skill needs, it is also important to identify those sectors which will have the greatest potential impact on the economic wellbeing of NI. Thus it makes sense that those sectors of greatest economic significance, for example, those that continue to attract high volumes of FDI, display the greatest exporting potential and those that continue to be the main accelerators behind the growth of the NI economy as a whole, are more likely to be a priority for any skills investment strategies. In this context, we propose a framework that will firstly, measure the significance of sectors to the NI economy and secondly, identify the skill needs in each of those sectors. It is envisaged that a number of indicators will be available to measure both significance and skill needs, with each indicator linked to one of the four NI specific drivers of productivity performance. The indicators will each be assigned a weight in terms of their relative importance although

there will be need to test any emerging results in terms of their sensitivity to the weights applied. The analysis will rely on historical data only to ensure the accuracy of the indicators. It is proposed that the following indicators are included under the individual sub headings:

Measures of Significance

- Total Employment Size
- Job Creation / Loss
- R&D Expenditure per Employee in Employment.
- Proportion of NI Businesses that are Product and Process Innovators
- Export revenue per Employee in Employment
- Export Growth
- GVA per Employee in Employment
- Growth in GVA per Employee in Employment
- Number of VAT Registrations expressed as a Proportion of the Stock of Existing Businesses
- Count of Foreign Owned Businesses expressed as a Proportion of the Total Stock of Businesses

Measures of Skill Needs

- Evidence of skill shortages – measured by 'external skill shortage' vacancies
    - % of Establishments
    - % of All Vacancies

- Evidence of Skill Gaps – employer's perceptions of the level of deficiency in the skill levels of their existing staff
    - % of Establishments
    - % of Employment

5.1.1 Measures of Significance

The level and growth of employment will clearly be important factors in terms of the extent to which a sector is likely to constitute a priority area. Obviously, employment size will reflect the critical mass of the sector in terms of its overall contribution to employment within the local economy, whilst the growth, in terms of both its level and direction provides a key indication of the extent to which the sector is expanding or contracting. It is envisaged that the securing of such data at the required level will necessitate the cooperation of the Department of Enterprise, Trade and Industry (DETI).

Promoting innovation and R&D are crucial to the success of any economy. Innovation related variables will give a key indication of the level of sophistication involved within the sector's activities and therefore, the extent to which skilled labour is required in order to both facilitate innovation and more general high-tech production operations. The two innovation related indicators - R&D expenditure per employee in employment and, the proportion of NI businesses that are product and process innovators will include data on R&D expenditure by 2-digit SIC drawn from the Business Expenditure on R&D Survey (BERD) and information on product and process innovation drawn from the Community

Innovation Survey (CIS). We are also investigating the possibility and potential merits of including the growth in R&D expenditure per employee as an indicator.

In the context of the Economic Vision for NI, enterprise is about improving competitiveness and achieving high-value added thus it is important to incorporate indicators which measure both competitiveness and entrepreneurship. Obviously firms that depend heavily on the domestic market will be much more constrained in terms of their growth potential as opposed to those firms and sectors with a greater capacity to compete within a more global environment. It is also widely accepted within the literature on export-led growth that exporting is a key determinant of productivity growth within the economy, thus, given that a central remit of the NISEG is to ensure that productivity performance within the economy is not constrained as a result of skill shortages, it stands to reason that those industries with more export potential should be given a higher priority. It is hoped that the data can be provided from the Manufacturing Sales and Exports Survey conducted by DETI. Another key indicator of competitive environment will come in the form of GVA per employee which will provide a very useful proxy for the level of sophistication of firm's activities and thereby their likely demand for high skilled labour.

It is also important that we take account of the contribution of small firms to the economy, for instance, Bonner and McGuinness (2005) indicate that SME's make up over a third of NI manufacturing employment, which is a share higher than that of any other UK region. To ensure that the needs of the SME component within the economy

are taken into account, we propose that data on the level of VAT registrations (expressed as a percentage of the total stock of businesses) is also included within our analysis. The number of VAT registrations is the best official guide to the pattern of business start-ups in each industry and will therefore act as a good indicator of the level of entrepreneurship and the health of business in that particular sector. The data on VAT registrations is widely available and produced by DETI.

Finally, FDI activity also represents a very significant component of overall employment within the economy and given that a key determinant of FDI itself is the availability of high skilled labour, it stands to reason that the higher the level of FDI potential, the greater the potential return to any increase in the level of labour market or skills investment. Data on FDI employment by 2-digit industry was not available and so we constructed an indicator which measures the number of foreign owned businesses in each sector as a percentage of the total stock of businesses. We are also looking at the possibility of a weighting scheme for FDI which incorporates growth in the global pattern of FDI by industry.

5.1.2 Measures of Skill Needs

A sector will clearly have higher priority if there are grounds for believing that skill shortages or problems already exist in that area. We propose to measure skill shortages in terms of 'external skill shortage' vacancies whereby employers attribute their recruitment problems to a lack of relevant skills amongst applicants. It is envisaged that

information on skill shortages can be obtained through existing and emerging survey data such as the NI Skills Monitoring Survey (SMS). In addition to information on skill shortages, this study will also investigate using an indicator which measures skill gaps in the current workforce in order to identify future performance improvement opportunities. Skills gaps exist where there is a gap between an employee's current skill level and the skill level required by the organisation to meet work objectives. This information can be obtained from the NI SMS.

In relation to equality issues, although data relating to equality of opportunity can not be explicitly incorporated within a skills assessment framework based on economic significance on the one hand and skills needs on the other, the NISEG should examine outcomes against Section 75 of the 1998 Northern Ireland Act to ensure that any policy response recognises the existence of any adverse impacts and takes mitigating actions where appropriate.

5.2 Weighting Strategy

Assuming that the above criteria are acceptable, agreement must be reached on an adequate weighting strategy that properly reflects the importance of each of the indicators considered above. There will be two sets of weights to decide upon – one set for those indicators measuring the significance of the sectors to the NI economy and one for those indicators which will help determine the sectors skill needs. A view must be taken with respect to the relative importance of the indicators to any skills strategy; nevertheless, one

might assume that, for example, FDI and export potential might carry a somewhat higher rating than innovation and enterprise given the rationale laid out above. Therefore, one might imagine that a potential weighting strategy could take the following form:

Measures of Significance

- Total Employment Size 12 %
- Job Creation / Loss 12 %
- R&D Expenditure per Employee in Employment 5.5 %
- Proportion of NI Businesses that are Product and Process Innovators 5.5 %
- Export Revenue per Employee in Employment 12 %
- Export Growth 12 %
- GVA per Employee in Employment 12 %
- Growth in GVA per Employee in Employment 12 %
- Number of VAT registrations expressed as a proportion of the stock of existing businesses 5 %
- Count of Foreign Owned Businesses expressed as a Percentage of the Total Stock of Businesses 12 %

Measures of Skill Needs

- Evidence of skill shortages 50 %
    - % of Establishments (25 %)
    - % of All Vacancies (25 %)
- Evidence of Skill Gaps 50 %

- % of Establishments (25 %)
- % of Employment (25 %)

It is envisaged that these weights will be applied to each of the sectors under each of the headings. At the end of this process, each sector will have been allocated two total weighted scores one which will reflect their economic significance and one which reflects skill needs. It will be possible to rank each sector according to those scores and provide recommendations as to which sectors could be deemed as higher priority. It is important to note that the above weightings are merely suggestive and further work is necessary to assess the extent to which the framework is likely to be sensitive to any altering of the weights.

6 SUMMARY AND CONCLUSIONS

This report provides a contextual background to skills forecasting research. The evidence seems to suggest that skill shortages and gaps impose real costs on the economy and that there are real benefits to be gained from using occupational forecasting models to attempt to predict changes in the nature of demand and therefore, the skills most likely to be in shortage. The standard approach based around macro-economic modelling, whilst providing a good proxy for the general demand movements within the economy as a whole, is much less informative for key sectors of the economy as

a) the methodology is mechanical in nature and therefore unlikely to pick up sharp swings in demand that typify high growth industries;

b) such models tell us nothing of the nature of unfilled vacancies that are occurring in the industry; and

c) the occupational classification system used tends to be highly generic and therefore, tends not to reflect accurately key occupations and qualifications within the industry.

Given that some industries will be more prone to skill shortages than others, and that the productivity cost of labour market imbalances will be much greater in some sectors than in others, it is concluded that a sectoral approach to skills analysis is much more informative and strategically useful than the more standard macro-based approach. Sectoral studies, when based around unique survey information overcome all of the difficulties previously mentioned, however, when they are based around employer expectations they may be subject to some subjective bias, nevertheless, this problem can

be overcome by developing different projection scenarios and therefore assessing the adequacy of the supply-side over a range of outcomes. From an international perspective, most countries appear to have adopted the more standard approach. However within the UK a more sectorally based focus has emerged with the establishment of the 25 SSCs, and within this context, the NI approach of sector specific projection models coupled with detailed survey information on industry labour market conditions appears very much in keeping with the general thrust of UK government policy on skills. Nevertheless, it is concluded that there is scope for some significant improvements in the NI approach and specifically it is recommended that a more transparent, indicator-based framework be adopted with respect to prioritising those sectors where the occurrence of skill shortages will impose significant costs on the economy and a suggested framework linked to the four drivers of productivity is outlined.

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