University of Strathclyde

Hunter Centre for Entrepreneurship

Skills for Growth: Understanding Skills Supply and Demand in the Scottish Economy

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A Thesis presented in partial fulfilment of the requirement for the degree of Doctor of Philosophy

30 September 2021

Declaration of Authenticity and Author's Rights

This thesis is the result of the author's original research. It has been composed by the author and has not been previously submitted for examination that has led to the award of a degree.

Signed:

Date: 30th September 2021

Acknowledgements

The research presented in this thesis has been co-funded by the Scottish Government and the UK Economic and Social Research Council (Project No. 45755147) and I am grateful to them for supporting it.

There are many people who have helped with this project along the way, and I'd like to offer all of them my sincere gratitude. My family and friends have been both a source of enormous support, and (when needed) a very welcome distraction from university life. I'd like to thank my parents, Margaret and Derek, especially, for a lifetime of guidance and encouragement – they have been as supportive of this endeavour as they have been of everything else I've ever tried to do. I'd also like to acknowledge those who I have studied alongside and worked with at the Hunter Centre over the years, from my fellow PhD researchers, to the administrative and professional services staff, to the academic faculty. They have all made this process much more enjoyable and I am lucky to count them as friends and not just colleagues. My thanks must also go to the examination committee, who have helped to shape this thesis into a much stronger piece of work.

Lastly, my Supervisory team have been excellent from "Day One", and I cannot speak highly enough of them. I'd like to thank Professor Jonathan Levie for his help in the early stages of this project. Dr Samuel Mwaura has been an incredible support, even before he stepped into the role of Supervisor. Sam guided me through the technical aspects involved in undertaking rigorous research, has always answered my many questions with supreme patience, and helped me to get back on track when I very much needed it. Most of all, my profound thanks go to Professor Niall MacKenzie, whose many years of academic, professional, and personal advice, guidance, and wisdom have been invaluable. Niall initiated this research project and persuaded the funders of its potential. He has been immensely generous with his time, having long ago left Strathclyde, and has shown me far more support and kindness than I have deserved. I'd never have gotten close to submitting this thesis without him.

Abstract

The research aim of this project is to investigate the distribution, severity, and determinants of regional skills mismatch in Scotland, with additional focus on the ability of employers to combat any deficiencies. The narrative of widespread and persistent imbalances in skills supply and demand is a common feature of the Scottish political and industry landscape. Evidence and anecdote point towards deficiencies at the sectoral, firm and job-role level, with presumed knock-on effects hampering firm and aggregate productivity growth. Nonetheless, further scrutiny reveals a host of substantial conceptual, methodological, and empirical weaknesses with prior skills deficiency research, and a holistic, in-depth focus on the Scottish context, with its varied/unique spatial-economic composition, is lacking. To shed light on these issues, this thesis adopts a mixed-methods research approach, incorporating both probit and logistic regression analyses as well as semi-structured interviews with employers, industry-representative bodies and policy makers.

Research findings suggest that: (1) little geographic influence can be detected at the statistical level despite the protestations of employers to the contrary; (2) sectoral variation exists, although not all knowledge-intensive sectors suffer equally; (3) there remains substantial confusion among employers as to what precisely is meant by the terms “skill shortages” and “skill gaps”; (4) what many employers mean by “skill shortages” could often be described as generic labour shortages; (5) besides technical skill deficiencies, the problem frequently manifests in what are commonly denoted as “soft” skills or “core” skills; (6) employers’ expectations of the skill levels of new employees, particularly young employees, varies drastically; (7) successful Scottish firms, even internationally successful Scottish firms, still manage to operate in sectors or industries where skill problems have been self-reported by employers; (8) these firms have first-hand experience of skill deficiencies, but place a lot of focus on training and robust internal HR, skills retention and skills diffusion procedures; (9) firms have been reluctant to raise wages and salaries to combat skill shortages. This thesis contributes to the literature by outlining conceptual and methodological weaknesses with much of the existing (influential) research, by exploring the Scottish context in greater detail, and by exploring the phenomena of skill deficiencies at the regional (in-country) level.

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List of Abbreviations

APS	Annual Population Survey
ASHE	Annual Survey of Hours and Earnings
CBI	Confederation of British Industry
CfE	Curriculum for Excellence
CPPs	Community Planning Partnerships
DfE	Department for Education
ESRC	Economic and Social Research Council
ESS	Employer Skills Survey
FISSS	Federation of Industry Sector Skills & Standards
FSB	Federation of Small Businesses
GIRFEC	Getting it Right for Every Child
G(L)A	Graduate (Level) Apprenticeships
HC(T)	Human Capital Theory
HIE	Highlands and Islands Enterprise
HRM	Human Resource Management
HTFVs	Hard-to-fill vacancies
ILO	International Labour Organisation
KBV	Knowledge-based View
KM	Knowledge Management
KSAO	Knowledge, Skills, Abilities, Other Characteristics
LA	Local Authority/Authorities
LFS	Labour Force Survey
MA	Modern Apprenticeships
MAC	Migration Advisory Committee
NFER	National Foundation for Educational Research
OECD	Organisation for Economic Cooperation and Development
PIAAC	Programme for International Assessment of Adult Competencies
PISA	Programme for International Student Assessment
RBV	Resource-based View
ROA	Regional Outcome Agreements
SCDI	Scottish Council for Development and Industry
SCQF(P)	Scottish Credit and Qualifications Framework (Partnership)
SDI	Scottish Development International
SDS	Skills Development Scotland
SE	Scottish Enterprise
SFC	Scottish Funding Council
SSVs	Skills shortage vacancies
SQA	Scottish Qualifications Authority
STEM	Science, technology, engineering and mathematics
UKCES	UK Commission for Employment and Skills
WERS	Workforce Employment Relations Survey
VIF	Variance Inflation Factor

CHAPTER 1: Introduction

1.1. Introduction to the Thesis

There exists a common narrative[1] surrounding skill gaps and skills shortages that exists both here, in Scotland and the UK, and in competitor economies. According to this narrative, a multitude of issues have conspired and aligned to produce a situation where employers face pernicious and persistent shortages in their required skillsets, particularly hindering their ability to compete on the international stage. There are several common themes running through this narrative. Firstly, is the idea of a somewhat broken (and degrading) education system, where standards are not quite what they once were, meaning that, in particular, students are now "falling behind" their international contemporaries (particularly in so-called STEM[2] skills) at a time of substantial structural change in the global economy. Along similar lines, a problem is associated with "millennial" workers, where attitudes, values, priorities, and efforts are sometimes seen as having declined compared with those of their predecessors. On top of all of this, there is a sense, and fear, of potentially vast emerging skills obsolescence in the face of rapid technological change. While skill deficiency issues have been reported – and studied – for decades, there is often a sense that this is a "new" problem that we're facing, at least in terms of its scale. The common view is that these issues are substantial, systemic, and interrelated, as well as strategic in importance for the country.

Nevertheless, rigorous study of these claims has not been forthcoming, particularly in the Scottish context. Large questions remain regarding the definition, conceptualisation, and measurement of skill gaps and skills shortages, and the weight of evidence largely seems to come from employer representative bodies, where study rigour and methodological soundness cannot often be relied upon. Importantly, objective information on their effects is essentially unavailable. Moreover, *within* the Scotland context, little information is available regarding the make-up or distribution

[1] See Tables 1a-1d for supporting evidence below.
[2] STEM is shorthand for science, technology, engineering and mathematics skills and subject areas.

of these issues, with few studies looking at the sector make-up, and none looking at the regional determinants of these skill deficiencies.

In addition, the problem is often viewed from the national level, with the role of firms in reporting and responding to these issues largely passed over. For example, if skills issues are met at the level of individual firms, then what part do employers play and what part can they play in mitigating the effects of skill gaps and skill shortages and in combatting them? Within skills gap research, this perspective is often passed over in pursuit of higher-level analysis which lacks the real detail regarding the perspectives and responses of individual firms and firm managers. This is especially evident regarding those firms which are still successful, even though they operate in sectors where skill deficiencies are commonly reported. It is unclear what these successful firms are doing to avoid, address or combat these issues while maintaining steady rates of growth.

This study resolves this by looking at skill gaps and skill shortages within the context of fast-growth firms. High and fast growth firms are of particular interest to entrepreneurship scholars (Audretsch, 2012), and have been the focus of study in the economic discipline as well (Coad et al., 2014), given their important role in the economy as a disproportionate creator of new jobs, and their noted potential to disseminate innovation and induce "spillovers" (Anyadike-Danes et al., 2009). Researchers have previously studied the determinants of high growth, examining the external environment and the internal configuration and characteristics of the firm (Audretsch, 2012), as well as the mindset of the individual entrepreneur themselves (Levie and Autio, 2013). Lee (2014) even goes as far as to differentiate between actual and potential high growth firms (those which currently do not currently experience high growth but which are undertaking measures which are conducive to it). While exact definitions have certainly proved contentious (Daunfeldt et al., 2015), high or fast growth firms are defined by the OECD (2007) as follows: "all enterprises with average annualised growth greater than 20% per annum, over a three year period should be considered as high-growth enterprises. Growth can be measured by the number of employees or by turnover." High growth firms constitute a key focus of this study. In terms of the quantitative aspects of this study, no distinction is made between those firms which are high growth (e.g. as defined or measured by either revenue or employee) and those that are not. However, in the primary qualitative research of this study, which targets research questions 3 and 4 specifically, this study focuses explicitly

on high/fast growth firms. Indeed, all firms interviewed were identified through firms nominated or awarded for their status as some of Scotland's fast-growing firms (as defined by 3-year rolling turnover).

This study aims to address a number of these important issues, and to shed light on the specific nature of the problem of skill gaps and skill shortages in Scotland.

1.2. Thesis aim, objectives, and approach

The aim of this research is:

> *To investigate the distribution, severity and determinants of regional skill shortages and skill gaps in Scotland, with additional focus on the ability of employers to combat these deficiencies.*

Four specific research questions have been addressed in this study. The rationale behind their formulation is set out in Chapter 5 (Research Context).

1. To what extent are so-called "skill gaps" appropriately conceptualised and measured?
2. To what extent does Scotland suffer from skill deficiencies?
3. To what extent are sector-specific skill gaps distributed evenly across all firms and organisations?
4. To what extent can firms mitigate the effects of industry skill deficiencies?

1.3. Thesis overview

This thesis proceeds as follows. A Literature Review is conducted on two separate but connected research streams and is presented as such here. Chapter 2 examines the existing research on skills imbalance. Chapter 3 outlines the literature on skills utilisation at the level of the firm. This begins by detailing in greater depth the development of the "skills gap" narrative, and the way that previous methodologies have approached the problem of assessing skill deficiencies. A greater look at the more

in-depth academic research is also set out, before a new holistic multi-method approach to assessing skill deficiencies is proposed. Chapter 4 presents the second stream of the literature review of this thesis, looking at the academic literature on skills utilisation at the firm level. This chapter sets out chronologically the development of firm theory, from neoclassical theory, through the resource-based view, to the knowledge-based view, and finally to human capital research. These two chapters form the foundations upon which this study proceeds.

Chapter 4 sets out the specific research context of this project, looking at various relevant aspects of Scotland's economy, geography, and specific political context. This includes a summary and depiction of the existing ecosystem surrounding and policy approach towards the development of skills enhancement. Chapter 5 details the Research Methodology of this study, including the philosophical foundations (pragmatism) upon which the empirical study rests. In line with this, the thesis adopts a mixed-methods approach to exploring the research aim and addressing the specific research questions. Specifically, this project adopts an econometric (probit and logit regression) analysis looking at the determinants (regional and otherwise) of skill gaps in Scotland. In order to explore these issues further, the secondary stage of primary research involved interviewing managers from a range of successful Scottish commercial organisations, as well as a smaller number of policy analysts and a single Minister within the Scottish Government. Chapter 6 presents the findings from this quantitative analysis and Chapter 7 presents the findings from this qualitative analysis. Chapter 8 then summarises both of these sets of research findings and presents some recommendations for policymakers.

In summary, this research finds that (1) little geographic influence can be detected at the statistical level despite the protestations of employers to the contrary; (2) sectoral variation exists, although not all knowledge-intensive sectors suffer equally; (3) there remains substantial confusion among employers as to what precisely is meant by the terms "skill shortages" and "skill gaps"; (4) what many employers mean by "skill shortages" could often be described as generic labour shortages; (5) besides technical skill deficiencies, the problem frequently manifests in what are commonly denoted as "soft" skills or "core" skills; (6) employers' expectations of the skill levels of new employees, particularly young employees, varies drastically; (7) successful Scottish firms, even internationally successful Scottish firms, still manage to operate in

sectors or industries where skill problems have been self-reported by employers; (8) these firms have first-hand experience of skill deficiencies, but place a lot of focus on training and robust internal HR, skills retention and skills diffusion procedures; (9) firms have been reluctant to raise wages and salaries to combat skill shortages.

This thesis contributes to the literature in two main ways. Firstly, by outlining conceptual and methodological weaknesses with much of the existing (influential) research, it proposes a new methodology of assessing the extent and severity of skill deficiencies, one which examines the issue at different levels and from a range of different perspectives. While a truly objective examination of this intrinsically subjective phenomena will never prove possible, this approach has the benefit of offering much greater balance than previous research has been able to offer. Secondly, this thesis explores the Scottish context in greater detail than has previously been the case and does so by exploring the phenomena of skill deficiencies at the regional (in-country) level.

Table 1a: Evidence of narrative development in an academic setting
"Many shortage studies appeared in the 1950s and 1960s, stimulating, and feeding on public and government concern about bottlenecks in certain labour markets, notably those for qualified scientists and engineers (QSEs) and skilled craftsmen. By 1970, it was possible to take an historic view of the literature..." (Meager, 1986)
"Overall, the indicators that are available suggest that the nursing/midwifery labour market in Scotland is tightening, with evidence of higher vacancy rates for some specialties and regions. When the ageing of the workforce is factored into the equation, there is a probability of more pronounced shortages occurring over the next few years, unless co-ordinated action is initiated." (Buchan, 2002)
"In September 2003, the Equal Opportunities Commission (EOC) launched a General Formal Investigation (GFI) into occupational segregation and gender stereotyping in the Modern Apprenticeship (MA) scheme. One of its main objectives was to create a wider understanding of the links between occupational segregation and the pervasive skills and pay gaps that prevail in the UK economy. In short, the UK is experiencing major shortages in skills, and the channelling of young people into occupations on the basis of their gender is restricting the pool of potential employees available to employers." (Campbell et al., 2005)
"The tourism industry is of significant economic importance to Scotland. In 2004, over 21 million overseas and domestic tourists visited Scotland bringing about £4.5 billion to the economy, accounting for 5 percent of national gross domestic product. Tourism ranked as the country's fourth-largest employer, accounting for 8 percent of the Scottish total employment (Scottish Executive, 2004a). Yet the tourism industry faces the persistent challenge of recruiting and retaining a skilled labour force. Labour turnover is nearly double that of other industries and the skills gaps among tourism staff, particularly managerial/supervisory staff, are greater than in any other industry." (Martin et al., 2006)
"A skills shortage for a number of positions in the Scottish oil & gas industry has been identified for a long time, with highly skilled project managers and engineers currently being in high demand. Continual developments in many areas of the industry over the years, for instance technology or increased cost reduction initiatives have helped to push the demand for a skilled workforce at a much faster pace than was originally anticipated. Some claim the industry today is unprepared and undermanned to deal with future workforce demand, adding to and increasing skill shortage issues." (Camps, 2015)
"To attract the interest of young school leavers into this trade, time and capital investment that would inspire them to see a future in bricklaying would help them make informed decisions. There should be a review and an overhaul of the standardised funding currently in place for the bricklayer apprenticeship scheme. There is need for meaningful collaboration between bricklaying firms and schools by incorporating hands-on trade skills within the school curriculum and pre-apprenticeship programmes to encourage and nurture the right candidate. This could potentially support the growth of bricklayer numbers within the Scottish construction industry otherwise there will be ongoing difficulty in retaining the current talents, knowledge and expertise of the present bricklayers" (Lawani et al., 2022)

Table 1b: Evidence of narrative development in periodicals and the popular press	
Dundee economists call for more positive action over supply and demand for skills (Dundee Courier, 1987)	Headline
Gloomy groans of the bosses – job losses in Scotland's manufacturing industries are set to continue, and a shortage of skilled labour is one of the major reasons according to company bosses (Daily Record, 1988)	Headline
Cancer patients hit by skills gap (Aberdeen Evening Express, 1997)	Headline
"Imagine Britain running out of engineers. It's almost as difficult as imagining Saudi Arabia running short of sand. Or Alaska snow or Russia Vodka. But that's what's happening and it has been getting there for a long time...Light engineering and the electronic engineering sectors are hardest hit, with the north of England and Scotland areas currently battling hardest to get hold of qualified staff." (Whitworth, 1998)	Editorial and commentary
"Scotland is becoming emptier and greyer, exposing serious skill shortages and storing up problems for generations to come...Scotland has to take its place in that queue and, since immigration is controlled from Westminster, it is limited in the extent to which it can act to improve its position. There is already a fast-track permit system to smooth the path of skilled immigrants into Britain, but it is a UK minister who is in charge of matching applicants to vacancies. Mr McConnell has now promised that the executive will "proactively intervene" in the UK framework to promote Scotland, but the extent to which he will be able to do so remains to be seen." (The Herald, 2003)	Editorial and commentary
Scottish manufacturers upbeat despite skills gap concerns and drop in exports (Scottish Financial News, 2017)	Headline
Brexit and Covid fuel skills shortages, weighing on Scottish workers (The Herald, 2021)	Headline
"A lot of this appears to be bureaucratic, and about turf being fought over by officials. But the consequence is very direct for the economy. It has become all the more so with the biggest skills shortages anyone can remember - brought on by many people leaving work during the pandemic, and because Europe has ceased to be a pool for new recruits as a result of Brexit. That said, the minister now responsible for youth employment and training, Jamie Hepburn, says he "welcomes" the report's recommendations. Maybe he does not realise how damning they are." (Douglas Fraser for BBC News, 2022)	Editorial and commentary
How 'micro-upskilling' could get Scottish business back on track – The Open University's recent Business Barometer revealed that more than two thirds of respondents in Scotland believe their organisation is currently facing a skills shortage (Rachel Aldighieri in the Scotsman, 2022)	Headline

Table 1c: Evidence of narrative development in politics and policy
“Take immigration, for example. We’re not full up in Scotland. We’ve got a key skills shortage. We have a different attitude towards the question, particularly of skills and immigration. So this is an example of where it suits Scotland to have more responsibility over immigration policy.” (Alex Salmond on BBC News (De Sarkar, 2008)).
“We are also determined that this generation of young people will not bear the long term burden of the pandemic. I can confirm that up to £70 million will be invested this year to support the Young Person’s Guarantee, intended to give all young people between 16 and 24 the guarantee of a job, place in education or training, or formal volunteering opportunity. That is part of a wider commitment to skills and employment across all age groups. We will invest an additional £500m to promote good and green jobs, address skills gaps and help people retrain. This is essential to protect our economy from the severe consequences of Brexit, but also to achieve the net zero transition.” (Nicola Sturgeon)
“In 2014, there was a large gap between demand for mid-level skill, sub-degree entry-level vacancies and supply of sub-degree qualifiers. IPPR Scotland estimated that there is an aggregate gap in Scotland between skills demand and supply of 29,000 people annually (Gunson et al 2016). The greatest gaps occur in caring personal services, where supply equates to only just over half of the 16,000 entry-level workers currently required. In administrative occupations – including elementary administration – and service occupations, there are 21,000 vacancies currently being advertised to fewer than 10,000 potential applicants.” Institute for Public Policy Research Scotland (Grunson & Thomas, 2017)

Table 1d: Evidence of narrative development in business and industry
"The software industry in Scotland is crying out for suitably qualified graduates, growth in our industry is being restricted and Scotland is losing out to other countries. It is unacceptable in the midst of a world-wide digital revolution that Scotland doesn't have enough talented graduates to exploit fantastic global opportunities. In order to be successful, Scotland needs more qualified graduates, we need to encourage and provide the opportunities for the next generation of students to be part of such a successful industry." (Alastair O'Brien, Deputy Chair of *ScotlandIS* (BBC News, 2013))
"76% of businesses think Scotland is in danger of being left behind by emerging countries and 67% agree Scotland is being left behind by EU economies" (SCDI, 2014)
"In Scotland the industry employs 80,000, with nearly 40 per cent working in software roles and an estimated 74 per cent of Scotland's total workforce requiring some degree of digital skills in the workplace every day regardless of industry sector. Across Europe 100,000 jobs are being created every year. These are highly skilled, highly paid jobs and yet in Scotland thousands of vacancies remain unfilled annually because of a skills gap. Everyone interested in Scotland remaining competitive in our global economy and in addressing the digital divide has a role to play – government, educators, parents, career advisers and the digital industry itself." (Maggie Morrison, Business Develop Director at *CGI*, 2015 (Scotsman, 2015).
"It is impossible to ignore the primary trend in this report - the gap between what is learned in schools, colleges and universities and what is valued by employers. Qualifications are one part of the mix, as indicators of achievement and ability, but nurturing the right attitudes, behaviours and skills as young people progress through the education system is just as important." (Rod Bristow of *Pearson's* (The Herald, 2018))
"There's no escaping that there's a skills gap in the financial services (FS) sector, in Scotland and across the UK. Recent research published by PwC and the Financial Services Skills Commission (FSSC) laid that fact bare. It also opened discussions into the benefits for businesses and employees, of reskilling which is going to prove vital to the sector's future success." (Fraser Wilson, Partner at *PwC UK* (PWC, 2022))

CHAPTER 2: Skills Imbalance Research in Context

2.1. Introduction

This chapter provides initial theoretical grounding for the study by analysing previous research on the topic of skill gaps and skill shortages, with special attention paid to methodological concerns which from both the heart of this empirical project, and as will be argued, the core of the debate surrounding these issues. Section 2.2. traces the development of the skills gap narrative, and shows that this is dependent on research and evidence with is often methodologically weak and contextually-unfurnished. Section 2.3. then goes on to analyse the more robust evidence, and demonstrates that academics have long been researches these issues. A summary of the findings of this body of work is presented, and the research gap is identified: specifically, that geographic – and in particular, regional – analyses of skill deficiencies have been largely overlooked. Finally, this Section 2.4. details explicitly the problems with existing methodology and proposes a new multi-method approach to studying the issues of skill gaps and skill shortages.

2.2. The "Skills Gap" narrative

Across industry, government and academia, concepts such as "skill gaps" and "skill shortages" are commonly ill-defined and poorly understood. Intention and terminology can change field-to-field, even within, and because a number of these actors differ substantially in terms of acceptable and expected methodological and evidentiary standards, research coming from one area often cannot be accurately and meaningfully compared to that from another. Within academia itself, it is evident that a natural "home" for any concentrated stream of skills mismatch literature[3] is absent, with interest, insight and relevance stretching across branches of economics, human resources, management, organisational studies, sociology, and indeed many other fields

[3] In a report on skills mismatch for the ILO, McGuinness et al. (2017) highlight 166 relevant papers which they differentiate across 8 separate focus areas: overeducation; undereducation; overskilling; underskilling; horizontal mismatch; skill shortages; skill gaps; and skills obsolescence.

and sub-fields. As an illustration, individual streams focused on the areas of educational mismatch, knowledge management and skills obsolescence all individually and collectively overlap with skills imbalance research, but a definitive, explicit, holistic and compatible body of work is distinctly absent. Furthermore, due to the very nature of the research, coupled with consequent calls for practical policy responses from government, evidence coming from industry often carries just as much weight as that from academia. These realities have created a research field that is at best complex, fractured, irregularly updated and dispersed – as well as confusing to analysts and policy-makers – and at worst, oversimplified, overstated, ambiguous, and even, at times, contradictory.

At a fundamental and theoretical level, a skill is defined as 'the ability to perform a productive task at a certain level of competence' (Shah & Burke, 2003), and this is the definition of skills utilised throughout this study. However, some additional comments are worthy of note here. In reality, "skill" is an incredibly malleable and dynamic concept. On the supply side, skillsets accrue on the scale of a lifetime – as Heckman & Masterov (2005) note, skill formation 'begins in the womb and continues on in the workplace'. Many distinctions appear in the literature: for example, between cognitive and non-cognitive skills (Lindqvist & Vestman, 2011); between core, people or soft skills and technical or hard skills (Heckman & Kautz, 2012); between occupation-specific and general skills (Bishop, 1998); between leadership, managerial and entrepreneurial skills (Jena & Sahoo, 2014); and between aggregate human capital endowment(s) and those skills employees (and indeed employers) are able to harness for economic gain (Becker, 1962). Skills are also not perfectly related to education either. Skills are a function of innate ability, the quantity and quality of education and training, the nature and extent of past experiences (Borghans et al. 1998), as well as the ability of individuals to successfully assimilate, process, learn, utilise, and gain from those past experiences (Kampelmann & Rycx, 2012). On the demand side, skill priorities can vary within and between departments of a single firm, between different firms within the one industry, across industries designated to lie within the same sector, and between firms operating in different countries (Holt et al., 2010). Skill demand also fluctuates and changes with the nuances of the business cycle, and on a longer time scale, technological change alters the skills demands of any given firm (Berman et al., 1998; Card & DiNardo, 2002). In terms of the primary research areas of this study,

job-specific technical skills, and more generic "soft" or "core" skills (including management-related skills) are investigated.

According to economic theory, skill imbalances are thought to trace the dynamics of the business cycle in an inverse way, with shortages expected during "boom" periods, and surpluses during economic downturns (Bosworth, 1993; Shah and Burke, 2003). Nevertheless, the notion that there exists widespread imbalance in the market for skills has become common place over recent years, even in the immediate years following the economic crisis starting in 2008, and continuing on during the slow economic recovery to-date (Scottish Government, 2007; Scottish Government, 2011; CBI/Pearson, 2013; p. 7; FSB, 2013; p. 2). A 2011 report by the Scottish Government's Social Research department found that "skills gaps" affect 6% of employees and 15% of employers (Scottish Government, 2011; p. 26). Most of these "gaps" centred on sectors which require low skills levels, with most reports relating to "soft skills", such as team work or customer service. Concerns over the ability of the Scottish/UK labour force to compete internationally have also been forthcoming. For example, a June 2014 study by the Scottish Council for Development and Industry (SCDI) reported that '76% of businesses thought Scotland was in danger of being left behind by emerging countries and 67% agreed Scotland was being left behind by EU economies' (SCDI, 2014; p. 2).

The evidence base itself can generally be categorised into two very different camps. On the one hand, the most relied upon data – by academics, practitioners and even regional skills and education planners – is gathered and published at regular intervals (biannually and in alternative years) as the *Employer Skills Survey* (ESS) and the *Employer Perspectives Survey* (EPS)[4]. Other rigorous work in the past has come from the *Skills and Employment Survey* (SES) and, although not undertaken in Scotland, the *Workforce Employment Relations Survey* (WERS). Evidence from these surveys shows a complex mix of skills matching trends and influences, with variation in the incidence and density of skill deficiencies occurring across geographic, industrial/sector and occupation lines. These surveys also make a point of collecting

[4] These surveys were undertaken by the UK Commission on Employment and Skills (UKCES), until that body's closure in March 2017, and were subsequently placed under the direction of the Department for Education (DfE). The 2017 iteration of the ESS gathered data from April-September 2017 with publication of results due in summer 2018. No decision has yet (as of February 2018) been made on future iterations of the ESS, nor that of the EPS, though analytical work by civil servants is underway. As a source of quality information on employer's perspectives of skills supply and skills matching, the ESS is recognised as an international high-water mark.

information as to what specific *type*[5] of skills employers find are in short supply, enquire about the companies' internal and external skills experiences, the nature and quantity of training that their staff undertake, and other related variables that are relevant to the research teams' core priorities. An alternative source of information comes directly from industry itself, produced mostly by sectoral representative bodies, with organisations throughout the UK publishing a range of periodic, sporadic and one-off surveys highlighting the depth (and impact) of skill deficiencies across their interest group[6]. The most prominent of these – the CBI/Pearson *Education and Skills Survey* – is published yearly.

Reports of detrimental skill deficiencies have attracted attention and "buy-in" from the print and broadcast media for some time[7]. Mirroring somewhat the strengths and weaknesses of the evidence base itself, the depth and quality of this media coverage can range from serious, nuanced and investigative journalism to superficial, fleeting and at times sensationalist work. One important feature of media reportage on skill deficiencies is the frequent combination of skills supply issues with some larger economic, political or demographic event, and the drawing of a conclusive (and at times) causal connection between the two. Examining at recent events, many British outlets have approached skill deficiencies from the perspective of the UKs' 2016 decision to withdraw from the European Union. As examples, reporting a mixture of anecdotal and survey evidence, the *Herald* (April 17th, 2017) states that, since the referendum vote, 'white-collar professions are toiling to hire qualified candidates', whereas the *Guardian* (August 29th, 2017), quoting their source from the manufacturing industry, run the headline "Lack of skilled EU workers 'could choke UK growth post-Brexit'". Regarding demographic changes, the *Scottish Sun* (August 8th, 2013) suggests that a skills exodus is due in the construction sector as ageing workers retire and new talent struggles to emerge, although (and somewhat as a nod to the cyclical nature of sectoral skill dynamics) a *BBC News* report (March 21st, 2001) shows that the same

[5] For example, the 2015 iteration of the ESS differentiated between those skillsets related to the use of 'information, equipment and materials' and those used when 'dealing with people', for a total of 24 individual skill descriptors.

[6] The methodological strengths and weaknesses of these two evidence categories are markedly different, as we discuss below.

[7] Although not filtering media reports only [rather, a combination of media reports, opinion articles, government and NGO policy documents, academic works and industry reports], an entry of "skill shortage" into the *Google* search engine returns almost 2,500,000 page hits [February 2018].

concerns about flows of skilled labour, in the same sector, were voiced as far back as the 1980s.

As Cappelli (2014) finds for the US and elsewhere, reports of skill deficiencies in Scotland frequently take on one of a few different forms. One of the most common arguments is that some measure of decline has taken hold within the education system[8], and that subsequently, a marked reduction in the knowledge, skills, and abilities of those young people, and their readiness to enter the workplace, has now emerged[9]. Starting in 2000, the OECD's Programme for International Student Assessment (PISA) has undertaken triennially an international comparison of student performance (aged 15) in mathematics, science and reading, with the most recent tests taken in 2015 and results published in December 2016. Scotland's absolute performance declined in science and reading compared to 2012 (staying similar in mathematics), and declined relative to international peers across all three categories (to 19th in science, 23rd in reading and 24th in mathematics). Moreover, Scottish students ranked lower across all categories compared to students of the other the UK administrations. Perhaps more tellingly, this performance was markedly below that of students from both the advanced and emerging economies of East Asia (Singapore lead all 3 categories, Hong Kong, Macau, Taiwan, Japan, China and South Korea completed the top 7 in mathematics, Japan ranked 2nd in science, and Hong Kong 2nd in reading). These results led Kier Bloomer, one of the principal architects of *Curriculum for Excellence*, to state that "it is no longer credible to describe Scotland's education system as world leading". Scotland has not taken part in the OECD's comparative measurement of adult skills – the International Assessment of Adult Competencies (PIAAC) – although it did run its own, slightly similar, test programme (the Scottish Survey of Adult Literacies) in 2009.

Perhaps the one specific area where the skills shortage narrative has been most pronounced is with respect to an undersupply of skillsets founded on core science,

[8] A specific form of this criticism in Scotland emerges from three distinct events endured by the national Further Education (FE) sector – a sector largely tasked with the development of vocational skills among young people and the reskilling of those currently out of work. The first concerns the decline of traditional "technical colleges" starting in the late 1980s and, in several instances, their transition into more "academic" Higher Education (FE) institutions. The second concerns the changes to the governance structures and subsequent merging of the existing colleges. The third revolves around the greatly reduced funding available to those existing colleges beginning in the 2012/13 academic year (McMurray, 2017).
[9] Much of the national school curriculum (for those aged 3-15) was overhauled with the introduction of *Curriculum for Excellence* (CfE) over the 2010-2011 academic years. An important component of CfE, starting with initial concept publication in 2002, was to ensure that suitable 'skills-for-work' were being advanced throughout students' time in the education system.

technology, engineering and mathematics (STEM) expertise. Although this notion has accelerated in recent years, concerns over the available supply of engineers and scientists actually formed the focus of the earliest academic literature on skills mismatch. In the UK, contemporary concerns can be split between arguments focused on the quality of the STEM skills supplied in the labour market and arguments focused on quantity. Taking the first line of argument, concerns have been growing that student's STEM skills have been in decline over a sustained period of time. Looking at the results of the PISA test scores on mathematics and science between 2006 and 2015, and in addition to decline and stagnation in absolute terms discussed above, Scotland's relative ranking declined in mathematics from 11th to 24th and in science from 10th to 19th. Anecdotal evidence from tertiary educators also suggest that the quality of STEM skills, even among those students enrolled in and studying non-STEM subjects, is inadequate. This argument also has traction across the UK, with added concerns over the detrimental impact on industry's ability to harness suitable talents. After publication of a 2012 report looking at STEM subjects in HE, Chairman of the House of Lords Science and Technology Committee Lord Willis stated that, 'in reality the quality of the STEM graduates coming out of [British] universities does not meet the requirements of industry and in fact is ultimately not even likely to meet the requirements of academia.'

Contemporary discussion here also points to both a *quantitative* lack of students at secondary and tertiary levels studying "hard science" subjects, and correspondingly, an oversupply of tertiary students focused on the social sciences, humanities, the arts and other non-STEM fields. In what is perhaps one of the more infamous examples, claims have been made that the UK produces more media graduates per year than there are media jobs in the UK. Again, there is evidence to suggest that these concerns are not without merit. Table 1 below shows the disparity in the number of graduates across Scottish HE institutions obtaining degrees (at all levels) between STEM subject and non-STEM subjects. Table 2 shows enrolment numbers at Scottish FE colleges by subject studies. These concerns are also borne out somewhat when we turn to the labour market and look at employer survey evidence. Many media organisations have picked up on industry concerns about a lack of professionals in the IT and computing sectors, specifically. One line of policy-response suggested as a means of combatting quantitative shortage has been to encourage more young people – and in particular more

young women and girls[10] – into STEM career paths from as early an age as possible[11]. The extent to which such initiatives are successful will only become apparent over the medium to long term.

[10] The gender balance across different career paths and by education subjects studied is a complex issue, with researchers point to 'occupational segregation' as a pernicious issue. In STEM subjects specifically, the numbers are quite striking.
[11] This forms an important component of the Scottish Government's STEM Strategy, published in 2016.

Table 2: *HE Qualifications Obtained by Subject Area and Level of Qualification, 2014/15*

	First degree	*Other undergraduate*	*Postgraduate*	*All levels*
Subjects allied to medicine	4,455	1,065	1,780	*7,300*
Engineering & technology	3,050	680	2,270	*6,005*
Biological sciences	3,825	650	1,375	*5,850*
Computer science	1,905	430	945	*3,280*
Physical sciences	1,535	295	1,050	*2,880*
Medicine & dentistry	1,285	25	780	*2,090*
Architecture, building & planning	900	195	825	*1,920*
Mathematical sciences	565	105	325	*995*
Agriculture & related subjects	145	355	330	*830*
Veterinary science	300	10	40	*345*
Total – science subject areas	**17,970**	**3,815**	**9,715**	***31,495***
Business & administrative studies	5,580	1,270	6,810	*13,675*
Social studies	3,320	765	2,320	*6,405*
Education	1,280	235	3,655	*5,170*
Creative arts & design	2,390	395	820	*3,610*
Law	1,520	80	1,695	*3,295*
Languages	1,715	680	750	*3,140*
Historical & philosophical studies	1,480	135	885	*2,500*
Mass communications & documentation	640	65	415	*1,120*
Combined	320	425	0	*765*
Total – all subject areas	**36,210**	**7,870**	**27,065**	***71,175***

Source: HESA (2015)

Notes: Figures are rounded as follows: 0, 1, 2 are rounded to 0. All other numbers are rounded up or down to the nearest multiple of 5.

Table 3: *Enrolled students' qualification aim of study at FE level, 2014/15*

Subject superclass summary	*No. of students*
Health Care / Medicine / Health and Safety	48,051
Family Care / Personal Development / Personal Care and Appearance	47,674
Engineering	31,200
Information Technology and Information	31,000
Catering / Food / Leisure Services / Tourism	17,736
Construction and Property (Built Environment)	16,686
Business/Management/Office Studies	16,409
Area Studies/ Cultural Studies / Languages/Literature	15,494
Arts and Crafts	8,925
Sciences and Mathematics	8,124
Authorship / Photography / Publishing / Media	7,957
Agriculture, Horticulture and Animal Care	7,682
Education / Training / Teaching	7,533
Sports, Games and Recreation	7,164
Performing Arts	7,066
Politics / Economics / Law / Social Sciences	5,554
Transport Services	4,998
Environment Protection / Energy/ Cleansing/ Security	2,168
Sales, Marketing and Distribution	1,902
Manufacturing / Production Work	1,405
Humanities (History / Archaeology/ Religious Studies / Philosophy)	1,022
Services to Industry	997
Oil / Mining / Plastics / Chemicals	332

Source: SFC (2015)
Notes: Figures do not sum to SFC figures for aggregate enrolled students (see *Table* 2). Source of discrepancy unclear.

An additional form of the skill shortage argument looks at the issue through the prism of skilled economic migration. In the UK, this line of argument is most prominent when discussion focuses on the number of staff (particularly doctors and nurses) employed by the National Health Service (NHS) who were born outside of the UK. Parliamentary statistics from February 2018 show that the proportion of NHS staff in England[12] who give their nationality as something other than British is 12.5%. Particular concerns have been raised regarding the ability of the NHS to recruit skilled and qualified EU nationals in light of the referendum vote in 2016 – something which will be highly dependent on the final arrangements formed at the end of exit negotiations. Using the same source as above, NHS England staff who are non-UK EU nationals currently stands at around 5.6% (and 9.6% of doctors and 7.1% of nurses and

[12] No equivalent data exists for Scotland, nor for Northern Ireland or Wales.

heath visitors). A more detailed breakdown of the most common nationalities across the NHS in England is given below in Table 3. An additional sector of particular concern here in Scotland is the ability of the tourism and hospitality industry to maintain a source of skilled immigrant labour. On a policy front, the Home Office's Migration Advisory Committee (MAC) maintains a Shortage Occupation List (SOL) which tracks labour shortages (though not exclusively skill shortages) in order to better inform Government policy towards economic migration.

Table 4*: Most common nationalities of staff across NHS England*

British	976,288	Nigerian	5,405
Indian	18,348	Zimbabwean	3,899
Philippine	15,391	Romanian	3,775
Irish	13,016	Pakistani	3,375
Polish	8,477	Greek	2,952
Spanish	6,781	German	2,400
Portuguese	6,725	Ghanaian	2,345
Italian	6,044	Malaysian	2,201

Source*:* HoC Library (February, 2018)

Politicians too have long accepted this narrative of persistent and pernicious skill deficiencies. Thus, in response to concerns regarding the ability of British workers to compete in the global economy, in 2004 the UK Labour Government commissioned the Leitch Review of Skills. Despite the set recommendations of Lord Leitch, skills concerns have continued. In the lead up to the 2015 UK General Election, "skill shortages" or "skills gaps" were alluded to in the manifestos of the Conservative Party, Labour, the SNP, the Liberal Democrats, UKIP, Plaid Cymru, and the SDLP. Vince Cable – the former Secretary of State for Business, Innovation and Skills – has stated that:

> '…The problem which is growing is the problem of skills - we just don't have the right level of people at all stages…We've got a gap already. We've got people approaching retirement who have got to be replaced. This is potentially a crippling handicap unless we get on top of it' (Silvera, 2014).

There are a number of reasons why such reports garner media buy-in and gain traction with the public. Throughout the developed world, a belief that the very nature of work (and therefore the very nature of desired, required and rewarded skillsets) has undergone (indeed, *is undergoing*) significant change is not unfounded. A number of

important and influential underlying global economic dynamics, some long understood, continue to impact the means by which individuals, firms and industries earn a return for their productive efforts. Technologic change, long known to favour certain skillsets and disfavour others, continues to alter domestic and international markets through innovation and disruption. Accordingly, workplace automation is likely to prove challenging to a number of labour-intensive Scottish industries over the coming years. Much of this happens at the same time that Scotland, and indeed many other countries, continues its long-standing move away from manufacturing work towards a knowledge-intensive economy. More recently, global competition continues to rise from the more successful transition economies, and it remains unclear if a high-skill high-value economic development model will prove a competitive one for all economies (Schwalje, 2011). Closer to home, there remains uncertainty surrounding the resilience of the economy with respect to Brexit and the potential of a second referendum on Scottish independence, and the impact these events will potentially have on both the regional as well as the national labour market.

These facts, combined with poor levels of economic growth, are accompanied by a persistently sluggish performance in productivity (i.e. output per hour worked). Productivity in the UK has stagnated for a decade and remains almost exactly at its pre-crisis levels. In terms of international comparison, [UK=100 base, figures from 2016] productivity is substantially lower in the UK than several advanced industrial competitor economies, most notably that of France (128), Germany (135), Italy (110) and the United States (128), though performance does remain above Canada (97) and Japan (89). Furthermore, productivity in Scotland has historically been consistently lower that elsewhere in the UK, a gap which narrowed in the years following the financial crisis, but has reopened following very weak growth performance over 2015 and 2016. Although economists aren't certain as to what exactly underpins the UK's "productivity puzzle" – in Scotland, a combination of strong employment growth and weak economic recovery surely plays it part (FoA, 2019) – evidence suggests that constrained skills supply has historically (Haskel & Martin, 1993) and more recently (Bennett & McGuinness, 2009) had a deleterious effect.

A number of reasons then – some intuitive, some evidentiary, some macroeconomic and some microeconomic – explain how the skills gap narrative has progressed in Scotland and how it has embedded itself into the consciousness of industry, Government and even the public. Yet there are good reasons to question the

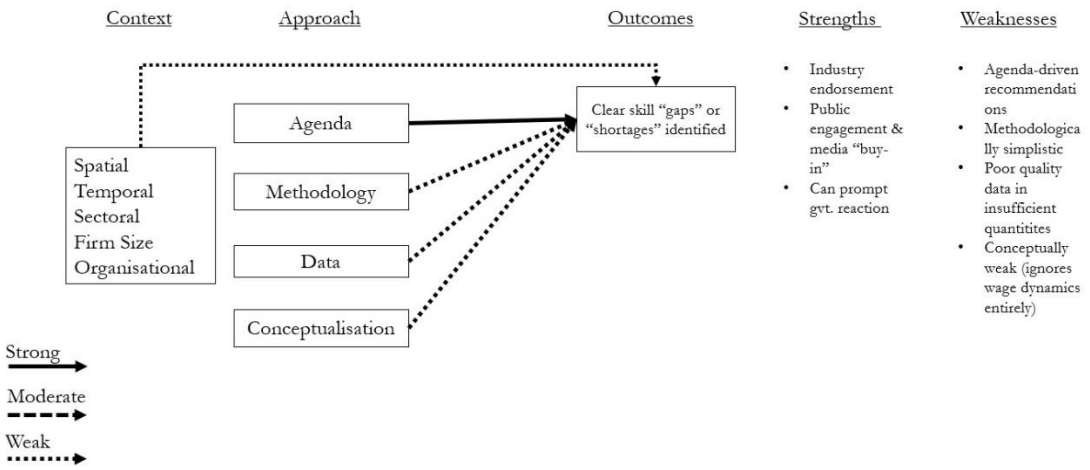
extent to which reports of skill deficiencies provide meaningful, reliable evidence. These doubts rest not just on poor evidence, but on conceptual matters, on unclear causal links, as well as on the very nature of economic shortages and the degree to which policy makers are able to efficiently combat them. Most fundamentally, none of the industry or consultancy reports done on skill shortages, those that receive so much attention in the public eye, offer any serious analysis of wage dynamics in the affected sectors or explain why wage signals might have either (a) failed to actually signal genuine shortages or (b) failed to encourage workers to respond. Moreover, very few sources provide detailed analysis regarding what *type* of skillset employers find hard to ascertain. For example, so-called "soft-skills" – those less-technical, more people-oriented, transferable and more universally-applicable skillsets used and developed in everyday life as well as in workplace settings – not to mention more general positive employee character and personality traits, have long been known to constitute an important component of employers' perception of skill deficiencies. This detail and nuance is overlooked when the industry-driven and media proliferated discussion rests so much on occupational or sectoral analysis.

The methodological approach much of this work takes is weak, and often much too simplistic for an issue of this complexity. Despite researcher calls for methodological pluralism having been circulated for several decades now, all industry-driven work analyses single industries or sectors in isolation, regardless of the interconnections and interdependent relationships between the labour market for, say, computer programmers in the IT sector and technical analysts in the financial services industry. Thus, a holistic approach relying upon a raft of measures – such as wage data, establishment surveys, economic indicators and qualifications matching – is notably absent from public discourse on mismatch. To compound these two previous issues, the data that these reports rely upon is often of very poor objective quality. Low response rates, or more at least low numbers of respondents, are a hallmark of much of the industry-driven surveys that form the backbone of media news coverage. Finally, it is clear that the industry-driven work, at the very least, runs the risk of being agenda-driven work, as is insinuated by the poor acceptable standards of their survey-based evidence. Interestingly, Cappelli (2014) suggests that the expectations of employers have changed in recent years, where many now expect that new hires be proficient at their job immediately upon their hiring. Moreover, he also suggests that, contrary to past attitudes, employers now find it is the role of the education system to provide for

certain skillsets. It can't be ignored therefore that industry may be looking for favourable, cost-reducing public-policy outcomes, especially when so much of the industry-driven narrative is concentrated on advocating change to the education system.

Thus, after scrutinising the robustness of this work, it seems that many of the explicit claims of mismatch stand on questionable premises and questionable data. By and large, much of the evidence of skill shortages that is driven by industry can be characterised as a superficial analysis of insufficiently reliable data founded on conceptually weak premises using only one method of analysis. We can therefore frame one strand of the research as depicted in Figure 1 below.

Figure 1: *Categorisation of Skills Research – Process & Findings (Industry-Driven Research)*



Source: Author's own work

2.3. What does the more robust research find?

The literature on mismatch can now be traced back more than half a century (Blank & Stigler 1957; Arrow & Capron 1959). In that time, researchers have focused their energy on assessing cause/determinants (Haskel & Martin, 1993b; Green et al., 1998), measurement (Adnett et al., 1980; Borghans et al., 1998), spatiality (Green & Owen, 2003; Houston, 2005; Watson et al., 2006a), effect – that is, on individuals (Allen & van der Velden, 2001; McGuinness & Wooden, 2009; Mavromaras et al, 2013), on employers (Watson et al., 2006b; Stevens, 2007; Bennett & McGuinness, 2009; Healy et al., 2015) and on macroeconomic outcomes (Haskel & Martin, 1993a; Acemoglu & Zilbiotti 2001) – as well as on understanding requisites in the design of adequate policy response measures (Heckman and Masterov, 2005; Dustmann et al., 2010). Skills mismatch research has an additional overlap with (what is now) a substantial body of literature examining the distribution and effects of job-worker qualifications mismatch, most of which examines the effects of over-or under education/qualification on job-satisfaction and return on earnings. However, at times this research has taken on more explicit, direct and causal comparisons with and to skills research (see, e.g. Allen & van der Velden, 2001; Green & McIntosh, 2007; Caincara & Sgobbi, 2012; Neumark et al., 2013).

The most fundamental purpose of skills mismatch research is to gather information on the distribution of imbalances across geographic, sectoral and occupational lines. Despite some important considerations regarding imprecise methodology and conceptualisation, which is addressed in more detail in the next section, the most reliable data for this comes from the biennial Employer Skills Survey. Taking the most up-to-date data from the 2015 iteration, the distribution of skill deficiencies across Scotland, at least from an employer's perspective, becomes clearer. On average, 6% of Scottish firms report at least one skill shortage vacancy (SSV) creating an overall SSV density[13] of 24%. SSV densities were most severe in the

[13] The Employer Skill Survey differentiates between the *incidence* and *density* of generic vacancies, skill shortages vacancies (SSVs) and skill gaps. Incidence reflects the proportion of establishments reporting (a) at least one vacancy, (b) at least one SSV or (c) at least one employee deemed not to be fully proficient in their role (i.e. a skill gap), giving a set of broader base figures for more detailed analysis. The density figure gives the proportion of the incidence to some separate but related measure, providing a more detailed understanding of the severity of the underlying skills issue. So: vacancy density is defined as vacancies as a proportion of total employment; SSV density is defined as the proportion of all vacancies that are SSVs; and skill gap density is the proportion of staff that are not fully proficient as a percentage of all employment.

Borders (49% of vacancies were SSVs), followed by Dumfries and Galloway (at 39%). At 17% of total vacancies being SSVs, Ayrshire, Edinburgh and the Lothians and North Lanarkshire were least affected by this measure. The overall incidence of establishments with at least one SSV peaked in Fife (at 9%), while in Ayrshire, only 3% of firms report an SSV (the lowest figure in Scotland). Turning to internal skill gaps, 13% of Scottish firms report at least one employee not fully proficient in their role, with density (percentage of all staff with a skills gap) recorded at 4.9%. These figures are highest in West Lothian (17% incidence) and Forth Valley (8.4% density), and lowest in the Borders (10% incidence) and Edinburgh and the Lothians (3.2% density).

Taking a sectoral analysis, SSV density was most severe in the Electricity, Gas and Water industries (at 66%), followed by the Construction, and Transport and Communication, industries (both at 46%). With respect to public-provision dominated sectors, education (at 32%, which doubled from 2013 at 16%), was far more affected than Health and Social Work (20%) and Public Administration (at only 6% density). By contrast, skill gap incidence was highest in Public Administration (at 23%), although the density of skill gaps in this sector was very low, at only 2.1%, perhaps reflecting the organisational structure of the sector. Skill gap density most affected the Manufacturing sector (10.5%) followed by Hotels and Restaurants (7.2%) and Wholesale and Retail (5.5%). Interestingly, the incidence of skill gaps halved in both the Health and Social Work, and Electricity, Gas and Water, industries from 2013 (to 14% each), perhaps reflecting a greater willingness to train staff internally. Skill gap density least affected Public Administration (2.1%), Electricity, Gas and Water (2.1%) and Agriculture (2.6%).

Looking at occupations, SSV density was highest amongst Skilled Trades (40%) and Machine Operatives (36%), followed by Professionals (29%) and Sales and Customer Service (28%). The least affected occupations were recorded as Administrative and Clerical (11%), Elementary (14%) and Managers (16%). Internally, skill gap density reflected these findings, with those working as Machine Operatives (8.7%) and in Skilled Trades (7.4%) ranking highest. Most proficient were those working as Managers (only 1.9% of Managers were reported as not being fully proficient in their role), Professionals (3.4%) and in roles concerned with Caring and Leisure (3.5%). Overall, a diverse mixture of skillsets was flagged as being deficient across those in both the external job market and the internal pool of existing firm

employees. Technical and practical skills of a particular concern included (1) "specialist skills needed for the role" (listed in 77% of all SSVs, and as the main skill lacking in 36% of SSVs), but also (2) "knowledge of the organisation's products and services" (37% of all, 7% main skill) and relatedly (3) "knowledge of how the organisation works" (35% of all, 4% as main skill). This highlights well the diverse range of issues employers encounter regarding skill deficiencies. Similarly, "people skills" were commonly reported: "customer handling skills" were flagged as the most common skill lacking (in 10% of SSVs), followed by applicants' "ability to manage and prioritise tasks" (9% main skill), and Team Working (6% main skill). Interestingly, "managing their own feelings, or those of others" was flagged as one deficient skillset in a full 40% of SSVs recorded.

In addition to the more intuitive structural (sectoral, occupational and regional) factors influencing the observed distribution of skill deficiencies across the economy, several other determinants emerge from the literature. In an early study of the UK, Haskel & Martin (1993) conceive of a typology of skill shortage *causes* differentiated by those attributable to factors that are either internal to the firm and those that are external, finding that with respect to the former, firms that are experiencing 'upswings in demand' and (perhaps surprisingly) whose production plans are more 'flexible' are more likely to experience shortages. Externally, the authors find that firms situated geographically in areas of high unemployment, high housing costs and low educational attainment are more encumbered by skill shortages. Green et al. (1998) undertake a comparative analysis of the determinants of SSVs and hard-to-fill-vacancies (HTFVs), finding that skills share of employment and expanding markets positively influence the likelihood to deficiencies. In a sub-regional analysis of the English county of Dorset, Watson et al. (2006a) find that both organisational size (larger firms) and growth rates (faster growing firms) are important determinants of heightened perception of firm skill shortages, whilst organisational age also influences the likelihood of firms reporting (non SSV-specific) HTFVs. Interestingly, the authors also observe that the position of the survey respondent within the firm is also an important contributing factor, finding that those in personnel positions are least likely to report shortages. Looking at regional patterns of skills deficiency in the England, Green & Owen (2003) find that the incidence of reported skill shortages is greater in the more economically-dynamic south than in the north, whilst a west-east discrepancy (west showing higher incidences of shortage) is evident both within the south of England *and* within London itself.

Conversely, in their study of the Andalusian hospitality sector, Marchante et al. (2006) find that the probability of reporting skill shortages is lower among those firms located in the coastal areas and provincial capitals.

Despite the policy-relevant and practical nature of the research, the academic work focusing on the impact and effects of mismatch, at least at the firm level, is relatively scarce, something which is likely attributable to the inadequate availability of sufficient or reliable data[14]. Haskel and Martin (1993) find that shortages reduce productivity growth significantly in UK firms, arguing that shortages (a) increase the wage rate sufficient to attract skilled staff, meaning that lower skilled workers are hired or used in their stead, and (b) increase the bargaining power of skilled workers, allowing them to seek less-demanding employment elsewhere. In their study of the Northern Irish IT, electronic and mechanical engineering firms, Bennett and McGuinness (2009), using two suboptimal definitions of shortage, find that both HTFVs and unfilled vacancies over the previous 12 months, reduced productivity (output per worker) by between 65% and 75% in affected firms. A more recent advance in the skills matching literature comes from Healy et al. (2015) in their study of the Australian SMEs. Using a dataset which permits more detailed and reliable analysis of the effects of skill shortages on firm performance than has been previously possible, the authors find that (a) using the subjectively reported measure, firms with simple skill shortages (*def.* 1 cause only) in year 1 manage to reduce their likelihood of reporting being hampered by skill shortages in years 2 and 3. Interestingly, the authors cannot find any link between skill shortages and objectively measured (via data linked to tax records) firm sales performance.

In terms of combatting skill deficiencies, a number of options are open to firm management. The most obvious of these is to increase the wage rate or salary offered for the particular role in shortage. However, there is a fairly substantial body of evidence to suggest that wage-adjustments are a relatively uncommon measure undertaken by employers to alleviate shortages. Looking specifically at Scotland, data from the ESS 2015 shows that only 7% of employers who reported SSVs had increased salaries for the role advertised. Other actions more likely to be undertaken included increased advertising/recruitment spend (32%), redefining existing jobs (16%),

[14] For example, the closest the ESS gets to providing quantitative data on firm performance is information regarding employer perception of the detrimental impact of skill shortages.

increased/expanded trainee programmes (13%), contracting work (9%) and offering training to those less qualified (9%). Other options included recruiting non-UK national workers (4%), making the job-more attractive (2%). "Other" action (3%) and – interestingly – "no action taken" (13%) were also noted by respondents. This is consistent with findings from Haskel & Martin (1993) and Mason & Stevens (2003). Healy et al. (2015) distinguish between simple skill shortages (those that have only one cause) and more complex skill shortages (those that have two causes or more) and find that firms are increasingly more like to respond to skill shortages by giving existing employees more hours when complexity increases. They find a similar pattern with improving working conditions – something which, taken together, they call a "first line of defence". The authors state that increasing training is an unlikely response because (a) high rates of noncompletion, and (b) the potential risk of "poaching" by rival firms.

In contrast to the literature on skills matching, a large, established body of empirical evidence spanning many different countries underpins the work surround education and qualifications matching, particularly with respect to measuring the extent and impact of overeducation. The vast majority of this work looks at the effects of overeducation on, firstly, wages, and secondly, job-satisfaction. Moreover, for data suitability reasons, university educated workers also constitute the focus of a disproportionately high percentage of the research studies. Results from the literature show a consistent wage penalty for those individuals who are overeducated. In a metanalysis of the existing literature, Sloane et al. find that, on average, overeducated workers have a wage penalty of 13.5% compared to well-matched workers of a similar level of education, whilst an analysis of the education-job-satisfaction literature yields inconclusive results. One interesting finding that emerges from the educational mismatch literature is that results vary depending on the measure of educational demand that is used[15]. With more relevance to the skill-matching literature, Ortiz and Kucel (2008) find that overeducation is more severe for those graduates of social science and the humanities, while Kampelmann and Rycx (2012) find that overeducation is beneficial for firm productivity and undereducation detrimental. Taking data from the 2006 Skills Survey, Sutherland (2012) examines both qualifications and skills mismatch in the Scottish context, finding that 38% of workers are over-educated and 15% suffer from skills underutilisation. Moreover, younger workers are found to be

[15] This is addressed in more detail in Section 2.3.

more likely to be over-educated, something which the author suggests might result from an inability of the economy to maintain creation of skilled jobs at a pace commensurate with the increased number of graduates Scotland has seen over the last two decades.

One important finding that emerges from the literature is the lack of in-depth qualitative studies looking at issues of skills mismatch. Most fundamentally, we have no evidence as to why successful companies – even internationally successful companies – are still able to operate in industries or sectors where skill deficiencies are widely reported by employers themselves. There are several reasons why such organisations are able to successfully navigate these conditions. It may be that they simply offer better pay and conditions than rival employers (although the success of new, innovative SMEs compared to large, established employers probably discounts the ubiquity of this explanation). Alternatively, it could be that their competitive advantage exists independently of, or is sufficiently far removed from, those skills deficient area of business operations. Another explanation is that those organisations are more efficient at undertaking the response measures outlined above – nuance which may be largely lost in a statistical study. Finally, it may even be that those organisations utilise a mix of additional response measures (such as efficient internal HR processes, practices and procedures) which allow them to maintain sufficient skill levels even in the face of industry shortages. This is a core area of the evidence base which requires strengthening.

Within the world of literature which encompasses skills gap and skills shortage research, which is broad and diverse in nature, specific work which examines the phenomena in relation to high-growth firms is relatively lacking, although this area does offer insight into how qualitative investigation might proceed. This is despite the important role that high-growth firms play within the economy in the creation of new jobs, their important place within the national innovation ecosystem, and their important contributions towards aggregate economic growth (Advadike-Danes et al., 2009). High growth firms are therefore an interesting case study into the phenomena of skills gaps and skills shortages – not only do they possess a thirst for highly skilled and motivated workers, both with respect to technical and soft (e.g., sales) skills, but their very existence suggest that these firms are either not encountering difficulties in accessing the required skills, or that they are otherwise somehow able to successfully navigate a landscape of insufficient skills supply and overcome any such difficulties.

Skills are certainly seen as an important component of the high-growth or fast-growth firm literature, and their contribution to HGF firm status is widely acknowledged (Baptista & Leitao, 2015; Tonoyan & Strohmeyer, 2019). For the founder or entrepreneur, themselves, skills accrual and skills development have been identified as an essential component in bridging and connecting initial idea generation and opportunity identification through to business start-up and the achievement of high-growth status (Saste et al., 2022). Moreover, the notion of the "entrepreneurial mindset" ((Levie and Autio, 2013) has almost intangible personal characteristic or work-ethic overtones which are so reminiscent to readers of the skills shortage literature (and in particular, as it illuminated the notion of the "good bloke syndrome" (Oliver & Turton, 1982)). Indeed, adding to the concept of soft or core skills, entrepreneurship scholars talk of "entrepreneurial skills" as a toolkit in and of itself (Iza, 2020). Notably, in addition to managerial skills being an important determinant of entrepreneurs building high growth firms, it has been shown that an openness and willingness to delegate managerial duties to others is equally important a marker (Dwyer & Kotey, 2016)

Still, there remains a shortage of research focussing on the nexus of high-growth firms and skills deficiencies. In a study looking at what factors are holding back potential high-growth firms from achieving this potential, Lee (2013) suggests three factors which are relevant to the debate of skills supply. Firstly, HGFs are found to perceive difficulties in the recruitment of new staff, for procedural issues and, secondly, for lack of skills. Thirdly, these HGFs are also found to be held back by the availability of suitable skilled or expert managers. Interestingly, and with definite relevance for this research project, within the dataset that the author uses, these firms are found to be more likely to perceive each of these issues compared to potential high-growth firms, and the population of firms more generally. (As an aside, the general population of firms was more likely to perceive skills shortages compare to the set of potential high growth firms). These findings may suggest that skills are of greater value to high growth firms, are more on the minds of managers and recruiters within these firms, and that they are seen as a larger obstacle to growth. Nonetheless, this study explicitly only studied HGF perceptions, without the use of more holistic and multi-perspective indicators to assess shortages. This study also does not differentiate between skills experiences as they relate to the separate cohorts of existing employees and potential new hires.

Mason & Brown (2013) do discuss high-growth firms in Scotland, looking specifically at supporting policies which are and, in their opinion, ought to be in place. While courses looking to hone technical skills are found to be in place, there is seen to be a dearth in support mechanisms in place to refine and enhance "specialist sales and marketing skills" which are found to be lacking in potential high growth firms. Moreover, the authors find that leadership skills, so central to the popular notion of the entrepreneur, are by no means a given for high growth enterprises and high growth entrepreneurs, and indeed are an area which should be supported and developed through policy. In summary, however, there remains a distinct lack of literature examining if, how and why high growth firms are escaping, mitigating, or otherwise overcoming the negative skills issues that they encounter.

There are a number of key findings that can be surmised from the literature that inform the design and findings of this thesis. The first of these is that there is wide agreement that it is difficult to (a) define and (b) operationalise the concept of "skill shortages" and "skill gaps". Thus, to the extent that these issues can be meaningfully investigated, there is consensus that a range of approaches – utilising a mixture of economic indicators, proxy variables and survey data – is necessary to detect and measure any genuine gaps or shortages between supply and demand. This approach, however, is not undertaken in the literature as studies utilise usually just one measure of skills deficiency in their approach. Therefore, the majority of work on skill deficiencies, even that coming from academia, does not analyse wage/salary fluctuations, even though it is acknowledged that the price mechanism plays a fundamental role in signalling and eliminating economic shortages and surpluses. Despite the fact that there remains substantial confusion as to what is meant it is employers mean when they talk of skill gaps and skill shortages, high quality survey data (such as that from the ESS) can go a long way to illuminate these issues. There exists some consensus regarding the determinants of skill shortages, such as the age, size and/or growth rate of the organisation or industry. There also exists some confusion regarding the regional distribution and determinants of skills mismatches. In the UK there appears to exist some discrepancy between areas of high skill shortages (London & the South East) and areas of lower levels of skill shortages (peripheral areas and the North of England). However, evidence from Andalusia suggests that those less economically dynamic areas are more affected by skill shortages that the provincial capitals and coastal areas.

This is an important area of research with much relevance to the study undertaken here. Economists research what they call regional and spatial economics have noted that more highly skilled workers tend to live in densely populated urban areas within a given country (Di Giacinto et al., 2014; Glaeser & Resseger, 2010). There are mutual benefits for workers and firms because of this. Firms also benefit quite substantially from locating within densely populated urban areas, where cost savings are enhanced by co-location, network effects, and a variety of economies of scale throughout the supply chain and customer base (Marshall, 1890; Porter, 1990; Krugman, 1991) – something noted as "agglomeration economics". Co-location within densely populated urban areas therefore produce more dynamic economic performance and work to heighten firm productivity levels, something which is backed up by quite a substantial body of evidence (Ciccone, 2002; Combers, Mayer & Thisse, 2008; Fingleton & Lopez-Bazo, 2003). Fast-growth firms have even been found to have positive spillover effects for *non*-fast-growth firms located in the same area and same industry (Du & Vanino, 2018). Moreover, plenty of research suggests that labour markets are rather well defined spatially, which greatly limits the ability of firms to source labour from distances further away than their located sites (Raines et al., 2001; Saxenian 1994; Boschma et al., 2014; Cappelli et al., 2019; Fratesi & Percoco, 2014). These factors presumably have quite detrimental impacts on firms located in more rural, peripheral areas (Morris, Vanino & Corradini, 2019), something which this study seeks to investigate in greater detail.

Finally, little evidence exists on the impact and effects of skill shortages. Some evidence suggests that there is a detrimental impact on firm productivity levels (Bennett, J. & McGuinness, 2009), but these studies often rely on small quantities of data. Moreover, the impact of mismatch on other metrics of firm performance (sales figures, for example) is negligible or inconclusive. The following hypotheses can therefore be deduced from the above literature:

Hypothesis 1

> Geographically more isolated firms will suffer more from skill deficiencies than firms located in or near urban areas

Hypothesis 2

> Firms operating in knowledge intensive sectors will suffer more from skill deficiencies than firms operating in non-knowledge-intensive sectors

Hypothesis 3

> Larger firms will suffer more from skill deficiencies than micro, small or medium size enterprises

Scotland provides an interesting case study for all of these issues. It is a small but highly educated country[16] with an economy skewed towards skilled, knowledge-intensive sectors, particularly across industries in the service, energy and high-tech sectors. However, recent international test scores of school pupils aged 15 reveals that educational performance has been declining relative to similar-sized OECD countries, for several consecutive years (PISA, 2013; 2016). Moreover, like other peripheral regions in the UK, it has been said that Scotland suffers from a so-called 'brain drain' (THE, 1995), where educated and skilled workers and graduates migrate to London and the UK's South East for work, without sufficient replacement coming in the other direction or from elsewhere. Scotland itself has wide geographic-population disparity, with a markedly high concentration of workers and jobs across the 'Central Belt'[17]– a region running from the Firth of Clyde near Glasgow in the West to the Firth of Forth near Edinburgh in the East, and up the North Sea coast to the city of Dundee in Angus. This conurbation is 'book-marked' by the vast, sparsely populated Highlands and Islands region to the North (and West), and the rural areas of the Borders and Dumfries and Galloway to the South, resulting in one of the lowest population densities in Europe[18] (at ~69/km^2). Nevertheless, recent decades have seen strong economic development – even resurgence – take hold in peripheral regions[19].

[16] According to the UK Office of National Statistics, Scotland was the most 'highly educated' country in Europe in 2014. Nearly 45% of those aged 25-64 had some kind of tertiary education, ahead of Ireland, Luxembourg and Finland (the only other countries over 40%) (The Independent, 2014).

[17] This area, covering only ~13% of the country's total land area, is home to some ~3.9 million people (~72% of the Scottish population) (National Records of Scotland, 2017).

[18] This stands in stark contrast to population density in neighbouring England (at ~406/km^2). The disparity *within* Scotland – ranging from ~9/km^2 in the Highlands and the Outer Hebrides to ~3,471/km^2 in Glasgow (National Records of Scotland, 2017) – presumably brings added variation and complication regarding employee attraction and retention.

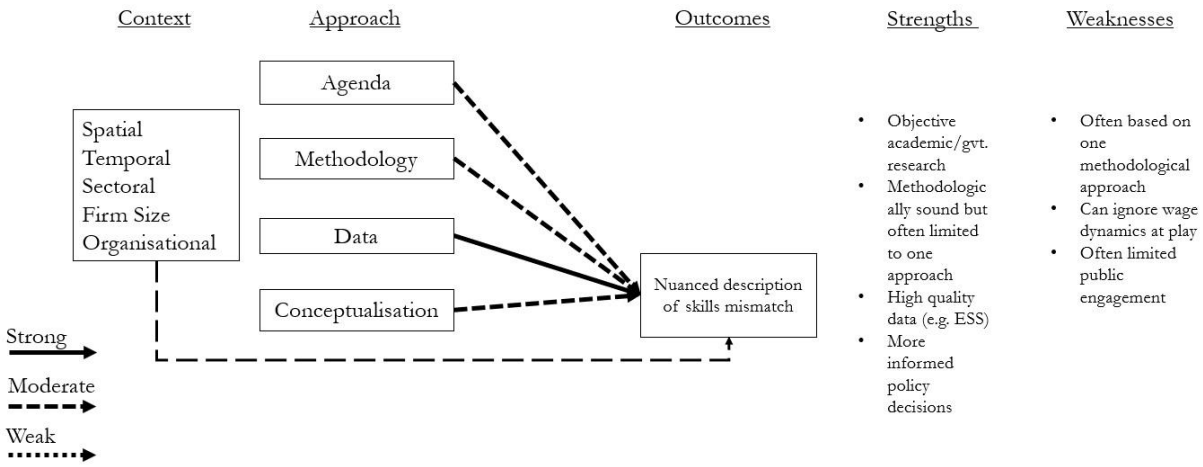
[19] This success has been facilitated, in part, by the work of the region's economic development agency, Highlands & Islands Enterprise (HIE). One outcome of the Scottish Government's current (May 2016-) Enterprise and Skills Review will be the creation of a new South of Scotland 'development vehicle' modelled on HIE. At present, South of Scotland, along with the 'Central Belt', is under the auspice of the main national development agency, Scottish Enterprise. This change is driven by recognition of the greater geographic similarities between South Scotland and Highlands and Islands (and hence, presumably, the greater similarities with respect to business opportunities and barriers to development).

On a final note, much of the literature on skills mismatch has focused on issues of accurate and appropriate measurement (which is discussed in more detail in the next section), both from the academic (Adnett et al., 1989; Oliver & Turton, 1982; Green et al., 1998; Borghans et al, 1998; Skinner et al., 2004) and policy-making perspectives (Grieg et al., 2008; Holt et al., 2010). One of the most important findings from this work, and one area of widespread consensus, is that because of imprecision and heterogeneity across definition and concept, and subjectivity in the perception of employers and employees, multiple measures are needed in the detection of skill imbalances. This necessitates that there must be some degree of correlation between each measure, but that no one measure on its own is sufficient to detect 'genuine' mismatches. At the same time, researchers have continued to primarily focus their study of skills mismatch on one or two measurements, even in more recent works (see for example, Healy et al., 2015). Aside from the educational/qualification mismatch literature, it is surprising to find that there are no skills mismatch studies which utilise a multimethod (n>2) approach. The closest resemblance to this multimethod approach is that utilised in practice by the UK Home Office Migration Advisory Committee (for details see Greig et al., 2008; Holt et al., 2010; MAC, 2017) in order to ascertain suitable occupations for the Shortage Occupation List (SOL), where a range of indicators are assessed alongside survey evidence from the ESS. However, the MAC approach is designed to assess generic occupational shortages and not specifically occupation or industry skill deficiencies.

The difference in quality and reliability between the more robust research and that coming from industry is evident. As Figure 2 below depicts, there area number of areas where the academic work far exceeds that of the studies pushed by industry. First, the lack of an agenda is immediately evident. Academic analyses uniformly paint a complex picture of skill shortages, where determinants and distribution are nuanced, unclear or even confusing, and where recommendations or definitive findings – if given at all – are qualified and presented as decidedly context-dependent. Moreover, the data which drives these studies is of a far higher quality than that used in industry-generated reports. In the case of data collected by the ESS, for example, this is sampled, weighted, disaggregated and accompanied by sufficiently detailed and transparent technical reports. Despite all of this, these studies are almost always dependent on one measure of skill shortages and lack the multimethod approach advocated by conceptual review papers (such as that from Shah & Burke, 2003). This methodological heterogeneity

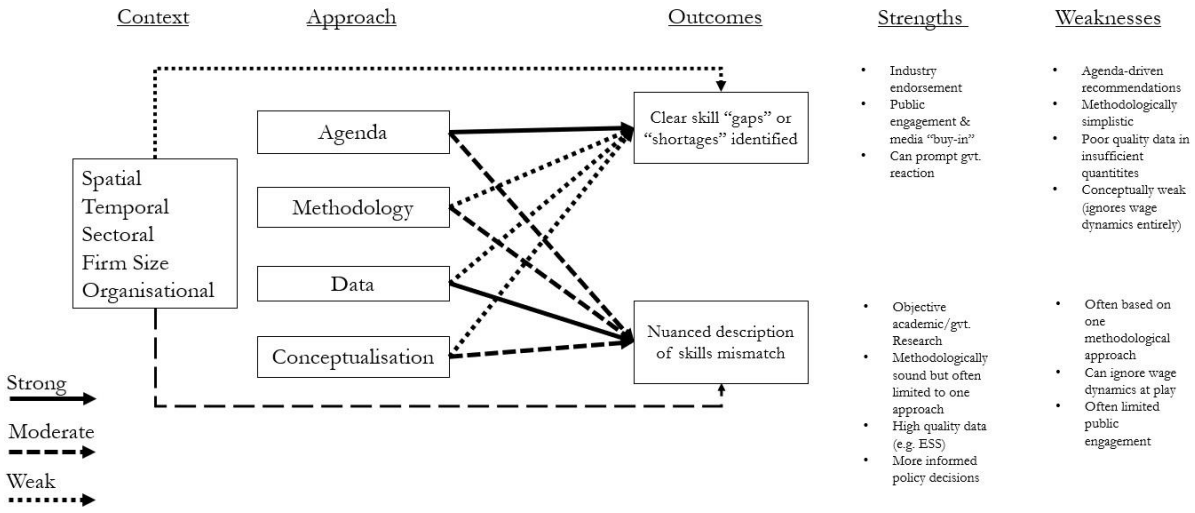
means that assessments based on one measure lack the holistic qualities necessary to identify genuine shortages in the market, even though this approach has long been identified in the literature as an important, even necessary, way for research to progress. Importantly, no research has hitherto undertaken a mixed methods approach incorporating a range of quantitative indicators and measurements accompanied by qualitative insights ascertained through interviews. Building upon the framework started in section 1, the strength of these relationships can be depicted below:

Figure 2: *Categorisation of Skills Research – Process & Findings (Academic-Level Research)*



Source: Author's own work

Figure 3: *Categorisation of Skills Research – Process & Findings (Comparative Analysis)*



Source: Author's own work

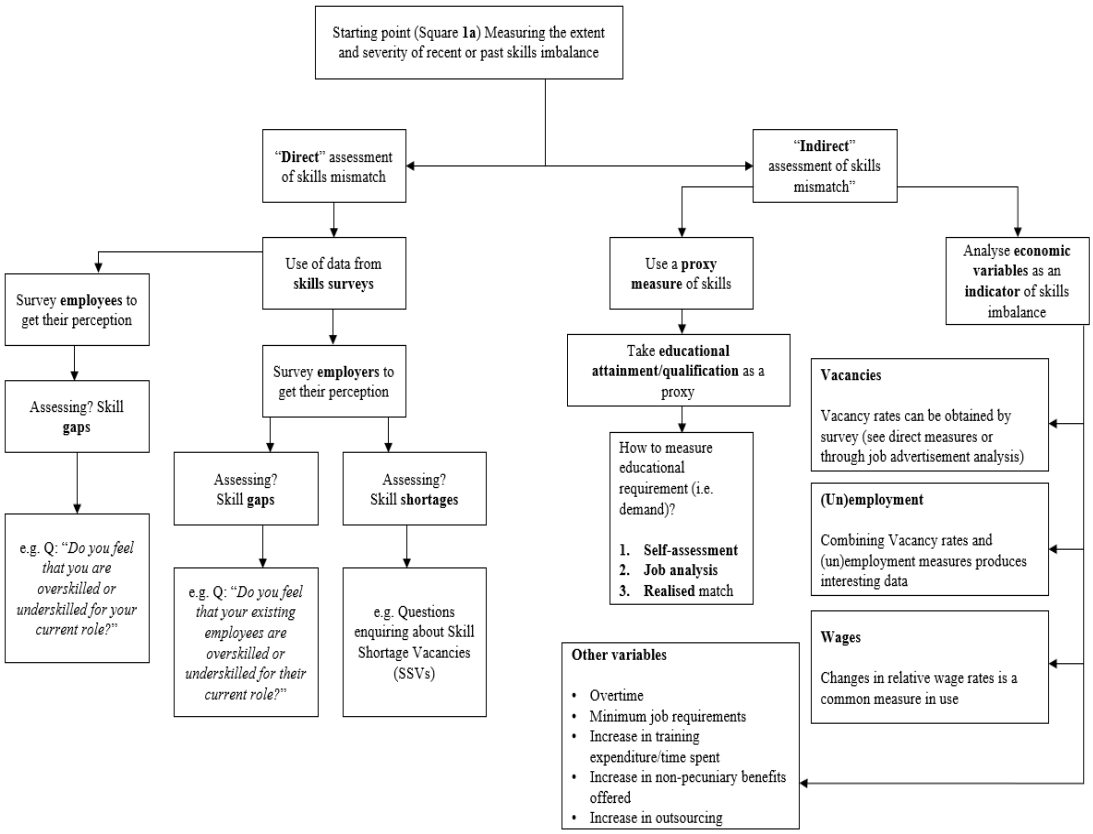
2.4. Methodological issues in skills gap research

The following analysis is based on review of the literature on skills deficiencies, which comes from many different areas of business studies. The existence, extent, determinant(s) and impact(s) of industry- or economy-wide skill deficiencies remain contested issues (for opposing views, see for e.g. Cappelli vs. CBI/Pearson). The origins of this dispute, particularly the origins of the objections held by those sceptical of the notion, are – typically, though not exclusively[20] – methodological in nature. Imperfect methodological approaches to measurement and analysis stem from both the conceptual issues outlined in Section 2.1. above (e.g. the importance of factoring in wage dynamics when assessing 'genuine' imbalances), as well as the inherent difficulties involved in the collection of robust and reliable data. Indeed, these difficulties are frequently interrelated and are, in all probability, insurmountable: when collecting and interpreting data, analysts are confronted with the fundamentally subjective, speculative, erratic, contested and often transient nature of job-worker skills imbalance. A number of researchers have therefore suggested that a 'host' of different

[20] There is also the question of whether advocates *for* the widespread existence and detrimental influence of skill deficiencies are simply looking to ascertain beneficial (e.g. cost-reducing) public policy outcomes (see, for e.g., Watson et al., 2006b).

measures are required when trying to ascertain an accurate picture of any potential discrepancy (Vanieri, 1999; Clarke et al., 2004; Shah & Burke, 2003), something that MAC (2008) describe as perhaps 'the one area of almost complete consensus' in the literature.

Figure 4: Typology of Skill Deficiency Measurement Approaches



Source: Author's own work

Methodological approaches to the assessment of skills imbalance can be categorised as either 'direct' or 'indirect'[21] (see Figure 4 above). Direct approaches utilise human opinion explicitly in their assessment (that of either the worker *or* the employer, or even of both), while indirect approaches assess skill deficiencies (a) as measured by their symptomatic effect(s) on dependent or interconnected economic variables, or (b) through the use of proxy variables. Individual methodological

[21] The use of the word 'direct' here should not be confused with any *direct* scientific measure of an individual's skillset, as undertaken, for example, through the OECD's PIAAC assessments. Rather, 'direct' simply means that the concept of skills imbalance is explicitly addressed by the interviewee or survey/questionnaire respondent. In contrast, the existence and extent of skills imbalance can also be *inferred in*directly through the use of interrelated variables.

approaches, across either broad category, have both conceptual and practical strengths and weaknesses, and can vary greatly in terms of resultant resource costs to the researcher.

Taking indirect approaches first, the revealing effects of imbalance on a variety of economic variables have been the longest used measure in the detection of shortages (Arrow & Capron, 1957), with indicators of vacancy rates, unemployment and wage dynamics being the most common. It is important to note that vacancies (taken alone and as a crude measure) tell researchers very little about the nature of any skills imbalance internal to the organisation (i.e. skill gaps), except to the extent that those vacancies exist *because* of deficiencies of the firm's internal skills base - vacancies will often exist simply because of normal organisation or market expansion. In the literature, vacancy measures of skill shortages that are used most often are those employers deem to be particularly persistent or hard to fill (HTFVs)[22]. Vacancy rates are often viewed alongside measures of unemployment, in a relationship depicted in what is known as the "Beveridge curve" – a curve showing the inverse relationship between employment and the job vacancy rate. In theory, a higher rate of unemployment would normally be accompanied by a lower rate of vacancies. Whilst one of the possible causes of movement in the Beveridge curve may be shortage of skilled labour, it would be difficult to separate this from a range of alternative underlying reasons, such as generic labour shortages or an inefficient "matching" process in the hiring market.

Theoretically, in a "perfectly-competitive" market economy, prices (in the case of labour markets we consider wages) adjust freely to eliminate any market shortages or surpluses. Therefore, for a particular occupation in shortage, where employers face increased competition for scarce skilled labour, researchers would expect to detect upwards pressure on wage rates (in the case of a particularly severe shortage, this movement should be sustained and notable). Correspondingly, the return via wages to those working in skill-deficient occupations would also be expected to increase. However, interpretation of wage pressures should be taken with care when analysing skill shortages. Not only will regulatory measures (e.g. required pay legislation) affect

[22] Those HTFVs which are specifically caused by lack of skills are called Skill Shortage Vacancies (SSVs) and are covered later on in this section. Data on SSVs, and HTFVs, are captured in establishment skills surveys, whereas researchers have long tracked vacancy posts (a cruder measure) by manual collection. Recent technological advances have allowed vacancy data to be "ripped" from internet job sites by specialised software (see for e.g. Burning Glass).

the extent to which wage dynamics signal skill shortages, but many other factors will influence wage pressures in one direction or another (e.g. productivity levels, collective bargaining, firm profitability and market expectations). In the UK, data on wage dynamics, disaggregated geographically and by occupation, are published in the Annual Survey of Hours and Earnings (ASHE) – itself an amalgamation of monthly Labour Force Survey (LFS) data.

The UK Home Office Migration Advisory Committee (MAC) utilise a range of shortage indicators in compiling their Shortage Occupational List (SOL) – the list of occupations which Government takes specific note of when formulating UK immigration policy[23]. Whilst this list takes account of skills shortages, its main concern is occupational (e.g. generic labour) shortages. Included in these are various measures of vacancy rates (taken alongside unemployment measures) and wage fluctuations, in what the MAC refer to as volume-based indicators and price-based indicators, respectively. They utilise a substantial range of indicators. For example, tor volume-based indicators, the MAC track (1) Annual percentage change in employment estimates, (2) Annual percentage change of median total paid hours, for all employees and (3) Absolute change in proportion working for employer for less than one year, among others. For their price-based measures, the MAC track (a) Annual percentage change in median hourly pay for all employees, (b) Annual percentage change in mean hourly pay for all employees, and (c) Return to an occupation, given NQF3, with age and region controls. In addition, the SOL also utilises more granular data from the Employer Skills Survey.

There are of course many other indicators, both macro- and micro-economic in nature, that, should reliable data be available, could be used in the determination of mismatch. In effect, most, if not all, potential indicators are simply signs of adjustment measures that employers would undertake, at least in the short term, to combat any perceived or real deficiency in the skills available to them. Many of these measures are unlikely to be captured accurately enough in any available data source to allow for broad, meaningful comparative analyses. An in-exhaustive list, some adapted from Shah & Burke (2003), would include:

[23] Recent political developments (in particular Brexit process and related policy settlements) are relevant to this debate. See Section 5.6 for more details on how these process impact this study.

- Hours worked and intensity of house worked (i.e. number of occupants in work)
- Increase in overtime
- Reduction in minimum qualification requirements
- Restructure workload among other employees
- Increase in training expenditure/intensity
- Increase benefits offered in job adverts
- Increase in expenditure on outsourcing

Educational attainment has long been known to constitute an important – indeed core – component of skills formation (Becker, 1964). However, it is also acknowledged that 'skill' is a dynamic, malleable and context-dependent concept, and that skills accrual (and indeed skills atrophy) occurs over the entirety of an individual's lifetime. As Heckman & Masterov (2005) state, skill formation 'begins in the womb and continues on in the workplace'. Skills are a function not only of educational attainment, but of innate ability, the quantity and quality of (career-long) training provision, the nature and extent of past experiences, as well as the ability of individuals to successfully assimilate, process, transfer, adapt, learn, utilise, reinforce and gain from those past experiences. Skillsets are 'multi-dimensional and at least partly unobservable' (Van Rens, 2015). Two subsequent facts materialise: first, tracking education and qualifications matching presents researchers with a conceptually sound and often economically practical method of assessing a core component of skills matching; second, regarding skills matching more generally, this method is conceptually (and therefore empirically) incomplete, and any findings must be assessed in conjunction with other sources from the wider evidence base. This point is further highlighted by an apparent contradiction lying at the centre of the skills imbalance debate. While reports of skill deficiencies continue to arrive from industry (ESS, 2015; ESS 2017), survey evidence also suggests that *over*education remains a concurrent and persistent workplace problem (Chevalier & Lindley, 2009). Sutherland (2012, pg 620) captures this imprecision well:

> "Qualifications constitute a measure of educational attainment and academic competence. Consequently, they constitute only one possible measure which may be used to examine the extent to which there is a mismatch between individual and job. Skills are another possible, if more problematic, measure.

> Measuring skills is seen as a subjective exercise, not the least because many of an individual's skills are obtained informally on the job, often by a process of osmosis, and are rarely certificated. By default, therefore, frequently specific qualifications – for example, vocational qualifications – are used as surrogate measures of skills."

There are two further practical reasons for the analytical and methodological focus on measuring qualifications mismatch instead of the more abstract notion of a pure skills mismatch. The first stems from the fact that children and young adults spend so much time in formal education – at a minimum from early years to age 16 – at a time when cognitive development is at its most productive. As a result, one additional year of education for someone in primary school is far more beneficial than an additional year of education for someone in midcareer, and this is doubly true if that year of education happens to be a productive one with a successful mixture of theoretical and practical pedagogical methods as outlined in up-to-date best-practice consensus. Skills enhancement engendered by educational improvement during this specific time period therefore represents perhaps the greatest opportunity for public return on investment. Second, and as a related point, many of those (e.g. CBI, 2015) who lobby for greater public-sector investment in skills have suggested that the education system is the origin of poor skills performance later in life – a proposition that necessitates a wider evidence base.

Measuring educational attainment (i.e. supply) is fairly straight forward – e.g. total number of years of schooling; highest level of qualification attained; type of highest level of qualification attained – but ascertaining educational requirement (i.e. demand) is more challenging. Three methods have emerged in the literature: 'self-assessment', 'job analysis' and 'realised match' (Battu et al., 2000; McGuiness, 2006). The first of these methods – the most common – utilises data from employee surveys, where researchers garner information regarding whether workers feel they are over-qualified, under-qualified or perfectly matched for their current role. The second method – 'job analysis' – ascertains the required level of qualification from expert job analysis. The third method – 'realised match' – is more distinct from the first set, and uses as a somewhat arbitrary measure the standard deviation from the mean educational attainment levels for a specific industry or job type. The resulting effects of definition and measurement here are not trivial. Battu et al. (2000) undertake an empirical analysis of educational mismatch using all three measures and find that only weak

correlation exists between them[24]. Nevertheless, the ease with which data can be obtained makes educational mismatch an interesting source of information for skills mismatch researchers.

Turning to direct approaches, the third methodological category used to ascertain the existence and extent of skill imbalances is establishment skills surveys. Establishment skills surveys are instruments which gather information on employer demand for skills, employers' experience of attempting to access the required quantity and quality of skills, and their intentions on investing in employee skills development going forward. Establishment skills surveys are useful to a wide variety of actors. Additionally, well designed surveys will also enquire about workplace performance so that researchers can analyse connections between skill requirements, access to skills, and business outcomes. Establishment surveys are different from employee skills surveys, but in an ideal world, a well-funded establishment skills survey would also gather data on employee perceptions, to allow for cross examination (ILO report). Establishment skills surveys can be used to monitor current demand for skills, which in turn can then be used to inform the design of skills forecast models. Surveys can be economy-wide, can be focused on certain occupations, certain industries, can be undertaken at sectoral level or can be geography-specific. Well-designed surveys at the aggregate level would stratify the data across these measures to allow for granular comparative analysis. Well-designed surveys would also stratify across skillsets, to allow for comparisons of the deficiencies in different types of skills: soft-skills and technical skills being the two broad categories, both of which could then be further sub-divided.

Skills surveys can be expensive and difficult to implement, so smaller more targeted surveys are often the most cost-effective depending on what are the aims and objectives of the commissioning body. More targeted surveys, however, don't capture dependence effects, for example on the interactions both between and within sectors. Although most surveys are cross-sectional, there are a number of longitudinal surveys operating in the UK. The most widely known of these are the Employer Skills Survey and the Employer Perspectives Survey, both of which were carried out until recently by the UK Commission for Employment and Skills (UKCES) and are now under DfE

[24] For more detailed evaluations of each method, see also Hartog (2000) and Leuven & Oosterbeek (2011).

funding. Ideally, skill surveys should cover recruitment experiences (which would focus on skill shortages), skills of the existing workforce, (which would focus on skill gaps) and training investment (which would focus on workforce skills development.

Like all results obtained using survey methods, data from establishment skills survey should be considered with a solid understanding of method limitations in mind. One of the main weaknesses of employer skill surveys is that they more often than not fail to incorporate the wage dynamics that are so central to the 'economist's view' (Shah & Burke, 2003) of skill shortages. This view states that skill shortages can only be said to truly exist when employers are offering wages at the 'market clearing' rate and (yet) still can't access the quantity and quality of skilled labour that they require. If evidence suggests that employers aren't adjusting wages to 'clear' the market – to signal to employees that they will reward them for investment in 'x' type of skills – then it could be said that a 'true' skills shortage does not exist, even if employers perceive this to be the case. This, Van Rens (2015) refers to as largely a 'semantic issue'. Nevertheless, the logic behind this analysis is strong, and a well-designed survey would need to incorporate a question(s) on salaries or wages.

Another limitation of the survey approach is that establishment skills surveys rely on employer *perception* of skill mismatch, which the literature has long-noted as decidedly varied. Several phenomena confuse our understanding here. Evidence suggests that firm size, firm and market growth rates and, tellingly, survey respondents' position within the firm all affect the extent to which shortages are reported (Watson et al, 2006a). There is also uncertainty regarding exactly what it is that employers perceive as the benchmark of any existing shortage or gap. That is, some employers may view shortage with respect to some desired or optimum level of firm output or performance, irrespective of the level of skills sufficient for current operational requirements. Green and Ashton (1992) refer to this as a 'skills deficiency', something which has also been termed a nominal or normative skills deficiency. At the same time, evidence suggests that many employees are likely to see themselves as over-skilled or overqualified for jobs (Sutherland, 2012), which is presumably even the case in industries where employers report persistent skill deficiencies. There is further uncertainty as to what specific skillset employers refer to when they consider firm skill deficiencies, unless explicit differentiation is made when they are surveyed. Oliver and Turton's (1982) study found that employers commonly referred to 'stable', 'reliable' or 'responsible' workers when they were asked about skill deficiencies, concepts which

would more accurately be termed characteristics than skills. The authors refer to this as the 'good bloke syndrome'. In addition to these "academic" issues, there are practical, real-world consequences to the way employees conceptualise and verbalise their skills difficulties. As Green et al. (1998, pg 165) state,

> "How employers conceive of skill shortages matters because they are often the prime, often the only, source of information allowing judgements to be made about skills disequilibria. What employers say therefore affects general perceptions about the adequacy, or otherwise, of skills supplies. In Britain's employer-led system of training this is likely to have strong bearing on policy formation."

One final benefit of the direct approach is the inherent flexibility that is offered. As is often case in these studies, generalisability is sacrificed for level of detail, and while cost considerations are unlikely to be trivial, additional approaches could take the form of:

- Tracer studies: used to trace the progress of graduates of educational institutions as they transition into further study and/or eventually into employment:
  Strengths: qualitative insight
  Depth: weaknesses: expensive
- Case studies: can be used to extensively analyse many aspects of the skills experience of an organisation and gather insight on both employer and employee perceptions:
  Strengths: qualitative insight, depth
  Weaknesses: time consuming

Table 5: *Examples of Measurement and Method in Skills Mismatch Research*

Method/measurement	Demand based on	Literature
In-depth interviews	Employer perception	Oliver & Turton (1992); Skinner et al. (2004)
In-depth interviews	Worker perception	Weedon & Tett (2013); Skinner et al. (2004)
Employer skills survey	Employer perception of skill shortage vacancies (SSVs) or hard-to-fill vacancies (HTFVs)	Bosworth (1992; 1993); Haskel & Martin (1993a; 1993b; 2001*); Halaby (1994); Green et al. (1998); Bennett & McGuinness (2009); McGuinness & Wooden (2009); McGuinness & Sloane (2011); Liu & Grusky (2013); Mavromaras et a. (2013); Healy et al. (2015); Borghans et al. (1998)[†]; Green and Owen (2003); Sanchez-Sanchez & McGuinness (2015); Green and Zhu (2010); Healy et al. (2015); Stevens (2007); Watson et al (2006a; 2006b)
Worker skills survey	Employee & worker perception	Allen & van der Velden (2001); Borghans et al. (1998)[†]; Badillo Amador et al. (2012); Caincara & Sgobbi (2012); Green & McIntosh (2007); Halaby (1994); Mavromaras et al. (2013); McGuinness & Sloane (2011); McGuinness & Wooden (2009); Sutherland (2012);
Indicators constructed around vacancy rates *not* ascertained via employer surveys	'Objective' measure – job listings	Adnett et al. (1980); Shah & Burke (2010); Greig et al. (2008)[β]; Borghans et al. (1998)[†]; Dustman et al. (2010)[β]; Holt et al. (2010)[β]; Borghans et al. (1998)[†];
Indicators – wage growth dynamics	'Objective' measure – worker survey	Shah & Burke (2010); Greig et al. (2008)[β]; Dustman et al. (2010)[β]; Holt et al. (2010)[β]; Blank & Stigler (1957)[β]; Vanieri (1999)[†β]
Indicators – return to occupation	'Objective' measure – worker survey	Shah & Burke (2010); Greig et al. (2008)[β]; Borghans et al. (1998)[†]; Dustman et al. (2010)[β]; Holt et al. (2010)[β]
Educational/qualification mismatch – 'self-assessment'	Worker perception – survey data	Allen & van der Velden (2001); Battu et al. (2000)[α]; Alba-Ramírez (1993)[α]; Battu et al. (1999)[α]; Caincara & Sgobbi (2012); Chevalier (2003); Chevalier & Lindley (2009); Dolton & Vignoles (2000)[α]; Dolton and Sillles (2008)[α] Duncan & Hoffman (1981)[α]; Green & McIntosh (2007); Green and Zhu (2010); Hersch (1991); Marchante et al. (2005)[α]; McGuinness & Sloane (2011); Rumberger

		(1987)[α]; Sicherman (1991)[α]; Sloane et al. (1996)[α]; Sloane et al. (1999)[α]; Sanchez-Sanchez & McGuinness (2015)
Educational/qualification mismatch – 'job-analysis'	'Objective' measure - expert analysis	Rumberger (1987)[α]; 89?) Kiker and Santos, 1991; Hartog and Oosterbeek 1988, Van der meer, 2006); Halaby (1994)
Educational/qualification mismatch – 'realised-match'	'Objective' measure – worker survey	Battu et al. (2000); Alba-Ramírez (1993)[α]; Badillo Amador et al. (2012); Rumberger (1987); Verdungo & Verdungo (1989)[α]; Cohn & Khan (1995): Groot (1996); Bauer (2002)[α] Kampelmann & Rycx [α] (2012); Kiker et al. (1997); Mavromaras et al. (2013)
Returns to qualification held	'Objective' measure – worker survey	Borghans et al. (1998)[†];

Source: Author's own work

N.b. Some studies utilise and/or compare two or more measures in a single study, hence why some papers are duplicated across >1 method/measurement category. This is particularly true with respect to the literature surrounding educational/qualifications mismatch.

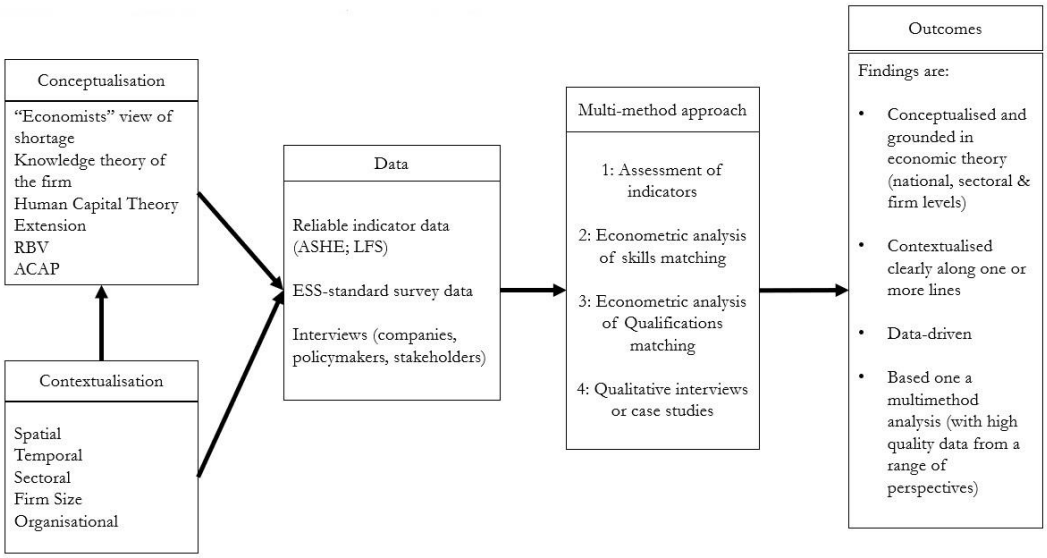
† These studies are reports (mostly commissioned by and for government). They often make method/measurement recommendations but do not necessarily carry out the analyses themselves.

α These studies do not explicitly link, or *explicitly do not* link, educational mismatch and skills mismatch research. They are included here to give an indication of the wider education/qualifications mismatch literature, given the linkages that *are* explicitly made in other studies.

β These studies focus on (generic) occupational shortages, which encompass both specific occupational skill shortages and those affected by generic labour shortages.

Methodological considerations therefore lie at the very heart of our understanding of the nature and extent of job-worker skill discrepancies. Data collection, data points, research findings, implications, even public policy outcomes are all determined, perhaps more than is usual in labour market studies, by (sometimes small) variation in methodological approach. Two key outcomes of this review can be surmised. First, given the very nature of supply-demand corrections in a market economy, it is important that price dynamics be incorporated into any assessment of 'genuine' mismatch. At the very least, consideration must be given as to how and why the price mechanism may have failed to correct for any imbalance. Secondly, siloed approaches must not be considered in isolation. Findings should be compiled across a range of methodological techniques, aggregated, and judgement gauged from the overall weight of evidence. Taking account of the strengths and weaknesses of the approaches outlined above, a new multi-method approach can be constructed (see Figure 5 below).

Figure 5: *Multi-Method Holistic Approach*



Source: Author's own work

CHAPTER 3: Skills Utilisation at the Level of the Firm

3.1. Introduction/Summary

This chapter provides further theoretical grounding for the study and analyses existing "theories of the firm", setting context for the qualitative portion of the study and enabling the contributions of that portion of the research to be embedded within the relevant literature, specifically as it relates to fast-growing firms. Thus, special attention is paid to the operationalisation of "skills" within an organisational setting, namely by looking at the literature on human capital. Secondly, the treatment of human and knowledge resources within the organisation is discussed, with focus on the resource-based view (RBV) as developed by Penrose (1959) and later scholars in the management literature. Moreover, the knowledge-based view (KBV) and knowledge management literature is discussed here. This is important in determining how skills are treated within the firm, how they are fostered and developed, and how they influence organisational success. Lastly, this chapter discusses the human resource management literature as it sets out "best practice" with regards to how managers, and human resource managers in particular, attempt to address issues of skills shortage. Specifically, it looks at how they can contend with these issues in recruitment and selection, in training and development, in rewards management processes, and in employee and skills retention. Thus, the complementarities between each of these literature streams are brought together and research gaps outlined. This chapter proceeds under the following headings: 3.2. Theorizing and operationalising workplace skills; 3.3. Human and knowledge assets & firm performance; 3.4. Attracting, enhancing & retaining skills & knowledge.

3.2 Theorizing and operationalising workplace skills

Although workforce skills have undoubtedly captured the attention of business scholars as far back as Adam Smith (Smith, 2008 [1776]), the foundations of modern economic assessments of skills endowment trace to the work of Schultz (1961), Becker (1964) and Mincer (1974) and their analyses of "human capital". Human Capital

Theory hypothesises that variation across workers' lifetime earnings are a result of individual differences in knowledge, skills and abilities (KSAs) gained through formal/informal education, training, experience or even through inherited characteristics. In the language of economics, human capital is defined as 'the individual worker's productive skills and knowledge as reflected in his or her marginal productivity' (Sloane et al., 2013). The theory implies that individuals invest in their own human capital with the aim of maximising long term wage returns. Under the assumption that earnings reflect marginal productivity, firms invest in workers' human capital in order to increase productivity returns to the firm. Here, as Smith (2003) suggests, the general flow of causality is:

↑EDUCATION→↑HUMAN CAPITAL→↑PRODUCTIVITY→↑EARNINGS

The incentive therefore exists for both individual workers and firm management to invest in human capital. For workers, this will usually involve making a decision to invest in further or higher education – under the assumption that primary and secondary education are almost universally subsidised – or in out-of-hours skills training. A lot of empirical work has investigated the magnitude of earnings return to tertiary education. Mincer – progenitor of the Mincer earnings equation – himself suggested that further and higher education account for 13% of variation in wage returns in the US, whilst education and work experience account for around a third (Mincer, 1993)[25]. For the firm, the decision involves whether to invest in the training of employees. This can come in the form of on-the-job or off-the-job training and can be both financially costly and time-consuming (which may well have the effect of incurring further opportunity costs). Nonetheless, the resultant increase in productivity is a great incentive for firms to invest in the training and development of their workforce.

Despite its influence across several research fields, the theoretical and empirical explanatory power of Human Capital Theory has been criticised, particularly concerning the extent to which operationalisation of human capital accurately and robustly corresponds to an equivalent assessment of *actual* skill level. Labour market Signalling Theory, developed by Spence (1973) suggests that, instead of increasing HC

[25] 1 For discussion on wage returns to education in the UK, see: Blundell et al. (2000); Bonjour et al. (2003); Booth et al. (2005); O'Leary and Sloane (2005). For discussion on wage returns to education in a Scottish context, see Polachek (1995).

directly, formal educational attainment sends a signal to employers that a candidate is suitable for the role advertised. Instead of knowing definitively whether a candidate has the requisite skill base, employers assume this to be the case given the candidate's attainment of formal qualification. Correspondingly, the employer assumes, rightly or wrongly, that investment in HC actually leads to increased HC outcomes. Building on this, the job-screening approach (Smith, 2003) suggests that employers set minimum qualifications levels in order to filter out potentially unsuitable candidates from the application process, again drawing upon the assumption that qualifications correspond to skills, at least to a certain degree. Moreover, the effectiveness of education or training in raising human capital isn't solely dependent on the decision to invest or not. There is growing evidence of the importance that early development has on an individual's capacity for lifelong learning (Heckman and Masterov, 2005) with the belief that what workers are capable of achieving once they are employed will likely be determined by factors shaped when they were children. Firm investment in training and development will therefore have to be sustained and well-targeted to have its desire effect.

Thus, the influence that HCT has had across the research agenda over the last half century is apparent. In contrast to its initial focus on wage/productivity returns, it has since been adapted as a framework by a range of social science and business researchers. For example, variation in cross-country HC stock has been suggested as an explanation for differing rates of economic growth. HC has also been analysed in empirical estimates of Total Factor Productivity (Manuelli and Seshadri, 2014), and although not the focus of this thesis, has also found overlap in Capital Theory as it applies to entrepreneurship studies [for a discussion on this see Lam, Shaw, and Carter (2007)].

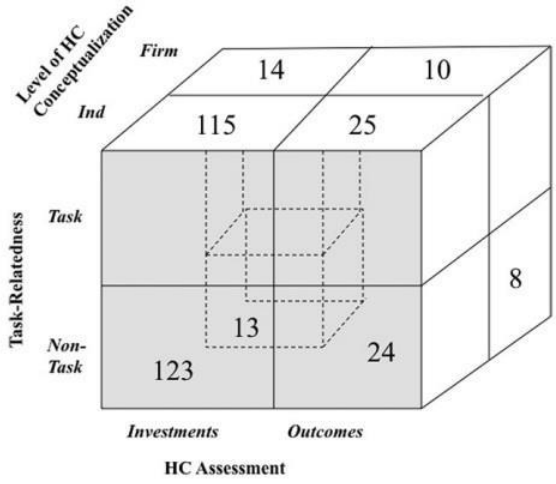
Human Capital Theory has long been utilised by entrepreneurship, small business, and management scholars investigating the explanatory factors of new venture success. In doing so, they have moved the theory further beyond its initial explanation of variation across workers' lifetime earnings. The first paper combining these approaches appeared in 1980, where Ray and Singh analysed the success effects of individual human capital differences across Indian farmers (Ray and Singh, 1980). Since then, human capital-entrepreneurship research has intensified, with per-year research output in the field roughly trebling since the year 2000; the consensus highlighting relatively small but significant returns to human capital. Several recent publications provide an overview of this existing human capital-entrepreneurship

literature. Marvel et al. (2014) offer a systematic review of the literature, with emphasis on theory and concept, whilst Unger et al. (2011) and Martin et al. (2013) both meta-analyse the findings of three decades of empirical research. Although differing in their scope and aims, all three papers (1) garner insight into conceptualisation of the human capital- entrepreneurship nexus and (2) suggest paths for future research. Most importantly, this provides a clear foundation for advancing conceptualisation, with research to-date depicting three distinct elements to the analysis: (1) whether human capital relates to job-specific or *non*-job- specific tasks; (2) whether human capital *investment* or human capital *outcomes* are assessed; (3) whether the unit of analysis examines *individual* human capital or human capital at the level of the *firm*. Notable, a regional analysis of human capital is lacking, and constitutes a gap that this thesis aims to directly address.

While the distinction between task-related human capital and *non*-task-related human capital (Cooper et al., 1994) (Marvel et al., 2014) speaks to modern debates on technical versus non-technical ("soft" or "core" skills), the second and third elements warrant further discussion as they relate to the research aims of this thesis. Once more highlighting the difficulties of operationalising workforce skills, the authors find that there exists a disconnect in conceptualisation and measurement between direct human capital investment (for example, through education) as opposed to the *actual gains and outcomes* of this investment. Human capital investment comes in the form of education, training or experience in a relevant area. Outcomes of human capital investment relate to the actual knowledge, skills and abilities (KSAs) gained from such investments. Not all of the skills gained by a graduate, for example, during their formal education will be relevant to their line of work. Furthermore, a proportion of these skills may have diminished over time or even have become forgotten. Human capital *investment* is the most frequently used measure of human capital, mainly due to concerns over data availability and reliability. However, investment is merely a proxy measure of the existing stock or flow of human capital, with past studies using investment measures as crude as years of schooling. Past research has shown that outcomes of human capital investment is a superior measurement. KSAs are better indicators of HC than qualifications, as KSAs gained during education or training can deteriorate over time. This operationalisation of KSAs, rather than years of schooling or education, is therefore the approach utilised in skills surveys (UKCES, 2014).

Combining these three levels of analysis, Marvel et al. (2014) provide a visual conceptualisation of the existing human capital-entrepreneurship research, shown here in Figure 6. Their 2x2x2 matrix highlights the number of academic papers published with respect to their specific focus and level of analysis. A number of things stand out; firstly, the majority of papers to-date have utilised a proxy measurement of human capital – human capital *investments*. Around a fifth use the preferred method of outcomes of human capital investment. Secondly, all papers utilise nontask-related human capital, instead of task related, which likely restricts proper analysis of high-skilled, technical firms, for example. Thirdly, the vast majority of papers analyse the human capital-entrepreneurship nexus at the individual level. Only 24 papers analyse success as a function of firm-level human capital capacity. As Marvel et al. (2014) state, 'firm-level human capital conceptualisations using outcome dimensions has received the least amount of attention', and a regional analysis doesn't feature in their work. This gap offers an opportunity for this research project to address more universal implications in addition to its Scotland specific skills deficiency distribution analysis.

Figure 6: *Focus of Past Human Capital Research*



Source: Marvel et al. (2014)

3.3. Human and knowledge assets & firm performance

A large body of literature covers the importance of human assets to firm success (Cyert & March, 1963; Conner, 1991; Lockett & Thompson, 2001; Makadok, 2001; Barney & Arikan, 2001; Newbert, 2007; Armstrong & Shimizu, 2007; Kraaijenbrink et al., 2010). A pivotal development in this regard is the Resource-based View (RBV) of the firm (Penrose, 1959). Here, Penrose sets out not to discover 'what determines whether a particular firm can grow', but rather, assuming that firms *can* grow, 'what principles govern their growth...' and 'how fast and how long can they grow?' (Penrose, 1959; pg. 7). In this respect, her analysis departs from the preceding neoclassical theories, which aim to determine the outcomes of firm operations, with specific attention paid to equilibrium states of cost, output/size and profit. Penrose sees no reasons why firms should be particularly inclined to tend towards any equilibrium stage, arguing instead that the neoclassical notion of discrete stages of output does not reflect the nature of firms in the real world (*Ibid*. pg. 2) – an inherently *disequilibrium* approach. The thesis of the book addresses one of the central questions any complete theory of the firm should answer: what are the causal influences that determine firm growth? Rather than analysing external factors of influence – which later works would become concerned with – e.g. (Porter, 1980) – Penrose suggests that factors *internal* to the firm provide many of the answers. Central to this, Penrose argues, is the fact that each firm possesses a diversified, *heterogeneous* bundle of resources which will determine its growth rate. These resources are viewed as "fungible", and a combination of internal and external resources will determine the optimal growth rate for any one particular firm. Each firm will possess a variety of capabilities enabling them to make different uses of resources, thus adding to the heterogeneous nature of firms across an industry.

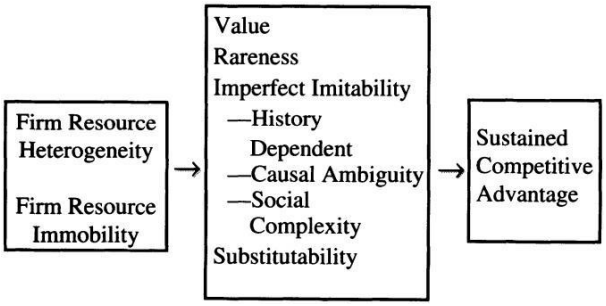
The modern form of RBV can be seen as a prescriptive approach to firm strategy, with several landmark contributions to the theory coming from the field of management[26] (Wernerfelt, 1984; Rumelt, 1984; Barney, 1991; Grant, 1991). The management literature positions RBV against the perspective of Industrial-organisation (IO), where IO accounts for external influences of competition and opportunity, and an

[26] The *Journal of Management* has twice published Resource-based View special issues: First in 1991, Vol. 17 (1) and again in 2001, Vol. 27 (6).

RBV perspective is used to examine internal firm growth factors. One of the core assumptions in the original IO model is that firm attributes are viewed as homogeneous; that the factors influencing business growth lie external to the firm in the forms of competitive threats or opportunities. On the other hand, RBV undermines the assumption of perfect competition found in the neoclassical analysis. If firms utilise heterogeneous resources to attain SCA (sustained competitive advantage), then the theory – by definition – acknowledges market imperfections, where vastly different firms compete operationally for market success. Wernerfelt (1984) helped to solidify Penrose's theory in the area of strategic management, stating that for firms, 'resources and products are two sides of the same coin'. He reasons that examining the firm's endowment of tangible and intangible resources, rather than their products, leads to new strategic insights into which products might bring the greatest returns. Further, Wernerfelt positions resources analogous to entry barriers, with 'isolating mechanisms' working to maintain firms' competitive advantage. Perhaps the most pivotal contribution is Barney (1991)'s paper, which helped to clarify understanding of the dynamics through which internal firm resources can help to create SCA.

Beginning in the 1980s, Barney worked to develop a theory of competitive advantage that would combine important aspects of environmental and RBV models. His 1991 paper examined internal firm resources which may account of SCA, with SCA being defined not via any period of time, but rather as a competitive advantage that continues to exist only after 'efforts to duplicate that advantage have ceased' (*Ibid*. pg. 102). He develops four characteristics that such resources should possess. Firstly, firm resources should be valuable in that they 'enable a firm to conceive of or implement strategies that improve its efficiency and effectiveness' (*Ibid*. pg. 106). Secondly, they must be rare. This point is almost tautological insomuch as any resource that is possessed by a large number of competing firms, almost by definition, *cannot* be sufficient for any competitive advantage. Barney does acknowledge, however, the difficulty in determining the degree to which a resource must be rare for an advantage to exist. Thirdly, resources must be (imperfectly) inimitable. For a position of SCA to be achieved, rival firms that do not possess valuable and rare resources must not be able to obtain them (*Ibid*. pg. 107). Lastly, these resources should be non-substitutable, unless the substitute resources are themselves value, rare and inimitable. Barney's own model shows how these factors link firm resources to SCA (see **Figure 7**).

Figure 7: *Resource Heterogeneity and Sustained Competitive Advantage*[27]



Source: Barney (1991)

Peteraf (1993) builds upon Barney's work and introduces four conditions which underpin sustained competitive advantage. The first of these relates directly to RBV: the endowment of 'superior resources' which are heterogeneously distributed across the industry. The second is *ex post* limits to competition. If resource heterogeneity works to develop competitive advantage, then this advantage can only be sustained over a substantial time horizon if there are factors which limit the degree of competition (see Wernerfelt (1984) and Dierickx and Cool (1989)). Thirdly, there must be imperfect resource mobility, a concept related to Dierickx and Cool (1989) and Barney (1991)'s work on inimitability and non-substitutability. Lastly is the existence of *ex ante* limits to competition. Similar in concept to point (2), resources acquired by the firm must first be subject to limited competition in order for a competitively advantageous position within the market to be attained. Peteraf's work can also be seen as an attempt to develop RBV using the framework of neoclassical analysis. This theoretical work on RBV is strongly evident in Teece et al. (1997) paper concentrating on firms' *dynamic capabilities*. They define dynamic capabilities as firms' 'ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments' which in turn 'reflect an organisation's ability to achieve new and innovative forms of competitive advantage' (Teece et al. 1997; pg. 516).

RBV is established theory in a number of related disciplines, and Penrose herself incorporated entrepreneurial aspects into her work[28]. For instance, she compares entrepreneurial action to managerial action, stating that '"enterprise" is obviously closely related to "ambition", but even if a firm is not very ambitious it may

[27] This theory has since been dubbed the "VRIN" model. For competitive advantage to be sustained, firm resources must be valuable, rare, inimitable and non-substitutable.
[28] The contemporary term "*intra*preneurship" may be a more appropriate usage for what Penrose intended.

nevertheless be competently managed' (Penrose, 1959; pg. 34). Here she highlights the impact that entrepreneurial processes can have on firm growth. Although entrepreneurial firms will take on a degree of risk in pursuing innovative strategies or actions, these firms will also accrue the associated rewards. Further still, each firm in a particular industry will be endowed with differing degrees of entrepreneurial resources, accounting in part for the heterogeneous nature of intra-industry growth rates. A number of entrepreneurship scholars have further contributed to theory development in RBV. An important paper in this regard comes from Alvarez and Busenitz (2001) who synthesise aspects of RBV into entrepreneurship studies, and extend the boundaries of RBV to better fit research questions in the field. They suggest that (1) entrepreneurial opportunity recognition and opportunity seeking behaviour are valuable resources for firms to possess, and (2) that entrepreneurial action – besides being a resource in itself – works to form *altogether new heterogeneous resources* for the firm through the 'creation and combination' of existing resources (*Ibid*. pg. 756). All in, the RBV perspective has been extremely influential in the study of the contribution of internal firm and human assets to firm performance (Zahra et al., 2004), highlighting the unique role that human endeavour and human skillsets play in advancing firm goals.

Indeed, expanding upon RBV, some scholars have isolated human, and by extension institutional, knowledge to be the most important resource a firm can possess (Grant, 1996a) (Grant, 1996b) (Spender, 1996). This has given rise to a body of work known as the knowledge-based view of the firm (KBV) – a view which has some overlap with Human Capital Theory as well as the RBV. The key idea here is that knowledge is heterogeneous, complex and can similarly possess traits that are valuable, rare, inimitable, and non-substitutable. Knowledge is viewed as strategically significant, and its proper creation, appropriation and deployment can offer avenues towards SCA for the firm. Despite this progress, key proponents in the field concede that it is not yet a fully developed theory of the firm (Grant, 1996) (Nickerson and Zenger, 2004)

Setting out the initial contribution in this area, Grant (1996b) sees knowledge as 'residing within the individual' rather than at the level of the firm, and conceptualises the firm as an 'institution for integrating knowledge'. He outlines four "coordination mechanisms" through which the firm tries to optimally integrate the knowledge of its employees in the most efficient and effective way. The first of these mechanisms are the rules and directives established through firm procedures. For example, if one

employee specialises in area X, then the firm would benefit from the diffusion of this knowledge to the other employees. This could perhaps be done most efficiently by the adoption of formal protocol concerning area X. The second mechanism – sequencing – suggests that the integration of knowledge into the firm's production process is achieved via optimal time sequencing of different component parts, though Grant (1996b) does concede that this is most applicable to products or services that are composed of many small interdependent constituents. Thirdly is the concept of routine. Although related to sequencing, the author notes that the 'interesting feature' of routines is 'their ability to support complex patterns of interactions between individuals in the absence of rules, directives, or even significant verbal communication' (Ibid. pg. 115). Lastly, Grant notes that the firm can also integrate knowledge through group problem solving and decision making. This stands in contrast to the preceding mechanisms which prioritise cost savings on communication.

Spender (1996) takes a similar approach, moving towards a dynamic theory of the knowledge-based firm, where firms are viewed as knowledge 'activity systems'. Nickerson and Zenger (2004) apply KBV to the study of problem solving within the firm. They note that there are certain hazards relating to knowledge processes within the firm which are a function of (1) cognitive limits to the speed of learning, and (2) the self-interest of those who hold valuable knowledge. Thus, the firm faces challenges in trying to appropriate its workers' knowledge, where workers may feel inadequately compensated for sharing. Further, during firm problem-solving processes, workers' have an incentive to guide solutions in directions which will benefit them. In contrast to the first point, this produces an incentive for workers to share their knowledge with firm management. In combatting these hazards, firm management may be inclined to structure the firm hierarchically (Nickerson and Zenger, 2004). These sorts of organisational and knowledge management procedures may be key to addressing more systemic issues of access to sufficient skill levels, and it is precisely this nuance which this research project aims to address.

An important development in this regard comes from the work of Nonaka & Takeuchi (1995) and their contribution towards organisational knowledge management procedures. Their model describes how different types of knowledge can be transferred between actors within an organisation. For example, tacit knowledge can be transformed into explicit knowledge (externalisation) and explicit knowledge is transformed into tacit knowledge (internalisation) through different procedural,

training, creativity, and mentoring schemes put in place by management. Moreover, more informal knowledge transformations take place by employees engaging in dialogue, and the opportunities to foster such engagements might well be good policy driven by management. Such knowledge transformation processes help the firm to retain knowledge if not the actual skillsets of their employees, as staff turnover continues to churn through the operation, a characteristic of high-impact (Borggren et al., 2016) and high-performing (Patel et al., 2012) organisations, and presumably, or potentially, of fast-growth firms as well. Organisations can actively engage in a process of learning (Senge, 1990; Crossan et al., 1999), taking a more proactive stance to address the skills shortcoming and skills challenges that they face.

3.4. Attracting, enhancing & retaining skills & knowledge

The treatment of human resources within a firm have evolved since the early days of management research, where emphasis was often placed on oversight, control, and a siloed approach to roles characterised by a high degree of worker isolation and task specificity (Pindur et al., 1995). Indeed, in the late 19th and early 20th centuries, academics and managers alike were pursuing a "scientific" approach to the management of workers; a rigid approach to people management was thought to offer firms and organisations the most efficient and effective path towards operational success (McGrath, 2014). Indeed, the relationship between managers and workers, or between employers and employees, had initially been one of tension and conflict, and so often resulted in workers taking the choice of industrial action in the face of management refusals to engage on issues of pay or reward (Guest, 1987). In order to manage such industrial relations issues, personnel departments were set up to oversee the human element of firms' resources. However, it wasn't until the 1980s that the central (even unique) role that human resources play within the firm began to be properly reflected in institutional and organisational approaches to people management (Storey, 2014; Ahammad, 2017). Thus, personnel departments began to give way to human resource departments, and the academic study of human resource management began to take shape in its current form.

Human resource management therefore takes a unique approach to employee management and people development and has been defined as:

> "...a strategic approach to managing employment relations which emphasises that leveraging people's capabilities and commitment is critical to achieving sustainable competitive advantage or superior public services. This is accomplished through a distinctive set of integrated employment policies, programmes and practices, embedded in an organisational and societal context." (Bratton & Gold, 2017)

Such a definition works to emphasise the more people-oriented approach that HRM seeks to encourage, where worker engagement & buy-in is viewed as central, and where intrinsic motivation rather than (or perhaps as well as) extrinsic motivation is hoped to be stimulated and activated. That is not to say that all modern organisations are uniformly motivated or inclined to adopt best practice approaches, as they are identified, studied, and encouraged in the human resource management literature (Pfeffer & Veiga, 1999; Rynes et al., 2007). Indeed, even within the HRM discipline, differences have emerged between what is termed as "soft" approaches to human resource management, and "hard" approaches to human resource management, characterised by their views of control and empowerment (Greenwood, 2002). Moreover, firms still need to balance potential benefits of such an approach with the costs and limitations borne by commercial operations, and in practice, human resource management departments need to content with a variety of people management challenges, including but not limited to precarious work and job insecurity, overarching organisational efficiency efforts (such as restructuring and downsizing) over which they have no control or influence, a wide set of issues of morale, such as workplace dignity and low wage employment, and last but not least, operational skills shortages (Bratton & Gold, 2017).

Human resources managers, and the human resource management function within organisations more generally, are therefore unique positioned and empowered to combat, mitigate, and alleviate the skills shortage and skills gap issues that the organisation encounters. Their strategic role within the organisation also potentially affords them greater voice than the line managers and team heads who will encounter skill deficiencies, as it were, on the front line. There are several key functions of the human resource management team that relate directly to the issues of skills development and skills retention for the organisation. In sequential order, these are:

recruitment and selection; training and development; rewards and remuneration; and retention.

As central agents in the hiring process, the human resource management team will be the first to encounter skills shortages as they relate to the external candidates that the organisation is attempting to select for the available role(s). Having undertaken workforce planning exercises to assess staffing needs within an organisation, management and human resource function will design a job description and candidate specification and then set about attempting to generate a suitable pool of potential applications and selecting an individual or individuals from that pool to fill the role. Recruitment processes are diverse (Bratton & Gold, 2017) and range from organisationally passive situations (such as relying on "walk-ins" or word-of-mouth networking and advertising) right through to more active measures such as e-recruitment (which is today well established, even via social media streams such as *LinkedIn*) and the use of so-called "head hunting" measures (i.e., the deliberate targeting and approaching of selected individuals, often using professional dedicated recruitment agents or agencies) (Koch et al., 2018). However, while there are a large number of recruitment approaches available to organisations, there is no "on size fits all" method for attempting to recruit the "right" candidate to the role, and the correct method will be very much contextually dependant on things such as industry conventions or the job being advertised, and the competencies and motivations of (and the resources available to) the organisations' recruiters. Nonetheless, human resource management departments can make the process as effective as possible by outlining detailed job analysis and descriptions specifications, outlining things such as duties, responsibilities, and relationships in as much detail and as accurately as the possibly can (Hanser, 1995).

The selection process itself is also contextually dependant and can take on a variety of different forms depending on the type and number of roles being recruited for. The staff turnover of that role will also have an impact on which method works best – for example, if the role is frequently being recruited for, then a large-scale assessment centre might work best, whereas more one-one in-depth biographical interviews and competency testing might work best for roles which are best served with settled candidates showing long-term commitment to the organisation. The use of psychometric testing has actually become more common place over the years, as organisations try to find valid and reliable ways of assessing the "fit" of the person, for

the job, the organisation, and the team that they'll manage or operate as part of (du Gray, 1996). Moreover, the search for as diverse a range of applicants as can be attracted has been shown to wield advantages for organisations, where workers with diverse experiences, knowledge, perspectives, and skillsets, are shown to bring operational benefits that more homogenous workforces are unable to match (Yakura, 1996). Indeed, evidence suggests that person-brand fit – the marketing of the organisation during the recruitment process in order to draw-in similarly-minded candidates suitable to the brand's "culture" and "citizenship" norms – can be a good way to reduce organisational skill gaps, particularly with respect to core and social skills (Hurrell & Scholarios, 2014).

Similarly, the human resource function within an organisation is ideally placed to oversee, consider, measure, analyse, and respond to internal skill gaps, given the central role they plan in planning, executing, monitoring, and evaluating its training regime. Effective training can take place on-the-job, involving more experienced staff and line managers, or off-the-job, involving the hiring and commissioning of dedicated training agencies. Training may be job-specific and technical, or focussed on soft or core skills, such as negotiation and teamwork. Moreover, effective management and leadership training has been shown to be an important component of solving long-term skills challenges facing organisations, regardless of sector (Farr & Brazil, 2009). To be effective however, training needs need to be accurately and reliably measured and assessed, requirements identified, and the training activity or activities effectively delivered. This will be an effective way to combat, at least in the short term, skills shortages where external candidates are unable to adequately fill roles to a suitable degree.

However, there is evidence to suggest that best practice in training and personnel development procedures is not quite being utilised to full effect by human resource managers within firms (Holland et al., 2007). Moreover, some organisations are actually dissuaded from fully training their own staff to the required level, given the practice of rival, competing firms, particularly those within the same geography or industry, "poaching" suitably training and qualified staff (Sheldon & Li, 2013). These organisations may feel that the costs involved in sufficient training provision, particularly when that training is undertaken off-the-job, are too expensive, and incur too much of an opportunity cost to be worth the investment in time and lost output. Nonetheless, human resource management departments can benefit organisational

skills performance here, in both the short and long term, as research has shown that training, combined with an originally enriched job design, have a positive impact on job-satisfaction and work-related wellbeing (Okay-Somerville & Scholarios, 2019), both key facets of retaining skilled and value-adding staff members. The authors further find that organisations with higher-skilled workforce are more likely to adopt these practices (*Ibid.*). Furthermore, the use of mentoring schemes in training and professional development has been shown to be an effective way to address gaps in skills and knowledge (Bautista, 2016), as has the use of more informal reflective coaching techniques (Tulgan, 2015). Thus, a fourth hypothesis can be added to the three that were formulated in Chapter 2:

Hypothesis 4

> Firms which utilise less intensive employee training schemes will suffer more from skill deficiencies

A properly executed reward management scheme also offers human resource managers the opportunity to identify and address skill requirements and any lingering imbalances. Importantly, this also gives management the opportunity to identify effective individuals who are contributing to organisation goals and to rewards them for their efforts. It also has the effect of putting in place effective incentive measures to encourage other staff to reach the same level in their own performance. Although the effectiveness and appropriate use of incentives has been questioned by some (Kohn, 1993) and defended by others (Stewart et al., 1993) for some time, many organisations still utilise some sort of rewards scheme for their staff beyond basic remuneration for their labour. While performance management is seen as important in the private sector, it is also in use in public settings as well, although the effectiveness of such schemes has been found to depend on management behaviour (Davenport & Gardiner, 2010). However, specific to this PhD thesis, Grant et al. (2014) find that employees in Scotland are more likely than their employers to think that their skillsets are underutilised. Incentive schemes can therefore be viewed as a potentially useful way to address skills shortcomings on both the external candidate and internal employee fronts.

Rewards management is seen as an important contributor to employee motivation and organisational engagement, although it is only one aspect of employee retention which is viewed as important. Employees need to be perceived as valued and

respected to have positive job satisfaction (Locke, 1969), and job satisfaction has been found to be an important component of successful retention (Terera & Ngirande, 2014). Moreover, it is important that work is seen to be manageable by staff, and work-life balance issues are common in any discussion of job-satisfaction (Grigg & Da Silva, 2008). Moreover, Hurrell (2015) finds that some employees actually engage in an active and voluntary withdrawal of their soft skills when they become dissatisfied with their employers. In this event, the author finds that organisations themselves may be to blame for any perceived skill gaps, if they fail to engage in appropriate selection, induction, and training practices. Looking back to job design, employees have been found to respond positively when they have freedom and autonomy in their role and when they get the change to engage with meaningful job review processes, all of which has added benefit for not just people and skills retention but new skill development. Talent management schemes (Hughes & Rog, 2008; Van den Brink et al., 2013), succession planning, and skills planning (Romo, 2015) are all important means of tracking the skills development and skill needs of an organisation, and allow management to actively engage with the organisations' future years in advance, taking a proactive role. Finally, the use of exit interviews has been shown to be a useful way to track skill shortcomings within an organisation (Spain & Groysberg, 2016).

However, evidence suggests that there is a discrepancy between HR best practice in theory and as actually performed by firms (Mayson & Barrett, 2006. Even the very idea of "best practice" in human resource management has been questioned, with some evidence suggesting that the bundle of practices outlined above may not be so well perceived or well received from potential and current organisation employees (Marchington & Grugalis, 2011). While best practice has been looked at in the context of public, non-commercial, and private enterprises (Colley et al., 2012; Graham & Lennon, 2002; Allui & Sahni, 2016), and in relation to company size (Heneman et al., 2000; Cassell et al., 2002), research to-date has yet to focus on the nexus of best-practice, skills deficiencies, and fast-growth firms. Moreover, no study has done so utilising the mixed-methods approach outlined in Chapter 2, where in-depth qualitative research is preceded by large-scale quantitative analysis focussing on breadth of research. Therefore, several important gaps appear which this research project aims to address. Specifically, there is a gap surrounding how these human resource best-practices are adopted by fast-growing firms (non-location-specific objective), and within the Scottish context (location-specific objective). Furthermore, and touching

upon the knowledge management literature (Hafeez, K., & Abdelmeguid, H., 2003), it is currently unknown whether firms engage in knowledge retention procedures in instances where employees themselves cannot be retained, and whether such procedures differ between fast-growing and non-fast-growing firms.

CHAPTER 4: Research Context

4.1. Introduction

The Scottish economy forms the "test-case" of this skills-imbalance research project. Scotland provides an especially interesting case study for these issues, given a number of interlocking features, such as its historical economic context and contemporary political environment, its history of quality education provision tempered by a more questionable history of in-work training provision, and its unique geographic make-up. As such, it is important to set out this context in full. This chapter proceeds as follows: Section 4.2. examines Scottish geodemographic issues, including issues such as regional population variation and population growth; Section 4.3. looks at the economic structure of the country, including the regional dynamics at play; Section 4.4. examines the country's education system, and touches on some of its strengths, weaknesses and changing dynamics.

4.2. Scottish geodemographics

Scotland provides an interesting case study for these issues. It is a small but highly educated country with an economy skewed towards skilled, knowledge-intensive sectors, particularly across industries in the service, energy and high-tech sectors (Businesses in Scotland, 2018). According to the UK Office of National Statistics, Scotland was the most 'highly educated' country in Europe in 2014 - nearly 45% of those aged 25-64 had some kind of tertiary education, ahead of Ireland, Luxembourg and Finland (the only other countries over 40%) (The Independent, 2014). However, international test scores of school pupils aged 15 at around the same period reveals that educational performance has been declining relative to similar-sized OECD countries, and for several consecutive years (PISA, 2013; 2016). Moreover, like other regions in the UK, it has been said that Scotland suffers from a so-called 'brain drain' (THE, 1995), where educated and skilled workers and university graduates migrate to London and the UK's South East for work, without sufficient replacement coming in the other direction or from elsewhere. Scotland itself has wide geographic-population disparities, with a markedly high concentration of workers, jobs and output across the

'Central Belt' – a region running from the Firth of Clyde near Glasgow in the west to the Firth of Forth near Edinburgh in the east, and farther up the North Sea coast to the city of Dundee near Angus. This area, covering only ~13% of the country's total land area, is home to some ~3.9 million people (~72% of the Scottish population) (National Records of Scotland, 2017). This large conurbation is 'book-marked' by the vast, sparsely populated Highlands and Islands region to the North (and West), and the rural areas of the Borders and Dumfries and Galloway to the South, resulting in one of the lowest population densities in Europe (at ~69/km^2). This stands in stark contrast to population density in neighbouring England (at ~406/km^2). The disparity *within* Scotland itself – ranging from ~9/km^2 in the Highlands and the Outer Hebrides (the archipelago off the country's Western coast) to ~3,471/km^2 in Glasgow, Scotland's most populous city (National Records of Scotland, 2017) – brings added variation and complication regarding worker attraction and retention.

Nevertheless, recent decades have seen strong economic development – even resurgence – take hold in peripheral regions. For example, after more than a century (indeed arguably several) of decline (Deveney, 2016), the unemployment rate in the Highlands and Islands now stands below the national average. At the same time, population declines have largely been halted and the region is now home to a range of high-growth SMEs and the host of several nationally and internationally established high-technology enterprises. This success has been facilitated, in part, by the work of the region's economic development agency, Highlands & Islands Enterprise (HIE), established in 1966 as the Highland and Islands Development Board (HIDB) with a current remit covering six of the country's thirty-two Local Authority areas (in addition to partial coverage of one other, North Ayrshire, via the islands of Arran and Cumbrae), as well as the national body charged with enhancing Scotland's workforce skills base, Skills Development Scotland (SDS). Indeed, one outcome of the Scottish Government's recent Enterprise and Skills Review has been parliamentary approval of the creation of a new South of Scotland 'development vehicle' modelled on HIE. Prior to this, South of Scotland, along with the 'Central Belt', was under the remit of the main national development agency, Scottish Enterprise. This change has been driven by recognition of the greater geographic similarities between South Scotland and Highlands and Islands (and hence, presumably, the argument goes, the greater similarities with respect to business opportunities and operational barriers). Indeed, skills attraction, development and retention policies constitute a government-driven

component of this resurgence (see, for example, the work HIE have undertaken to implement and develop the "ScotGrad" graduate placement scheme across the region's faster growing SMEs, as well as their "Northern Innovation Hub" project, among other collaborative engagement schemes pursued alongside SDS and others).

The Scottish labour market is characterised by high employment and low unemployment rates, a trend which has continued despite the global financial crash and the subsequent recession which followed in the years after 2007. As of September 2019, according to the ONS/Nomis (2019) the employment rate for Scotland stood at 74.9% and the unemployment rate at around 4.0%, compared respectively to rates of 76.1% and 3.8% for the UK as a whole showing Scotland performs very close to the UK overall. Across Scotland itself, these figures fluctuate somewhat dramatically, ranging from highs of 88.9% employment (and lows of 2% unemployment) in the Orkney Islands to lows of 65.8% employment in Glasgow (and highs of 5.8% unemployment in North Ayrshire). Interestingly, the un/employment figures tend to highlight stronger performance across the country's island Local Authority areas, with (in descending order) the Orkney Islands, Shetland and Na h-Eileanan Siar the three top-ranked areas for both measures, perhaps, though by no means definitively, pointing to more resilient community workforce structures. Conversely, the populous, post-industrial areas of Glasgow, Dundee and the three Ayrshire Local Authorities rank as the five worst-performing areas for employment. The rather strong national-level figures, however, although substantially improved from those of the early 1990s, and on the face of things a sign of rather durable economic resilience in the face of significant external, international "shocks", are arguably masking underlying issues and trends of high *under*employment, a rise in part-time work and more advanced and entrenched forms of workplace and workforce "informality" (FOA, 2019). Thus, issues of increased labour market "flexibility" continue to define the Scottish economy in much the same way that they do in other industrialised economies throughout the developed world. Indeed, economists are unsure of the extent to which these newly evolved (and evolving) workforce patterns constitute: (a) a permanent change in the meaning and nature of "work"; (b) significant alterations to the human/capital ratio allocated to the wider production mix, or (c) changes in the very structure of the globalised economy. Moreover, these patterns may even simply reflect prolonged but temporary adjustment measures which have functioned to maintain high employment throughout what has been a fairly turbulent economic decade, at least in the

industrialised world (Stiglitz, 2010). Even in the years since 2007, productivity, employment and wage indicators have shown continued and robust positive trends throughout much of the developing world chiming with Abramowitz's catching up thesis (Abramowitz, 1986).

The demographic makeup of the Scottish workforce itself is steered, and inevitably in some ways, constrained, by a fairly aged (and indeed aging) population-at-large. The overall national population total now stands at roughly 5.44 million, up some 400,000 since the start of the new millennium (NRS Fact Sheet, 2019). This rather stable ~20-year increase stands in contrast to the negligible growth rates experienced over the roughly 50-year preceding period, where overall population actually decreased slightly, from 5.14 million in 1958 to 5.06 million in 2000. Population pyramids (a class of graphical representations of the stacked distributions of age brackets within a given population) are used by demographers to map various aspects of the makeup of a country and by labour economists as a tool to understand present and future trends in workforce composition. In 2018, 19% of the country's population was aged 65 and over (*N.b.* 65 is still the "age of retirement" for men in Scotland – the age at which they are entitled to receive a state pension), with 64% aged 16-64 (an age range which comprises the vast bulk of the workforce) and the remaining 17% aged 15 and under. In comparison, a decade prior these figures stood at 16% aged 65 and over, 66% for those of working age and 18% aged 15 and under. Net migration in 2018 amounted to 20,900, from a total of 80,600 inward migrants and 59,700 outward migrants (NRS, 2019), while more specifically, total net migration for *those of working age* (again measured as 16-64) equalled 17,048. The Local Authority areas which saw the largest increase in inward migration flows were Glasgow (16,920 from elsewhere in Scotland as well as 9,970 from overseas) and Edinburgh (10,200 from the other constituent countries of the UK, excluding Scotland). The Local Authorities with the greatest magnitude *net* increase (and decrease) from (and to) the other UK countries were Edinburgh with +2,810 (and Aberdeen with -650), while those same figures reflecting movement from (and to) overseas countries were Glasgow with +5,310 (and South Lanarkshire with -220). Net movements *within* Scotland are less revealing than one might imagine in larger, more populous countries due to the small aggregate numbers involved and the overall masking effects of the country's most populous cities: in 2018, Edinburgh saw the largest net decrease (-2,490 people), while with a figure of only 870, East Lothian saw the largest net increase. Importantly for skills research,

Scottish Government analysis shows that foreign-born residents in the country were more likely to hold both formal and degree-level qualifications than Scotland's UK-born population (REF – just google).

These structural trends look set to continue in the years, and perhaps even decades, ahead. Indeed, in the first quarter of 2019, the Scottish fertility rate had fallen to 1.41 (NRS, 2019), while in 2019 the quarterly birth rate reached its joint-lowest level since records began (BBC, 2019). In order to combat these structural issues, Scottish employers have increasingly looked to the international labour pool in order to secure a level and quantity of workforce commensurate with maintaining their required level of international competitiveness. Under the terms of the Maastricht Treaty, workers from across the European Union are legally free to move to, live in and work in any of the other 27 EU countries. Localised market conditions, therefore, in particular relative real wage rates – which dominate at least the *economic incentives* to migrate – are one of the main drivers of attracting skilled migrants into the country, and their strengthening and enhancement remain the core focus of Scottish skilled migration policy. Outside of these confines, however, the ability of the Scottish Government to influence UK policy regarding (non-EU) international migration is fairly limited. However, and in any case, regarding occupation-specific shortages, UK Government policy is steered by the non-departmental (and non-political) Migration Advisory Committee, a body composed solely of academics, which through its Shortage Occupation List, provides a set of occupation profiles for government to better target and identify prospective inward migrants who are skilled in those particular areas of the economy deemed sensitive to a constrained domestic labour supply.

In addition to the foregoing, international students (i.e. those students who do not hold any EU citizenship) who graduate from UK universities are now (under proposals brought forward in September 2019) permitted to stay and to find work in the country for two years after they leave university – a substantial change from the previously permitted period of four months. How these (and other) legal and structural mechanisms will operate in a post-Brexit context have yet to be formally settled but should become clearer in the months ahead, as the set deadline of 31st October 2019 approaches, subject, of course, among other things, to the machinations of short-to-medium-term political negotiations regarding any new "trade deals" with non-EU nations and/or entities, which have been the subject of recent speculation and discussion.

Table 6: *Population and Population Density Estimates Across Scottish Local Authorities, 2015*

Map key	*Local Authority*	*Population*	*Area (km^2)*	*Density*	*Density rank*
/	**Scotland**	**5,373,000**	**77,910**	**69**	/
1	Aberdeen (City)	230,350	186	1,240	4
2	Aberdeenshire	261,960	6,313	41	24
3	Angus	116,900	2,182	54	21
4	Argyll & Bute	86,890	6,909	13	30
5	Clackmannanshire	51,360	159	323	13
6	Dumfries & Galloway	149,670	6,427	23	27
7	Dundee (City)	148,210	60	2,477	2
8	East Ayrshire	122,060	1,262	97	19
9	East Dunbartonshire	106,960	174	613	7
10	East Lothian	103,050	679	152	18
11	East Renfrewshire	92,940	174	533	=9
12	Edinburgh (City)	498,810	263	1,894	3
13	Falkirk	158,460	297	533	=9
14	Fife	368,080	1,325	278	14
15	Glasgow (City)	606,340	175	3,471	1st
16	Highland	234,110	25,657	9	=31st
17	Inverclyde	79,500	160	495	11
18	Midlothian	87,390	354	247	15
19	Moray	95,510	2,238	43	22
20	Na h-Eilean Siar	27,070	3,060	9	=31st
21	North Ayrshire	136,130	885	154	17
22	North Lanarkshire	338,260	470	720	5
23	Orkney Islands	21,670	989	22	28
24	Perth & Kinross	149,930	5,286	28	25
25	Renfrewshire	174,560	261	668	6
26	Scottish Borders	114,030	4,732	24	26
27	Shetland Islands	23,200	1,467	16	29
28	South Ayrshire	112,400	1,222	92	20
29	South Lanarkshire	316,230	1,772	178	16
30	Stirling	92,830	2,187	42	23
31	West Dunbartonshire	89,590	159	564	8
32	West Lothian	178,550	428	417	12

Source: Derived from National Records of Scotland (2015)

Notes: Land areas derived from Standard Area Measurements produced by the Office of National Statistics in December 2015. Figures may not add exactly because of rounding. Persons per square kilometre have been calculated using actual, not rounded areas.

4.3. Economic structure and performance

The recent decoupling of traditionally-aligned economic performance indicators also marks a noteworthy aspect of the modern Scottish economy. Whilst, as stated above, national (and for the most part, local) un/employment figures have tended to highlight resilient, and perhaps even fundamentally strong, underlying foundations to the national economy, measures of aggregate productivity levels (frequently measured as output per hour worked, or output per hour) have been decidedly sluggish in the years since 2007. For example, in the 8-year period leading up to the global financial crash, Scottish productivity levels had grown 20 percentage points above the 1999 base index (FoA, Google). This advance was then reversed, so that as late (or *as recently*) as 2013, productivity levels were only 15 percentage points above the 1999 base index, a position which had remained stable and persistent over the previous 4 years as well. Again, while Scotland is far from atypical in this respect, a noteworthy differential has grown between Scotland and the aggregate indicator taken for the UK as a whole. Indeed, while in the years running from 1999 to 2007 Scottish productivity growth had matched, and, on several occasions, even outstripped UK performance, by 2015, a gap had begun to emerge in the opposite direction. Moreover, this gap looks set to continue into the near future: by 2022, productivity levels in Scotland are projected to be a full 5 percentage points below UK levels as measured from the 1999 base index (FOA, Google).

The importance of this disparity is further emphasised when a comparison is drawn between aggregate UK productivity performance and the performance of several otherwise closely-aligned, advanced economies. For instance, in 2016 the UK had the worst productivity performance of all the G7 economies. France and Germany, perhaps the most sensible comparison countries, are, correspondingly, according to one account, a full 30% and 35% more productive economies than the UK. Several theories have been advanced to explain these phenomena, which have been respectively labelled, depending on the level of analysis, as Scotland's or the UK's "productivity puzzle". However, focusing on Scotland specifically, while overall investment rates in capital (i.e. machinery and new production technologies) have fallen substantially, and are in any event comparably low, a mix of meagre Gross Domestic Product (GDP) growth and, conversely, robust and sustained employment growth have inevitably commanded considerable attention in almost all analyses of the problem.

Economic growth has thus followed a similarly turbulent pattern to productivity growth, something (again) which is hardly unique to Scotland. When viewed in the context of sustained and rapid progress across large parts of the developing world, the change in global economic and financial flows over the last ten years, moving from a "Western"-oriented global market in crisis, to an "Eastern"-oriented global market with considerable commercial growth opportunities, can hardly be overstated. Moreover, growth performance continues at a slow pace (all <1%, YoY, Q4, 2018) across all EU countries as we head into the 2020s, save for the exception of the smaller, former Yugoslav or Eastern Bloc economies of Croatia, Poland, Hungary, Romania, Bulgaria and Lithuania, and there are further ominous signs in other parts of the "Western world" (most notably in the United States). Indeed, even viewed in terms of its own historical performance, Scottish GDP growth has experienced a remarkably slow decade. Overall, the size of the Scottish economy now stands at ~$238 billion, compared to that for the UK as a whole of ~$2.8 trillion. Taking only similarly-sized EU nations, Scottish nominal GDP and annual real GDP growth rates (ibid., 1.4%, 2018) generally compare quite unfavourably to Ireland (~$385 billion, 3.0%), Denmark (~$370 billion, 2.3%) and Norway (~$443 billion, 1.4%). Unsurprisingly given their size, Glasgow (£20.4 billion), Edinburgh (£19.9 billion) and Aberdeen (£10.6 billion) make up the top three Local Authorities in terms of Gross Value Added (GVA), as computed for the year 2016 (ONS), with substantially more coming from their connected surrounding conurbations located in Renfrewshire, the Lanarkshires, the Lothians, Fife and Aberdeenshire. Those Local Authority areas with the smallest three GVA totals are, again unsurprisingly, Shetland (£6.7 million), Na h-Eileanan Siar and the Orkney Islands (both with £6.4 million).

There persist some important geographic dimensions to Scotland's industrial makeup, with several dominant industry-groupings (somewhat) easily demarcated across its regions. Roughly speaking, the economy of the sparsely-populated Highlands and Islands can be characterised by the large component contributions to GVA coming from the region's tourism and (with a substantial export market surrounding Scottish single malt whiskies, specifically) food and drink sectors, while that of Aberdeen is largely dependent on offshore oil and gas exploitation and its associated support services, which, although facilitating a fairly notable concentration of wealth and prosperity in Scotland, nonetheless make it susceptible to the not-*in*considerable price volatilities of a single, globally-produced-and-exported commodity. To exemplify their

twinned fortunes, as the oil and gas industry came into sharp decline in the years after 2014, following a widely-reported global "price slump", sectoral employment in Aberdeen fell from 500,000 in 2014 to 315,000 in 2017 (Guardian, 2017). More generally, financial services are clustered in-and-around Edinburgh, with life-science companies in-and-around Dundee. The wider service sector aside, the defining sectoral characteristics of Glasgow and its peripheries are perhaps now harder to pin down, although in previous decades shipbuilding and other heavy and primary industries would, of course, have stood out. Looking at the national picture, services constitute the largest share of GDP (~£54 billion), followed by primary (~£18 billion), manufacturing (~£12 billion) and construction ~£7 billion). Sectoral growth, of course, mirrors the slow overall GDP growth figures: indeed, in 2018, services grew marginally, while larger gains in construction were offset by contractions elsewhere in the production sector. In addition, however, in Scotland as in the UK-at-large, the Higher Education (HE) sector constitutes an area of international competitive advantage – indeed, the UK ranks second in the world for number of foreign students enrolled, with a total of almost half-a-million studying (2018). Considering the substantial enrolment fees required, particularly for those international students studying at postgraduate level, it therefore represents what has become a fairly uncommon success story: a lucrative export sector on a global scale for "UK plc.". In 2018, students from China, India, the United States, Hong Kong and Malaysia represented the most frequent countries of origin for these students; most notably, students coming from China (*excluding* Hong Kong) outnumbered those coming from India by a multiple of five.

In 2018 there were roughly 346,000 registered and unregistered enterprises in Scotland, constructed as follows: 238,000 with 0 employees – essentially independent contractors; 102,000 with 1-49 employees, and; 4,000 with 50-249 employees, for a total of >344,000 small-to-medium-sized enterprises (SMEs) (as defined using the size-band classification of SMEs). SMEs and micro-enterprises therefore totalled 99.4% of all registered and unregistered enterprises. The remaining 2,380 enterprises employed 250 or more people. While this overall figure represents a small fraction of total businesses, these more established enterprises accounted for a substantial ~56% of total employment and ~60.9% of total turnover. Those enterprises engaged in 'professional, technical and scientific activities' (48,155) and construction (47,800) were the most numerous, while the retail industry employed the greatest number of people (at

259,350). The mining, quarrying and utilities sector had the greatest total turnover (£40 billion) while education, unsurprisingly, had the smallest (£3 billion). There were 2,610 foreign-owned enterprises in Scotland, split between 1,100 EU-owned and 1,510 non-EU international-owned proprietors. Combined, these foreign-owned enterprises employed more than 330,000 people in Scotland and had a total turnover of almost £86 billion. High growth enterprises are defined as any enterprise with ten or more employees in the base year (year 1) who experience an average of 20% turnover growth over a three-year period. For the 2015-2018 period there were a total of 1,820 high growth enterprises in Scotland, accounting for 1% of the total number of businesses. The greatest proportion of these high growth enterprises (5.8%) were located in the 'water supply and sewerage, waste management and remediation activities' sector, while at 2.9%, Dundee had the highest share of its businesses classed as high growth. Interestingly, Aberdeenshire had the lowest (0.8%), although Aberdeen (the city itself) fared much better (1.9%), which perhaps paints a fairly complicated picture of the oil and gas downturn. Generally speaking, Scotland performs quite poorly in comparative measures of entrepreneurship and innovation. With respect to new business ventures, Scotland ranks 10th out of the 12 UK Government Office Regions, with 48 VAT/PAYE registrations per 10,000, predictably behind first placed London (with 132/10,000), but more concerningly, also far behind second ranked North West (England) (81/10,000) and well behind the UK average (71/10,000). Scotland also compares badly in measures of research and development (R&D) expenditure. Scottish business expenditure on R&D, known as BERD, ranks 8th out of 12, with BERD constituting 0.8% of GDP. However, gross expenditure on R&D (GERD) has increased, driven by BERD, with HERD having slowed.

While commercial activity within the intra-UK context still dominates Scottish trade (in 2017, Scotland exported ~£48.9 billion/60% worth of goods and services while running a rather substantial current account deficit with the rest of the United Kingdom (rUK)), economic activity with EU (~£14.9 billion/18%) and international (~£17.6 billion/22%) partners has grown substantially in importance in recent decades, and unlike many advanced Western economies, Scotland does run a current account surplus with the rest of the world, although the magnitude of this is not enough to balance the rUK deficit (*n.b.* these figures do not take account of North Sea oil and gas trades, which are counted as a UK export not tied to any constituent country or region). Generally speaking, Scotland produces, manufactures, exploits and exports oil and gas,

food (particularly sea food) and drink (notably whisky), and tourism, as well as a wide variety of services, mostly notably in finance. More specifically, export sales (from 2017 – product or service/value) are chiefly composed of: petroleum products (£8.5 billion), beverages (£4.1 billion), power-generating machinery (£2.2 billion), general industrial machinery (£1.3 billion) and transport equipment (£1.2 billion), while the Netherlands (£4.3 billion), the USA (£3.4 billion), Germany (£2.8 billion), China (£2.2 billion) and France (£1.7 billion) are the top non-UK export destinations. In terms of imports, Scotland buys from the rest-of-the-world (again, non-UK) a variety of gas, natural & manufactured products (£3.1 billion), office and automatic data-processing (ADP) machinery (£2.3 billion), power generating machinery (£2.2 billion), machinery & transport equipment (£1.8 billion) and apparel and clothing accessories (£1.0 billion). Norway (£3.9 billion), USA (£2.7 billion), China (£2.7 billion), Germany (£1.9 billion) and the Netherlands (£1.6 billion) make up the country's top 5 import partners. The tourism sector alone contributes around £6 billion to the Scottish economy, supports over 200,000 jobs and 14,000 businesses, and annually more than 3.2 million people visit the country from overseas. Importantly in relation to sectoral skills composition, compared to an economy wide average of 5%, the Scottish tourism sector employs ~9% of its workers from other non-UK EU nations.

Finally, growth in median pay rates has remained fairly sluggish in the ten-year period following the financial crash. In 2018, median full-time gross weekly earnings in Scotland stood at £563.20, below the corresponding UK rate of £569.00. Given the skewing-effects of the outsized London and the South East regions, Scotland actually has the 3rd highest pay rate increases of the UK's 12 Government Office Regions. This is itself a year-on-year increase of 3.0% in nominal and 0.8% real terms, respectively, though again, these figures are somewhat shy of corresponding UK rates of 3.5% and 1.2%. Moreover, taking 2007 as the base index year (=100), median gross hourly wage rates actually fell, from 102 points in 2008 to a low of 93 points in 2014, a figure which has, however, risen somewhat to 96 points in 2017. Pay rates have also suffered something of a decoupling from labour productivity rates over this same timeframe: indeed, measures of labour productivity rebounded quicker than median hourly wages after 2007 – something which didn't start increasing after 2008 until late 2014/early 2015. Looking at the proportion of employees earning the "Living Wage" – defined as £8.75/hour as of 2019 - 19.4% of Scottish employees (aged 18+) do so, aggregated from only 5.6% in the public sector to 27.6% of those in the private sector (figures from

2018). Dumfries and Galloway (at 30.6%) had the most entrenched levels of below-Living Wage pay rates, with Aberdeen (City) at 14.2% having the least entrenched; of the four constituent countries of the UK, Scotland had the lowest proportion of employees earning below the Living Wage. Switching focus away from income, Scotland has a marginally lower Gini-coefficient for net personal wealth (at 0.61) compared to the UK (at 0.63). More generally, poverty and inequality remain stubborn problems in Scotland – the reduction of which First Minster Nicola Sturgeon has made a priority for her government to address. Over the period 2015-18, after housing costs, some 20% of Scots were living in relative poverty. Child poverty rates (at 20%) were the same – some 240,000 Scots children live in relative poverty.

4.4. The Scottish education system

Education has long had a fundamental role to play in fostering Scotland's distinct national identity, and in a few important ways, it has come to embody and define an essential part of the country's sense of itself. After the Acts of Union (1707) and the merging of the Scottish and English state architectures, education was one of three areas where distinctive heritage was retained, and where separate systems continued to develop and thrive (alongside the well-established – *and prestigiously-held* – legal system, and – while still, as in England, 'reformed' – a separate, "national", non-Anglican church, in the form of the Church of Scotland (known colloquially as 'the Kirk')). Given the dissolution of the Edinburgh parliament, however, it is not quite correct or accurate to state that the retained education "system", such that it was, possessed what could be deemed any sort of coherent, centralised "national" framework; instead, it remained dominated, indeed almost exclusively so, by the entrenched and localised network of schools, colleges and universities which formed the backbone of provision, albeit one that was often subject to Kirk patronage and guidance. More importantly, the prodigious and prolific years of the 'Scottish Enlightenment' (a rather roughly-defined historical time period dating from around the Acts of Union to the early-to-mid 1800s) has ensured for posterity that any list of the country's "greatest achievements" would include rather numerous and rather considerable advancements in matters of science, reason and the arts, as much as it would the spread of, for example, national military objectives.

Today, a host of famous Enlightenment figures (e.g. Adam Smith, David Hume and Joseph Black) – who had themselves inherited and promulgated a culture of academic-public engagement in the form of free public lectures – now lend their names to some of the country's most celebrated university faculties, departments and buildings. Perhaps the primary contemporary form of this "universalist" character to education provision can be seen in the state funding of higher and further education courses for every prospective Scottish student studying in a Scottish college or university. Regardless of the relative merits, advantages and benefits of either approach, at ~£9,000/year for university fees in England, Wales and Northern Ireland, there is a clearly *substantive* distinction in approach to post-secondary education between the government in Edinburgh and those in London, Cardiff and Belfast. In emphasising this political *and cultural* difference, former First Minister Alex Salmond famously stated in 2014 that, "the rocks will melt with the sun before I allow tuition fees to be imposed on Scottish students".

Primary education in Scotland begins with cohorts aged between 4 ½ and 5 ½ (defined, for an August academic year start-date, by birth-year cut-offs of March through February) and, after seven years of education, lasts until pupils are aged 10 or 11. From here, pupils progress to high school which then lasts for a further four, five or six years; education is no longer compulsory after the age of 16, and pupils can leave after the first term of their S4 year ends. Today there are more than 400,000 children in Scotland's primary schools under the tutelage of almost 52,000 teachers, combining for an average pupil-teacher ratio of 13.7 and an average class size of 23.6. 2010 saw the long-awaited introduction (albeit a phased one) of the redesigned and redeveloped nationwide curriculum, titled "Curriculum for Excellence" – the initial discussion document was published in 2004 –, a change which also came to encompass a new set of qualifications, aimed at instilling in every Scottish pupil a set of capabilities, characteristics and values termed the "Four Capacities". These are to produce children and young adults who are more: (1) successful learners; (2) confident individuals; (3) responsible citizens; (4) effective contributors. These core elements are infused with a programme which aims to foster the creation and reinforcement of workforce skills and which holds employability considerations as a fundamental aspect of the very purpose of pupils' educational experience.

The Curriculum for Excellence programme 'benchmarks', that is to say a set of *content-independent* "outcomes" to which teachers must reach, encourages the design

and delivery of class content with underlying practical and interdisciplinary considerations/appreciation in mind. From primary school through to mid-secondary school years, pupils receive a 'broad general education'. From S4 onwards, the broad education turns to the 'senior phase' of the Curriculum for Excellence programme, which is designed to qualify students in subject areas which align with their 'interests and abilities'. In 2018, there were ~286,000 secondary school pupils in Scotland with around 23,000 secondary school teachers. Private school provision is less widespread in Scotland than it is in England and the other constituent countries of the UK: since the abolition of the grammar school system in the 1970s, comprehensive schools dominate the Scottish secondary school system, indeed almost exclusively so.

The Curriculum for Excellence programme has long been, and remains, controversial, chiefly among educational academics and educational practitioners. By contrast, CfE has long held widespread support across the Scottish political environment, from parties to trade unions. Indeed, while the initial discussion document was produced during the Labour-Liberal Democrat coalition, the formation and implementation of the new curriculum has survived and endured the change to successive minority, majority and minority SNP governments, demonstrating its fixed position as the cornerstone of national education policy over a fifteen-year period. The debates surrounding its implementation and its foundational ideas, as well as its rigour and coherency, range from practical to philosophical in nature, and reflects a more general and universal division in the educational and pedagogical communities. On one side of the debate – say those favouring CfE – lie arguments in favour of a curricula which prioritises the practical element of learning and the primacy of *how* to think over *what* to think. On a philosophical level, students are thought to *construct* knowledge for themselves, as opposed to being mere impassive recipients of *taught* knowledge. These proponents emphasise the importance of interdisciplinary learning and the acquisition of *skills*, the latter of which is a central feature of the new curriculum (see for e.g. the "entitlements" of CfE and the Developing the Young Workforce programme). Indeed, this interdisciplinary aspect marks a particularly notable change from older more compartmentalised frameworks.

On the other side of the debate, those sceptical of the new curriculum argue that the *accumulation of knowledge* is itself the key to learning how to think; the acquisition of new knowledge requires a thorough, comprehensive and systematic understanding of existing knowledge. Importantly, while reducing educational inequalities in

Scotland forms a central element of the Government's parliamentary programme, and not just with respect to its education policy, critics of CfE, such as Lindsay Paterson of the University of Edinburgh, believe that CfE will actually come to *widen* educational inequalities in Scotland. For Paterson, "knowledge can therefore be emancipating, and knowledge acquired through schools provides that opportunity to people who would not get it from home. If schools stop teaching structured knowledge, then inequality of access to knowledge will widen, because the children of the well-educated and the wealthy will get it in other ways" (Paterson, 2018). Moreover, Paterson points to the development of what he calls a "data desert" in Scottish education: iterative withdrawal of and from data collection surveys has diminished the abilities of researchers to measure, analyse, interpret and monitor the effects of CfE as it develops.

In 2014/15, ~93% of Scottish school leavers had moved onto a "positive destination", defined generally as those moving on to further or higher education, training or employment. This was divided more specifically between those moving onto Higher Education (HE) (38.8%), Further Education (FE) (27.6%), Employment (21.4%), Training (3.8%), Activity Agreements (0.9%) and Voluntary Work (0.4%). Those in *less* positive destinations after secondary school were split among those unemployed *and seeking work* (5.4), those unemployed *and not seeking work* (1.1%) with (0.5%) in unknown positions. One particularly notable characteristic of the Scottish education system – and student outcomes more specifically – is the *proportion* of school leavers who move on to FE and HE study. Indeed, while England and Wales met the milestone of 50% of young people enrolled in HE institutions in 2019 (note these statistics include a combination of HE+FE), this figure was met in Scotland far earlier (find date). Scotland is home to 19 Higher Education Institutes that have the power to award degree-level qualifications and 16 Further Education colleges which offer a wide range of vocational, competency-based qualifications (SVQs), as well as Higher National Certificates (HNCs) and Higher National Diplomas (HNDs). Moreover, these FE Colleges also provide access to secondary school-level qualifications for those adult returners who require them.

The University of Edinburgh (28,880) and the University of Glasgow (26,815) had the greatest number of HE students enrolled in 2014/15, while the University of the Highlands and Islands, with 7,850 students enrolled, provides much needed geographical cover for the most rural and unpopulated areas of the country. Reflecting population concentrations, the three FE colleges in Glasgow enrolled a combined

~60,000 students. The subject areas with the greatest number of students obtaining their first degree were business and administrative studies (5,580 graduates) and subjects allied to medicine (4,455 graduates). Overall, in 2015, 36,210 graduates obtained a first degree (with 7,870 obtaining *another* undergraduate degree), while 27,065 were newly qualified to postgraduate level, for a total of 71,175 graduates. Looking at HE Leavers over the same period, 17% of those obtaining their first degree went onto further study, with 68% moving into employment (both in the UK and abroad), 5% becoming unemployed, and 6% moving onto a combination of work and other study. Looking at Further Education provision, the three subject areas with the greatest number of enrolled students were Health Care, Medicine and Health and Safety (48,051), Family Care, Personal Development, Personal Care and Appearance (47,674) and Engineering (31,200).

Both the FE and HE sectors in Scotland have undergone significant change over recent decades. The early 1990s saw the largest set of organisational reforms to tertiary education (across the whole of the UK) since the 1960s. Most notably, the long-running "Binary Divide" that had previously existed across the UK HE sector was brought to an end with the Further and Higher Education Act (1992) when former technological colleges – the so-called "Polytechnics", or "Central Institutions" as they were known in Scotland – and other institutions of HE (such as the Conservatoire) were formally granted university status, becoming what were to be known as the "New Universities" or "Post-92s". To this end, Robert Gordon University (1992), Edinburgh Napier University (1992), the University of Paisley (1992; later to be enlarged and renamed the University of the West of Scotland), Glasgow Caledonian University (1993) and Abertay University (1994) finally became degree-awarding institutions.

Roughly 20 years of relative stability[29] then followed, before substantial upheaval of the FE sector was precipitated once again, this time by more austere budgetary conditions in the years after the global financial crisis. In this regard, one of the most pronounced changes was the drive towards college regionalisation, with more atomised, localised structures discarded. Many colleges were amalgamated with their closest neighbours and mandated to monitor and serve the skill needs of the regional and local economy more closely, with greater analytical considerations in mind, and

[29] Slightly out of kilter with this time frame, a number of independent colleges across the Highlands and Islands of Scotland were amalgamated, becoming officially the University of the Highlands and Islands, in 2007.

ultimately, greater financial consequences at stake (see e.g. the workings of the SFC/College Regional Outcome Agreements). Another aspect of FE disruption during this period came in the form of fairly substantial cuts to funding (a 32% reduction over the two-year period from 2011/12) and student numbers (over 150,000 fewer since 2007/08) (McMurray, 2016).

Other recent changes have mirrored wider, global sectoral trends: an increasingly competitive market in attracting international students, as well as above-inflation increases in the fees that are charged; the promulgation of interdisciplinary academic research and teaching; an amplified focus on academic/industry and academic/public engagement; and the intensification of managerialism and institutional corporatism – more specifically (and most importantly in this regard), a focus on institutional ranking and performance (and therefore image and marketability) resulting from, among other things, academic staff performance metrics and comparative, nationwide student surveys results. However, the extent of sectoral marketisation in Scotland has been much more limited than elsewhere in the UK, most notably in England (Kemp, 2018).

Table 7: *Number of Students Enrolled in Higher and Further Education Across Scotland*

Institution	No. of students enrolled* (2014/15)	Location of central office
Higher Education Institutions (19)		*Local Authority*
Abertay University	4,220	Dundee (City)
Edinburgh Napier University	13,125	Edinburgh (City)
Edinburgh University	28,880	Edinburgh (City)
Glasgow Caledonian University	16,930	Glasgow (City)
Glasgow School of Art	1,840	Glasgow (City)
Heriot-Watt University	10,705	Edinburgh (City)
Open University in Scotland**	14,170	Edinburgh (City)
Queen Margaret University	5,270	Edinburgh (City)
Robert Gordon University	13,240	Aberdeen (City)
Royal Conservatoire of Scotland	985	Glasgow (City)
Scotland's Rural College	1615	Dumfries & Galloway
University of Aberdeen	14,035	Aberdeen (City)
University of Dundee	15,180	Dundee (City)
University of Glasgow	26,815	Glasgow (City)
University of the Highlands & Islands	7,850	Highland
University of St Andrews	10,660	Fife
University of Stirling	11,100	Stirling
University of Strathclyde	21,210	Glasgow (City)
University of the West of Scotland	14,730	Renfrew
HE Total	**217,830**	
Further Education Colleges (16***)		*Local Authority*
Ayrshire College	18,036	Ayrshire
Borders College	4,980	Scottish Borders
City of Glasgow College	24,109	Glasgow (City)
Dumfries & Galloway College	5,483	Dumfries & Galloway
Dundee & Angus College	14,054	Dundee (City)
Edinburgh College	25,047	Edinburgh (City)
Fife College	27,091	Fife
Forth Valley College	14,687	Falkirk
Glasgow Clyde College	17,041	Glasgow (City)
Glasgow Kelvin College	19,735	Glasgow (City)
New College Lanarkshire	22,260	North Lanarkshire
Newbattle Abbey College	156	Midlothian
North East Scotland College	23,481	Aberdeen (City)
South Lanarkshire College	6,283	South Lanarkshire
West College Scotland	28,206	Inverclyde
West Lothian College	6,971	West Lothian
FE Total	**257,620**	
Scotland Total	**475,450**	

Source: Higher Education: HESA (2015); Further Education: SFC (2015)
Notes: *includes all full-time and part-time undergraduate and postgraduate students at HE level and *all* students at FE level; **excludes all non-UK domicile OU students, those studying at PGR level, and students returned in the HESA 'Aggregate Offshore' record (these groups are included in the OU in England statistical record; ***excludes Leith College of Art & the constituent colleges of the University of the Highlands & Islands, the latter of which is aggregated in the HE figures.

Table 8: *Destinations of HE Full-Time Leavers by Activity and Level of Qualification, 2014/15*

	First degree		Other postgraduate		Doctorate	
	No.	%	No.	%	No.	%
UK work	13000	65	4040	67	560	69
Overseas work	695	3	690	11	135	17
Combination of work & further study	1145	6	185	3	15	2
Further study	3420	17	480	8	25	3
Unemployed	965	5	425	7	45	6
Other	840	4	190	3	30	4

Source: HESA (2015)
Notes: Scottish HE providers only

CHAPTER 5: Research Methods

5.1. Introduction

This chapter proceeds as follows. Building upon the literature review chapters, Section 5.2. sets out the rationale behind the research aims and objectives of this research project. More formally, it sets out the specific research questions (of which there are four) which have been addressed through this research project and which are answered in Chapter 8. Section 5.3. addresses research philosophy, detailing research philosophy more generally, and relating it to business studies, before discussing the research philosophy underpinning this specific research project and this thesis. Lastly, Section 5.4. details the research methods undertaken for this research project – namely, the approach to social research known as the mixed methods approach. Here, the strengths, weaknesses and rationale behind this approach are set out. Section 5.5. discusses the data sources that have been utilised for this research, namely the 2015 Employer Skills Survey for the quantitative research, and the original primary research undertaken for the qualitative element of the mixed-methods approach. This section discusses the complementarities between these two approaches, and how they holistically and comprehensively give a better understanding of these phenomena compared to the more singular approach that is so common in the existing literature. Section 5.6. notes and details the timeframe of the study, with specific reference to two events (namely the "Brexit process" and the Covid-19 pandemic), which occurred after project research had ended, but which have undoubtedly had an impact on issues of skills matching since.

5.2. Aims and Objectives

The aim of this research is:

To investigate the distribution, severity and determinants of regional skill shortages and skill gaps in Scotland, with additional focus on the ability of employers to combat these deficiencies.

This broad aim was designed to explore several key features of the skills gap debate which appeared in the literature review. Some of the unique characteristics of the skills gap literature are worth stating here. Firstly, the literature is not confined to or dominated by any one research area of business studies. Indeed, skills gap literature is spread out over the fields of economics, general management, human resource management, organisational studies, and several other venues of research, creating a dispersed body of work with a non-uniform approach to research. Secondly, this body of work is distinctly practical in nature, and thus, skills gap research often captures the attention of policymakers more readily than does other research subjects. At the same time, given the practical nature of the research, evidence coming from industry often carries just as much weight as that coming from academia, even when the robustness, validity and reliability of the methods deployed vary quite dramatically. As shown in Chapter 2, this creates a situation in which the narrative of pervasive and persistent skill gaps and skill shortages is a fairly widespread topic of discussion in industry, politics and in society more broadly. Closer examination of this evidence, however, reveals nonconformity not just of approach but also of definitions in how these terms are even deployed. Therefore, this analysis leads to the formulation of the first research question:

Research question 1:

To what extent are so-called "skill gaps" appropriately conceptualised and measured?

While skills gap and skill shortage research has been conducted across several jurisdictions, geographical areas and contexts from a number of decades, analysis of Scotland specifically has been less prominent, with some exceptions (see e.g. Sutherland (2012) for analysis of educational mismatch). Nonetheless, the United Kingdom (with constituent country level detail) is home the Employer Skills Survey which is one of the most detailed and long-lasting data sources available that formally and systematically investigates these issues. This data is transparently reported at a high level, although more granular analysis, making use of more advanced statistical techniques, is largely absent from the literature. Importantly, even with this excellent data source at our disposal, academic research looking at the Scottish context, and more

specifically, variations *within* and *across* the Scottish context, has been distinctly lacking. This analysis therefore leads to the formulation of the second research question:

Research question 2:

To what extent does Scotland suffer from skill deficiencies?

Superficial analysis of the reporting data from the Employer Skills Survey reveals that issues of skill gaps and skill shortages impact Scotland at all levels, albeit to varying degrees, across different geographies, sectors, industries, and job roles. Not one of these differentiations is left untouched. Still, casual observation and analysis shows that Scotland still possesses, and is home to, successful firms which operate in these places and in these industries, and even some which are successful and manage to compete successfully at the international level. A lot of this gets "lost in the detail" of the popular narrative regarding economy-wide and country-wide skill gaps and skill shortages – something which is also common in other national settings. Importantly, higher level survey data cannot capture the detail in what is taking place here, which only a thorough qualitative investigation of organisations, either by way of case studies, interviews, or observation. This leads us to the formulation of the third research question:

Research question 3:

To what extent are sector-specific skill gaps distributed evenly across all firms and organisations?

It naturally follows from this then that some firms may be impacted differently than others, even though they are located in a similar geography, or compete alongside each other selling similar products to similar customers. Crucially, they might also be competing for the same talent pool. As with research question 3, higher level survey data cannot properly capture the mechanics of what is taking place here. If some firms are more impacted than others, then it is important, even crucial, to understand why this is the case, what it is that the more successful firms are doing to evade the skills gap effect, mitigate the problems they *do* face, or otherwise overcome the issue. This therefore leads to the formulation of the 4th research question:

Research question 4:

To what extent can firms mitigate the effects of industry skill deficiencies?

The aims and objectives of this research therefore require the use of both high-level and broad statistical analysis to ascertain the economy-wide, national picture, as well as more granular qualitative insights garnered from individual firms and actors within those firms. This research project therefore advanced a mixed-method approach undertaking quantitative and qualitative analysis. Moreover, it is important to garner insights from individuals working across a range of commercial and government organisations. This approach is depicted in this chapter below, with further detail provided in the quantitative (chapter 6) and qualitative (chapter 7) findings chapters.

5.3. Research Philosophy

Although researchers in the field of natural sciences have, at least to a certain extent, been able to "disassociate themselves from philosophy" (Hughes & Sharrock, 1997), this has not the case for most researchers operating in areas of the humanities, social sciences, and business studies. Given the nature of, and knowledge about, the social world, consensus in these areas hold that it is important to be explicit with the philosophical foundations underpinning academic research (Popper, 2005). In turn, this can help researchers to select, interpret, rationalise and justify their choice of selected research method(s) (Easterby-Smith, Thorpe and Lowe, 2002).

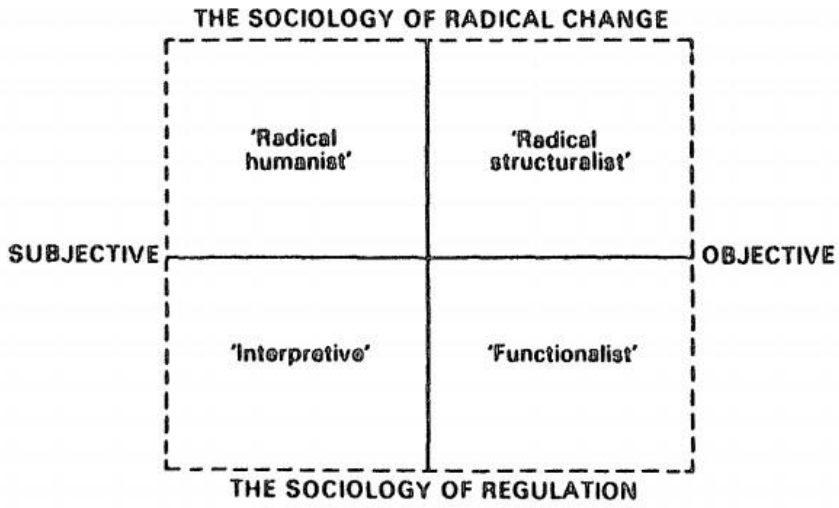
Philosophers often make distinctions between what is known as *ontology* (or the study of what is, or what actually exists) and what is known as *epistemology* (or the study and exploration of what can be understood about phenomena that exists) (Hughes & Sharrock, 1997). Within the field of research philosophy, different approaches have long been taken in tackling these important and fundamental issues. Although many approaches have been developed, a high-level distinction is often commonly and initially made between the *positivist* approach and the *anti-positivist* (or *interpretivist*) approach, which are radically different in their assumptions regarding the nature of reality.

The former approach assumes that nature can be understood through human sensory perception, and that *truth* can be gained through this knowledge alone (Comte,

1853). With respect to the social, human world, and the fields of research we have erected to study these issues, this approach suggests that – similar to the natural world – there are laws which can be investigated, codified and understood (Giddens, 1987; Popper, 2001). On the other hand, the anti-positivist, or interpretivist, approach takes the opposite view of nature, and holds that there are underlying, fundamental limitations on our knowledge, the root cause of which is our inability to overcome our own *perceptions* of reality. Fundamentally, the researcher cannot be removed from the research that they themselves are conducting (Bunnin & Tsui-James, 1996, pp. 367-8).

Although the roots of entrepreneurship research date back to the 1940s and 50s (Schumpeter, 2009), the modern academic discipline is a new field compared to most other subjects taught and studied in the business school. As such, it has had a certain degree of difficulty in defining its unique set of boundaries and its purpose (Shane & Venkataraman, 2000; Gartner, 2001). Over its short history, the *functionalist* perspective has come to dominate the philosophical underpinnings of the field, at least to a certain extent (Jennings, Perren & Carter, 2005; Grant & Perren, 2002). This philosophical approach can be understood in terms of Burrell & Morgan's (1979) famous paradigm matrix (see Figure 8 below). This matrix categorises philosophical frameworks based on two dimensions: i) whether the approach is subjective or objective; ii) whether the approach can be characterised by radical change or regulation. On this figure, functionalism falls within the boundaries of objectivism and regulation. Functionalism can largely be viewed of as a pragmatic approach or framework of research, where insights into policy, and not just theory, can be understood. Functionalism can be characterised by a "concern for providing explanations of the status quo, social order, consensus, social integration, solidatrity, need satisfaction and actuality" (Burrell & Morgan, 1979).

Figure 8*: The Paradigm Matrix*



Source: Burrell & Morgan's (1979)

Alternatively, the economics discipline has for a long time been fixated on analyses of equilibria and disequilibria (Marshall, 1890). Economists, whose analysis and analytical toolkit are so relevant to the study of (in this case, skills) shortages and surpluses, have often been accused of suffering an ailment known as "physics envy" (Mirowski, 1992). As the charge goes, economists have been accused of the desire to find generalisable and fixed "laws" in economic and social phenomena, where their application of sophisticated mathematic techniques seeks to find precise answers to questions and problems of economic mechanisms. The economics field, at least in its mainstream form, has been dominated by positivist research and positivist researchers, although there are changing dynamics here, where modern insights from psychology have proved influential (McCloskey, 1985). The relatively poor predictive performance of certain positivist economic analyses has also led to questioning of the positivist supremacy in the field (Boland, 2014; Alvey, 2005; Caldwell, 1980; Keita, 2003).

This stark divide between these philosophical approaches has been bridged by a philosophical (and indeed methodological) approach knowns as pragmatism, which views the broader approaches through the lens of complementarity rather than conflict or incompatibility (Brewer & Hunter, 2006; Morgan, 2007). As the name suggests, philosophical pragmatism rejects absolute distinctions and binary choices and favours an approach which puts practical considerations at the heart of researchers' decision making. This philosophy therefore offers an alternative to the positivist or interpretivist

conventions of traditional social research. Research rooted in philosophical pragmatism is free to blend the research methods of both of these without compromising on philosophical consistency and rigour. Practical outcomes and consequences are at the heart of pragmatic research, and pragmatic research places value on real-world impact from academic study. Philosophical pragmatism can be viewed of as the bedrock of the "third option" (Creswell & Plano Clark, 2011) of social research methods: neither strictly quantitative, nor strictly qualitative, but an adoption of both approaches. This mirrors the research approach taken in this thesis.

5.4. Research Design

Following from this pragmatic philosophical approach, this thesis adopts and implements a mixed methods research methodology in tackling the research questions. Mixed methods research adopts both quantitative and qualitative methods of analysis. The fundamental differences between these modes of research are given below:

Figure 9: *Fundamental Differences Between Quantitative and Qualitative Research Strategies*

	Quantitative	**Qualitative**
Principal orientation to the role of theory in relation to research	Deductive; testing of theory	Inductive; generation of theory
Epistemological orientation	Natural science model, in particular positivism	Interpretivism
Ontological orientation	Objectivism	Constructivism

Source: Bryman (2004)

Mixed methods research has previously been critiqued on both epistemological and ontological grounds as being incompatible (Bryman, 2004) differing not only in their methods, but also in their values and assumptions – something which proponents of philosophical pragmatism would reject, or at least view as not insurmountable. However, mixed methods research has been an increasingly common mode of analysis in business studies, the humanities, and social sciences over recent decades (O'Gorman & MacIntosh, 2014). Mixed methods approaches have been justified on three grounds (Hammersley, 1996): firstly, the use of one method to corroborate the findings of the

other (triangulation); secondly, the use of one approach to air research using the other (facilitation); thirdly, the use of both methods to investigate various complex aspects of a phenomena (complementarity). While all three of these rationales could be justified to a certain degree, this research adopts a mixed methods approach largely on the grounds of complementarity. As demonstrated in the first literature review chapter (Chapter 2: Skills Imbalance Research in Context), the phenomena of skill gaps and skill shortages is conceptually, mechanistically, and empirically complex, and requires the use of tools which probe the issue at various levels of analysis. The use of quantitative analysis has been adopted to examine the distribution and magnitude of the problem, while the use of qualitative analysis is used to follow up and examine employer views of the issue, as well as how they see their (relative) success in responding to any shortfall. This process is done in an explanatory and exploratory manner following what has been called the "sequential" approach to mixed methods research (Harrison, 2013; Creswell and Creswell, 2017), where one approach is adopted and analysed first (in this case quantitative analysis) and then used to inform the second approach (in this case qualitative).

Mixed methods research has a number of strengths and weaknesses associated with it (see Table 14 below for a summary of these provided by Johnson & Onwuegbuzie (2004)). The main advantages that a mixed-methods approach brings for this research is that it helps to shed light on the more nuanced, complex and intricate aspects of skills mismatch research, while maintaining the breadth of scope of analysis that previous single method (namely, quantitative) approaches have provided (Creswell et al., 2003). At the same time, several of the weaknesses associated with mixed-methods research have been, at least to a certain extent, mitigated, given the nature of doctoral research projects such as this. More specifically, the time-consuming nature of mixed-methods research was not a weakness or vulnerability of this study, nor was the resource constraint of a single researcher conducting primary research. In addition, as demonstrated in this chapter, the mixing of paradigms, via the pragmatic approach, has been viewed as a strength of this research, adding a level of comprehensiveness and thoroughness that is largely missing from the literature and public debate on the problem of skill gaps and skill shortages.

Figure 10: *Strengths and Weaknesses of Mixed-Methods Research*

Strengths
• Can answer a broader and more complete range of research questions because the researcher is not confined to a single method or approach. • A researcher can use the strengths of an additional method to overcome the weaknesses in another method by using both in a research study. • Can provide stronger evidence for a conclusion through convergence and corroboration of findings. • Can add insights and understanding that might be missed when only a single method is used. • Can be used to increase the generalizability of the results. • Qualitative and quantitative research used together produce more complete knowledge necessary to inform theory and practice.
Weaknesses
• Can be difficult for a single researcher to carry out both qualitative and quantitative research, especially if two or more approaches are expected to be used concurrently; it may require a research team. • Researcher has to learn about multiple methods and approaches and understand how to mix them appropriately. • Methodological purists contend that one should always work within either a qualitative or a quantitative paradigm. • More expensive. • More time consuming.

Source: Johnson & Onwuegbuzie (2004)

5.5. Data sources

The quantitative data utilised in this study comes from the 2015 iteration of the Employer Skills Survey, which was the most recent and up-to-date iteration of this survey at the time the analysis began. The Employer Skills Survey, which covers employer perspectives of skills across England, Northern Ireland, Scotland, and Wales, is widely seen as an authoritative source of the UK's skills imbalance picture, and as an exercise in data collection, is seen as the "gold standard", even in an international setting. Subsequent publications of the ESS series of surveys have been produced (Scottish Government, 2021). While analyses of the more recent ESS publications and utilisation of their data would produce more up-to-date analysis, this study utilised the 2015 version as it was contemporaneous with the qualitative element of the study, and therefore in-line with what were the recent recruitment and training experiences of employers within Scotland. Moreover, subsequent iterations of this survey will have

captured information on skill gaps and skill shortages as they relate to the Brexit process and the Covid-19 pandemic (please see Section 8.6).

This project incorporated a mixed methods research approach to try to shed light on the distribution and severity of skills gaps and skills shortages in Scotland. This was one of the key findings of the literature review portion of this study, which identified that previous research was too focused on one set of indicators, or on data coming from one perspective or from one source. Therefore, a multi-method holistic approach was formulated which suggested the utilisation of multiple data sources and the incorporation of several key indicators to form a more objective assessment of the phenomena. To the extent that data limitations allowed, this approach was followed in this study. While the methodological assessment and the quantitative element of the research formed a substantial portion of the project and its findings, the qualitative element, while smaller in size, was still important. The qualitative element was an exploratory investigation to shed light on the key quantitative findings, aiming to add some depth to the broad layer of statistical analysis which had been conducted. The qualitative element can therefore be viewed as complementary, exploratory, and investigative. Future researchers might reverse the contributions of the quantitative and qualitative elements while maintaining an accordance to the multi-method holistic approach.

Qualitative data were gathered from a range of successful businesses across the country, as well as from a host of individuals involved in government and in the implementation and analysis of regional economic policy. Businesses were deemed as "successful" depending on their rate of growth over the previous three years, and were identified based on lists of these companies set forth by the CBI and the FSB for the purposes of national business award events. These companies were therefore selected with the research following a purposive sampling approach (Etikan et al., 2016). Priority was given to ensuring a range of diverse companies were targeted, including those from diverse sectors and industries, headquartered and operating in diverse geographies (including urban and rural, highlands and lowlands), and of varying sizes and in varying stages of development. These companies were then contacted initially by letter (see Appendix G), with follow-up advances via email, and then finally telephone. In total, eight companies agreed to and followed through with participation, with interviewees being a mixture of owner/managers, controlling managers, or human resource managers (see Table 15 for a summary of these organisations and interviewee

positions). HR Managers, while not company owners, were seen as an appropriate interviewee given their central role in recruitment, training and retention procedures within a firm. Following Aguinis & Solarino (2019), HR Managers were therefore selected on the basis of being an 'expert informant'. Moreover, policy analysts and the government minister were identified, targeted, and contacted using professional networking contacts developed and nourished at the university. Again, these actors were targeted as potential interviewees given their central role in the skills ecosystem in Scotland, and the extent to which they hold overarching view of the system – by necessity, these actors *need* to listen to and be aware of a multitude of stakeholders, in a way that (at least in this regard) business owners do not. In total, three of those were identified, targeted, and contacted, with all following through with the interviews (see differing interview guides between participant groups in Appendix H and Appendix I). This brought the total number of interviews to eleven, which were designed and undertaken to investigate the quantitative findings in more depth. Interviews were all semi-structured to allow for a range of unrestricted, unforeseen, and unencumbered viewpoints to emerge. They were conducted either in-person or over the phone beginning in Spring 2016, depending on the wishes and convenience of the interviewee. Interviews lasted on average one hour in length.

The work was conducted in accordance with the University of Strathclyde's Ethics Committee guidance on research. Participants were informed that they were under no obligation to contribute to this study and could withdraw their involvement at any time. Prior to interview, a description of the research aims and objectives were provided, alongside a participant consent form informing them of their rights (see Appendix F). The qualitative fieldwork interviews took place over the Summer of 2016. All interviews were recorded with the consent of the participant, and then transcribed at a later date.

5.6. Timeframe of the study

In-line with the funding proposal and project agreement documents, the timeframe of this study covers only the funded years of the project, from 2014 to 2018. The 2015 iteration of the Employer Skills Survey provided the data for the quantitative analysis that was conducted, while the data used in the qualitative analysis was gathered by the author from primary interviews conducted over the Spring and Summer of 2016.

Since the funded stage of the project ended, the Scottish economy has been quite substantially impacted by two important events. Firstly, the United Kingdom formally withdrew from the European Union (i.e., the so-called "Brexit" process) beginning in January 2020 (UK Parliament, 2019). Secondly, in early 2020, the outbreak of the novel coronavirus which had surfaced in Wuhan, China began to spread internationally, and was quickly declared a global pandemic (WHO, 2020). Each of these issues had different economic consequences, but the magnitude of the disruption has been notable for both, and the implication for skills policy is far from trivial (Costa et al., 2019; De Lyon & Dhingra, 2021; Li et al., 2020). Given China's position as the cornerstone of global manufacturing, the Covid-19 pandemic has induced a level of turmoil into the international logistics and supply chain systems which has been quite unprecedented (Shih, 2020). Covid-induced policies of citizen "lockdowns" have reduced working hours, decreased labour productivity, and lowered firm and aggregate output, affecting (albeit to varying degrees) every sector of the economy (Caselli et al., 2020). At the same time, Brexit has affected product availability for British consumers (Lang & McKee, 2018), greatly reduced access to foreign markets for British companies (in what had previously been a major export market) (Fernandes & Winters, 2021), and most pertinent to this study, has had a rather transformative impact on the British labour market (Dennison & Geddes, 2018).

Despite moves to legally accommodate the non-British EU citizens already residing within the country (Sumption, 2020), a process marred by difficulties (Jablonowski, 2020), the UK labour market lost (rather abruptly) access to millions of potential workers who no longer had the automatic right to live and work within the country, something which had previously been guaranteed by the UK's EU membership (Kohler & Muller, 2017). Sectors which were previously disproportionately reliant on EU workers were particularly effected. For example, reports detailing the difficulties that seasonal employers in the hospitality (Hall, 2020) and agricultural (Petetin & Dobbs, 2022) sectors had in trying to access adequate numbers of workers were far from uncommon, and likewise, skill shortage stories regarding the National Health Service have again surfaced in the aftermath of Brexit (Dalingwater, 2019). The concurrence of both of these events have had a compounding effect, with the UK economy, as of August 2022, forecasted as heading into recession (BBC News, 2022), and a large amount of uncertainty remains regarding their longer-term consequences (McIntyre et al., 2020). Moreover, the effects of the Brexit process have arguably been

masked to a certain extent by the international turmoil of the Covid-19 pandemic. Given the volatile, unpredictable, and interconnected economic dynamics at play here, the economy is far from equilibrium, making detailed and accurate analysis a hard task for researchers. Only over the longer term will future research be able to determine the full effects of these events (particularly the Brexit process) on the Scottish labour market, especially regarding its skills supply and demand dimension. These events however fall outside the remit of this project, which was limited in scope by the project funding bodies.

This chapter has detailed the underpinning research philosophy of this research project, namely that of pragmatism. This research philosophy helps to justify the selection of a mixed-methods approach to tackling the research aim and objective of investigating the distribution, severity and determinants of regional skill shortages and skill gaps in Scotland, focusing on the ability of employers to combat these deficiencies. Moreover, the individual quantitative and qualitative approaches are at times particularly well suited to answering each of the four specific research questions. This thesis proceeds from here as follows. Chapter 6 discusses the specific approach of gathering and analysing the quantitative data used in this study, and details the findings of that analysis. Chapter 7 discusses the specific approach of gathering and analysing the qualitative data used in this study, and details the findings of that process. Chapter 8 then brings these findings together, and in conjunction with previous research from the literature (Chapters 2 and 3), explicitly tackles the four research questions of this thesis.

CHAPTER 6: Quantitative Findings

6.1 Introduction

As noted in the first literature review, statistical analyses have formed and should form an essential component of any attempt to ascertain the efficacy and magnitude of skills imbalances in the economy, and this research project utilised just such an approach as the foundation of its analysis (see Chapter 5 for a full breakdown of the research methodology undertaken). A full description of the empirical analyses undertaken in, and relevant findings resulting from, this research are provided below. This chapter is structured as follows. Section 6.2 describes the preparation of data (as it was altered from the original ESS 2015 dataset), and sets out key descriptive statistic tables of the variables utilised. Section 6.3 then gives a written analysis of these descriptive statistics. After this, attention turns to the main quantitative methods undertaken: namely, probit and logistic regression. Section 6.4 sets out the assumptions behind these quantitative models and details how the particular models utilised in this research satisfied them. Section 6.5 goes on to describe the specific steps which were undertaken, including discussion on model estimation and specification, reference category selection, sensitivity analysis and robustness checks, and post-regression diagnostics. Finally, regression outputs are shown in Section 6.6 with a summary of these findings given in Section 6.7.

6.2. Data preparation & descriptive statistics

A core strength of the Employer Skills Survey (2015) lies in the number of cases available to researchers for analysis (n=6035 for Scotland, although many of the survey's considerable number of variables (n=2399) lack inputted data over a majority of these cases). However, of the given ESS variables that would have been relevant (and indeed useful) as independent[30] or control variables for this analysis that still did not meet the full allocation of 6035, only *A4A* (whether the establishment's head office is located in the UK) was missing considerable data (3786/6035 missing). Still,

[30] For discussion on additional or alternative *dependent* variables, see section 6.3 below.

inclusion of *A4A* was considered but rejected due to the large numbers of case data (at variable and reference level) that probit and logistic analyses require for meaningful analysis. All other variables utilised in the main models had full data inputted (n=6035). In addition, due mostly to resource constraints on the side of the UKCES when planning, structuring and configuring the 2015 iteration of the survey, not all relevant control variables identified in the literature review were available for use in the final quantitative models. Of these, a lack of information concerning (a) the success of the firm (e.g revenue or profit growth), (b) the age of the firm, and (c) the position of the survey respondent within the firm, are perhaps the most impactful.

As discussed in the chapter detailing the research methods used in this study (Chapter 5), it had been hoped to utilise a wide variety of geographic, economic and social data taken at the level of the Local Authority. This would have permitted the use of Multilevel Modelling in the analysis, illuminating aspects of LA structure which may impact on generation, attraction and accessibility to, as well as the utilisation of, a given area's worker skillset. However, a lack of variable categories (n=32) obstructed this approach, where n(min)=50 is recommended (Moineddin et al., 2007). Therefore, much of the data gathered in this process was unsuitable for inclusion in the main regression models. Nevertheless, this data has been maintained and utilised in a descriptive manner to tease out possible explanations for results in the Discussion chapter (see Chapter 8). Still, Local Authority – as a variable in its own right – was still utilised in geographic sensitivity analysis.

A substantial amount of recoding was necessary for this research. Several of the binary variables were coded 1,2 in the original ESS, and had to be changed to 0,1 for the analysis undertaken in this research. This original coding configuration posed little issue on a technical front, but the order of this coding potentially introduced unnecessary confusion during the interpretation stage of the analysis. To eliminate this potential, 1=affirmative, 2=negative became 0=negative, 1=affirmative in the final constructed/reduced dataset. The ESS variable named *A3* was also recoded (0=single; 1=multi-site) as *NoOfSites* for the same reason. *OrgType* was recoded from the ESS variable *A8* so that what would become the reference category – those organisations mainly seeking to make a profit – was coded as 0.

Finally, to allow for considerable use of sensitivity analysis in this research, several of the variables were reconstituted to reflect different variances of the same construct. Thus, the ESS category bins for urban/rural location – *URBSC_2011* (n=8)

– were collapsed to produce a binary variable *GeoDetached* (0=Accessible; 1=Inaccessible). The ESS categorical variable for company size (which was named *A1RAN*) was recoded to reflect fewer (and different) configurations of the variable. The new variables *Size* (four categories of micro, small, medium and established enterprises) and *Size2* (a binary variable representing established or new enterprise) were constructed. In the analysis, a combination of original and recoded variables was utilised. Descriptive statistics of these variables are presented in Tables 6.1A-6.1L, below. Alongside Stata-produced statistics for (a) frequencies, (b) expected frequencies (shown to highlight frequency deviation from standard probabilities), (c) cell X^2 contributions and (d) cell percentages, calculations on (e) the share of each category stating that they have at least one skill gap at present, and (f) the magnitude to which these deviate (% difference, + or -) from what is expected are provided.

Tables 9A-9L: *Descriptive statistics*

Table 9A: *Tabulation of URBSC_2011 & SkillGap*

URBSC Urban/Rural Indicator - based on 2011 Census Output Area - Scotland	Whether have skill gaps recode			Share of category answering "yes" (%)	Deviation from expected frequency (%)
	No	Yes	Total		
Large Urban Area	**1739**	**486**	**2225**	21.84	+6.65
(Expected Frequency)	(1769.3)	(455.7)	(2225.0)		
Chi2 contribution	0.5	2.0	2.5		
(Cell percentage)	*(28.82)*	*(8.05)*	*(36.87)*		
Other Urban Area	**1315**	**357**	**1672**	21.35	+4.26
	(1329.6)	(342.4)	(1672.0)		
	0.2	0.6	0.8		
	(21.79)	*(5.92)*	*(27.71)*		
Accessible Small Town	**285**	**56**	**341**	16.42	-19.77
	(271.2)	(69.8)	(341.0)		
	0.7	2.7	3.4		
	(4.72)	*(0.93)*	*(5.65)*		
Remote Small Town	**137**	**27**	**164**	16.46	-19.64
	(130.4)	(33.6)	(164.0)		
	0.3	1.3	1.6		
	(2.27)	*(0.45)*	*(2.72)*		
Very Remote Small Town	**113**	**40**	**153**	26.14	+27.80
	(121.7)	(31.3)	(153.0)		
	0.6	2.4	3.0		
	(1.87)	*(0.66)*	*(2.54)*		
Accessible Rural	**686**	**148**	**834**	17.75	-13.35
	(663.2)	(170.8)	(834.0)		
	0.8	3.0	3.8		
	(11.37)	*(2.45)*	*(13.82)*		
Remote Rural	**286**	**60**	**346**	17.34	-15.37
	(275.1)	(70.9)	(346.0)		
	0.4	1.7	2.1		
	(4.74)	*(0.99)*	*(5.73)*		
Very Remote Rural	**238**	**62**	**300**	20.67	+0.98
	(238.6)	(61.4)	(300.0)		
	0.0	0.0	0.0		
	(3.94)	*(1.03)*	*(4.97)*		
Total	**4799**	**1236**	**6035**	**20.48**	**0.00**
(Expected Frequency)	(4799.0)	(1236.0)	(6035.0)		
Chi2 contribution	3.5	13.8	17.3		
(Cell percentage)	*(79.52)*	*(20.48)*	*(100.00)*		
Pearson chi2 (7) = 17.3308	Pr = 0.015				

Table 9B: *Tabulation of GeoDetached & SkillGap*

Whether firm in accessible location	Whether have skill gaps recode			Share of category answering "yes" (%)	Deviation from expected frequency (%)
	No	Yes	Total		
Accessible	**4025**	**1047**	**5072**		
(Expected Frequency)	(4033.2)	(1038.8)	(5072.0)	20.64	+0.79
Chi2 contribution	0.0	0.1	0.1		
(Cell percentage)	*(66.69)*	*(17.35)*	*(84.04)*		
Detached	**774**	**189**	**963**		
	(765.8)	(197.2)	(963.0)	19.63	-4.16
	0.1	0.3	0.4		
	(12.83)	*(3.13)*	*(15.96)*		
Total	**4799**	**1236**	**6035**		
(Expected Frequency)	(4799.0)	(1236.0)	(6035.0)	**20.48**	**0.00**
Chi2 contribution	0.1	0.4	0.5		
(Cell percentage)	*(79.52)*	*(20.48)*	*(100.00)*		
Pearson chi2 (1) = 0.5136	Pr = 0.474				

Table 9C: *Tabulation of LA & SkillGap*

Local Authority (LA)	Whether have skill gaps recode			Share of category answering "yes" (%)	Deviation from expected frequency (%)
	No	Yes	Total		
Aberdeen City	**242**	**94**	**336**	27.98	+36.63
(Expected Frequency)	(267.2)	(68.8)	(336.0)		
Chi2 contribution	2.4	9.2	11.6		
(Cell percentage)	*(4.01)*	*(1.56)*	*(5.57)*		
Aberdeenshire	**296**	**66**	**362**	18.23	-10.93
	(287.9)	(74.1)	(362.0)		
	0.2	0.9	1.1		
	(4.90)	*(1.09)*	*(6.00)*		
Angus	**124**	**26**	**150**	17.33	-15.31
	(119.3)	(30.7)	(150.0)		
	0.2	0.7	0.9		
	(2.05)	*(0.43)*	*(2.49)*		
Argyll and Bute	**116**	**33**	**149**	22.15	+8.20
	(118.5)	(30.5)	(149.0)		
	0.1	0.2	0.3		
	(1.92)	*(0.55)*	*(2.47)*		
City of Edinburgh	**455**	**138**	**593**	23.27	+13.67
	(471.6)	(121.4)	(593.0)		
	0.6	2.3	2.8		
	(7.54)	*(2.29)*	*(9.83)*		
Clackmannanshire	**38**	**6**	**44**	13.64	-33.33
	(35.0)	(9.0)	(44.0)		
	0.3	1.0	1.3		
	(0.63)	*(0.10)*	*(0.73)*		
Dumfries and Galloway	**202**	**45**	**247**	18.22	-11.07
	(196.4)	(50.6)	(247.0)		
	0.2	0.6	0.8		
	(3.35)	*(0.75)*	*(4.09)*		
Dundee City	**100**	**36**	**136**	26.47	+29.03
	(108.1)	(27.9)	(136.0)		
	0.6	2.4	3.0		
	(1.66)	*(0.60)*	*(2.25)*		
East Ayrshire	**88**	**15**	**103**	14.56	-28.91
	(81.9)	(21.1)	(103.0)		
	0.5	1.8	2.2		
	(1.46)	*(0.25)*	*(1.71)*		
East Dunbartonshire	**60**	**16**	**76**	21.05	+2.56
	(60.4)	(15.6)	(76.0)		
	0.0	0.0	0.0		
	(0.99)	*(0.27)*	*(1.26)*		
East Lothian	**67**	**13**	**80**	16.25	-20.73
	(63.6)	(16.4)	(80.0)		
	0.2	0.7	0.9		
	(1.11)	*(0.22)*	*(1.33)*		

East Renfrewshire	**48** (42.9) 0.6 *(0.80)*	**6** (11.1) 2.3 *(0.10)*	**54** (54.0) 2.9 *(0.89)*	11.11	-45.95
Eilean Siar	**37** (35.8) 0.0 *(0.61)*	**8** (9.2) 0.2 *(0.13)*	**45** (45.0) 0.2 *(0.75)*	17.78	-13.04
Falkirk	**110** (105.8) 0.2 *(1.82)*	**23** (27.2) 0.7 *(0.38)*	**133** (133.0) 0.8 *(2.20)*	17.29	-15.44
Fife	**265** (266.4) 0.0 *(4.39)*	**70** (68.6) 0.0 *(1.16)*	**335** (335.0) 0.0 *(5.55)*	20.90	+2.04
Glasgow City	**572** (555.8) 0.5 *(9.48)*	**127** (143.2) 1.8 *(2.10)*	**699** (699.0) 2.3 *(11.58)*	18.17	-11.31
Highland	**279** (282.3) 0.0 *(4.62)*	**76** (72.7) 0.1 *(1.26)*	**355** (355.0) 0.2 *(5.88)*	21.41	4.54
Inverclyde	**59** (58.8) 0.0 *(0.98)*	**15** (15.2) 0.0 *(0.25)*	**74** (74.0) 0.0 *(1.23)*	20.27	-1.32
Midlothian	**63** (66.8) 0.2 *(1.04)*	**21** (17.2) 0.8 *(0.35)*	**84** (84.0) 1.1 *(1.39)*	25.00	+22.09
Moray	**105** (99.4) 0.3 *(1.74)*	**20** (25.6) 1.2 *(0.33)*	**125** (125.0) 1.5 *(2.07)*	16.00	-21.88
North Ayrshire	**102** (108.1) 0.3 *(1.69)*	**34** (27.9) 1.4 *(0.56)*	**136** (136.0) 1.7 *(2.25)*	25.00	+21.86
North Lanarkshire	**205** (202.0) 0.0 *(3.40)*	**49** (52.0) 0.2 *(0.81)*	**254** (254.0) 0.2 *(4.21)*	19.29	-5.77
Orkney Islands	**41** (40.6) 0.0 *(0.68)*	**10** (10.4) 0.0 *(0.17)*	**51** (51.0) 0.0 *(0.85)*	19.61	-3.85
Perth and Kinross	**160** (168.6)	**52** (43.4)	**212** (212.0)	24.53	+19.82

	0.4 *(2.65)*	1.7 *(0.86)*	2.1 *(3.51)*		
Renfrewshire	**149** (147.9) 0.0 *(2.47)*	**37** (38.1) 0.0 *(0.61)*	**186** (186.0) 0.0 *(3.08)*	19.89	-2.89
Scottish Borders	**157** (147.9) 0.6 *(2.60)*	**29** (38.1) 2.2 *(0.48)*	**186** (186.0) 2.7 *(3.08)*	15.59	-23.88
Shetland Islands	**39** (42.9) 0.4 *(0.65)*	**15** (11.1) 1.4 *(0.25)*	**54** (54.0) 1.8 *(0.89)*	27.78	+35.14
South Ayrshire	**123** (118.5) 0.2 *(2.04)*	**26** (30.5) 0.7 *(0.43)*	**149** (149.0) 0.8 *(2.47)*	17.45	-14.75
South Lanarkshire	**227** (221.1) 0.2 *(3.76)*	**51** (56.9) 0.6 *(0.85)*	**278** (278.0) 0.8 *(4.61)*	18.35	-10.37
Stirling	**96** (97.0) 0.0 *(1.59)*	**26** (25.0) 0.0 *(0.43)*	**122** (122.0) 0.1 *(2.02)*	21.31	+4.00
West Dunbartonshire	**55** (58.0) 0.2 *(0.91)*	**18** (15.0) 0.6 *(0.30)*	**73** (73.0) 0.8 *(1.21)*	24.66	+20.00
West Lothian	**119** (122.5) 0.1 *(1.97)*	**35** (31.5) 0.4 *(0.58)*	**154** (154.0) 0.5 *(2.55)*	22.73	+11.11
Total (Expected Frequency) Chi2 contribution *(Cell percentage)*	**4799** (4799.0) 9.3 *(79.52)*	**1236** (1236.0) 36.2 *(20.48)*	**6035** (6035.0) 45.5 *(100.0)*	**20.48**	**0.00**
Pearson chi2 (31) = 45.4682	Pr = 0.045				

Table 9D: *Tabulation of Training & SkillGap*

Whether train	Whether have skill gaps recode			Share of category answering "yes" (%)	Deviation from expected frequency (%)
	No	Yes	Total		
Does not train	**1056**	**85**	**1141**	7.45	-63.63
(Expected Frequency)	(907.3)	(233.7)	(1141.0)		
Chi2 contribution	24.4	94.6	119.0		
(Cell percentage)	*(17.50)*	*(1.41)*	*(18.91)*		
Trains on the job only	**921**	**188**	**1109**	16.95	-17.22
	(881.9)	(227.1)	(1109.0)		
	1.7	6.7	8.5		
	(15.26)	*(3.12)*	*(18.38)*		
Trains off the job only	**584**	**142**	**726**	19.56	-4.51
	(577.3)	(148.7)	(726.0)		
	0.1	0.3	0.4		
	(9.68)	*(2.35)*	*(12.03)*		
Trains both on and off the job	**2238**	**821**	**3059**	26.84	+31.05
	(2432.5)	(626.5)	(3059.0)		
	15.6	60.4	75.9		
	(37.08)	*(13.60)*	*(50.69)*		
Total	**4799**	**1236**	**6035**	**20.48**	**0.00**
(Expected Frequency)	(4799.0)	(1236.0)	(6035.0)		
Chi2 contribution	41.7	162.0	203.8		
(Cell percentage)	*(79.52)*	*(20.48)*	*(100.00)*		
Pearson chi2 (3) = 203.7572	Pr = 0.000				

Table 9E: *Tabulation of TrainPlan & SkillGap*

A training plan that specifies in advance the level and type of training your em	Whether have skill gaps recode			Share of category answering "yes" (%)	Deviation from expected frequency (%)
	No	Yes	Total		
No plan in advance	**2028**	**445**	**2473**		
(Expected Frequency)	(1966.5)	(506.5)	(2473.0)	17.99	-12.14
Chi2 contribution	1.9	7.5	9.4		
(Cell percentage)	*(33.60)*	*(7.37)*	*(40.98)*		
Plan in place	**2686**	**782**	**3468**		
	(2757.7)	(710.3)	(3468.0)	22.55	10.09
	1.9	7.2	9.1		
	(44.51)	*(12.96)*	*(57.46)*		
Not sure	**85**	**9**	**94**		
	(74.7)	(19.3)	(94.0)	9.57	-53.37
	1.4	5.5	6.9		
	(1.41)	*(0.15)*	*(1.56)*		
Total	**4799**	**1236**	**6035**		
(Expected Frequency)	(4799.0)	(1236.0)	(6035.0)	**20.48**	**0.00**
Chi2 contribution	5.2	20.2	25.4		
(Cell percentage)	*(79.52)*	*(20.48)*	*(10.00)*		
Pearson chi2 (2) = 25.3622	Pr = 0.000				

Table 9F: *Tabulation of SECTOR15 & SkillGap*

15 sector classification	Whether have skill gaps recode			Share of category answering "yes" (%)	Deviation from expected frequency (%)
	No	Yes	Total		
Agriculture, hunting, forestry and fishing	**450**	**42**	**492**		
(Expected Frequency)	(391.2)	(100.8)	(492.0)	8.54	-58.33
Chi2 contribution	8.8	34.3	43.1		
(Cell percentage)	*(7.46)*	*(0.70)*	*(8.15)*		
Mining and quarrying	**30**	**4**	**34**		
	(27.0)	(7.0)	(34.0)	11.76	-42.86
	0.3	1.3	1.6		
	(0.50)	*(0.07)*	*(0.56)*		
Manufacturing	**266**	**111**	**377**		
	(299.8)	(77.2)	(377.0)	29.44	+43.78
	3.8	14.8	18.6		
	(4.41)	*(1.84)*	*(6.25)*		
Electricity, gas and water supply	**58**	**12**	**70**		
	(55.7)	(14.3)	(70.0)	17.17	-16.08
	0.1	0.4	0.5		
	(0.96)	*(0.20)*	*(1.16)*		
Construction	**394**	**95**	**489**		
	(388.9)	(100.1)	(489.0)	19.43	-5.09
	0.1	0.3	0.3		
	(6.53)	*(1.57)*	*(8.10)*		
Wholesale and retail trade	**720**	**218**	**938**		
	(745.9)	(192.1)	(938.0)	23.24	+13.48
	0.9	3.5	4.4		
	(11.93)	*(3.61)*	*(15.54)*		
Hotels and restaurants	**407**	**175**	**582**		
	(462.8)	(119.2)	(582.0)	30.07	+46.81
	6.7	26.1	32.9		
	(6.74)	*(2.90)*	*(9.64)*		
Transport and storage	**260**	**63**	**323**		
	(256.8)	(66.2)	(323.0)	19.50	-4.83
	0.0	0.2	0.2		
	(4.31)	*(1.04)*	*(5.35)*		
Information and communications	**229**	**31**	**260**		
	(206.8)	(53.2)	(260.0)	11.92	-41.73
	2.4	9.3	11.7		
	(3.79)	*(0.51)*	*(4.31)*		
Financial services	**190**	**37**	**227**		
	(180.5)	(46.5)	(227.0)	16.30	-20.43
	0.5	1.9	2.4		
	(3.15)	*(0.61)*	*(3.76)*		
Real estate, renting and	**603**	**160**	**763**	20.97	+2.37

business activities					
	(606.7)	(156.3)	(763.0)		
	0.0	0.1	0.1		
	(9.99)	*(2.65)*	*(12.64)*		
Public admin. and defence; compulsory social security	**79**	**23**	**102**		
	(81.1)	(20.9)	(102.0)	22.55	+10.05
	0.1	0.2	0.3		
	(1.31)	*(0.38)*	*(1.69)*		
Education	**264**	**74**	**338**		
	(268.8)	(69.2)	(338.0)	21.89	+6.94
	0.1	0.3	0.4		
	(4.37)	*(1.23)*	*(5.60)*		
Health and social work	**482**	**112**	**594**		
	(472.3)	(121.7)	(594.0)	18.86	-7.97
	0.2	0.8	1.0		
	(7.99)	*(1.86)*	*(9.84)*		
Community, social and personal service activities	**367**	**79**	**446**		
	(354.7)	(91.3)	(446.0)	17.71	-13.47
	0.4	1.7	2.1		
	(6.08)	*(1.31)*	*(7.39)*		
Total	**4799**	**1236**	**6035**		
(Expected Frequency)	(4799.0)	(1236.0)	(6035.0)		
				20.48	**0.00**
Chi2 contribution	24.5	95.0	119.5		
(Cell percentage)	*(79.52)*	*(20.48)*	*(100.00)*		
Pearson chi2 (14) = 119.5029	Pr = 0.000				

Table 9G: *Tabulation of SECTOR6 & SkillGap*

6 sector classification	Whether have skill gaps recode			Share of category answering "yes" (%)	Deviation from expected frequency (%)
	No	Yes	Total		
Primary Sector and Utilities	**538**	**58**	**596**	9.73	-52.50
(Expected Frequency)	(473.9)	(122.1)	(596.0)		
Chi2 contribution	8.7	33.6	42.3		
(Cell percentage)	*(8.91)*	*(0.96)*	*(9.88)*		
Manufacturing	**266**	**111**	**377**	29.44	+43.78
	(299.8)	(77.2)	(377.0)		
	3.8	14.8	18.6		
	(4.41)	*(1.84)*	*(6.25)*		
Construction	**394**	**95**	**489**	19.43	-5.09
	(388.9)	(100.1)	(489.0)		
	0.1	0.3	0.3		
	(6.53)	*(1.57)*	*(8.10)*		
Trade, Accommodation and Transport	**1387**	**456**	**1843**	24.74	+20.79
	(1465.5)	(377.5)	(1843.0)		
	4.2	16.3	20.6		
	(22.98)	*(7.56)*	*(30.54)*		
Business and Other Services	**1389**	**307**	**1696**	18.10	-11.60
	(1348.7)	(347.3)	(1696.0)		
	1.2	4.7	5.9		
	(23.02)	*(5.09)*	*(28.10)*		
Non-Market Services	**825**	**209**	**1034**	20.21	-1.32
	(822.2)	(211.8)	(1034.0)		
	0.0	0.0	0.0		
	(13.67)	*(3.46)*	*(17.13)*		
Total	**4799**	**1236**	**6035**	**20.48**	**0.00**
(Expected Frequency)	(4799.0)	(1236.0)	(6035.0)		
Chi2 contribution	18.0	69.7	87.7		
(Cell percentage)	*(79.52)*	*(20.48)*	*(100.0)*		
Pearson chi2 (5) = 87.7037	Pr = 0.000				

Table 9H: *Tabulation of A1RAN & SkillGap*

A1ran Size of establishment	Whether have skill gaps recode			Share of category answering "yes" (%)	Deviation from expected frequency (%)
	No	Yes	Total		
2-4	**1188**	**76**	**1264**	6.01	-70.65
(Expected Frequency)	(1005.1)	(258.9)	(1264.0)		
Chi2 contribution	33.3	129.2	162.5		
(Cell percentage)	*(19.69)*	*(1.26)*	*(20.94)*		
5-9	**1092**	**174**	**1266**	13.74	-32.90
	(1006.7)	(259.3)	(1266.0)		
	7.2	28.1	35.3		
	(18.09)	*(2.88)*	*(20.98)*		
10-24	**1348**	**405**	**1753**	23.10	+12.81
	(1394.0)	(359.0)	(1753.0)		
	1.5	5.9	7.4		
	(22.34)	*(6.71)*	*(29.05)*		
25-49	**643**	**286**	**929**	30.79	+50.29
	(738.7)	(190.3)	(929.0)		
	12.4	48.2	60.6		
	(10.65)	*(4.74)*	*(15.39)*		
50-99	**334**	**156**	**490**	31.84	+55.38
	(389.6)	(100.4)	(490.0)		
	7.9	30.9	38.8		
	(5.53)	*(2.58)*	*(8.12)*		
100-249	**147**	**102**	**249**	40.96	+100.00
	(198.0)	(51.0)	(249.0)		
	13.1	51.0	64.1		
	(2.44)	*(1.69)*	*(4.13)*		
250+	**47**	**37**	**84**	44.05	+115.12
	(66.8)	(17.2)	(84.0)		
	5.9	22.8	28.6		
	(0.78)	*(0.61)*	*(1.39)*		
Total	**4799**	**1236**	**6035**	**20.48**	**0.00**
(Expected Frequency)	(4799.0)	(1236.0)	(6035.0)		
Chi2 contribution	81.4	315.9	397.3		
(Cell percentage)	*(79.52)*	*(20.48)*	*(100.00)*		
Pearson chi2 (6) = 397.3137	Pr = 0.000				

Table 9I: *Tabulation of SIZE & SkillGap*

Number of Employees	Whether have skill gaps recode			Share of category answering "yes" (%)	Deviation from expected frequency (%)
	No	Yes	Total		
Established	**47**	**37**	**84**	44.05	+115.12
(Expected Frequency)	(66.8)	(17.2)	(84.0)		
Chi2 contribution	5.9	22.8	28.6		
(Cell percentage)	*(0.78)*	*(0.61)*	*(1.39)*		
Medium	**481**	**258**	**739**	34.91	+70.41
	(587.6)	(151.4)	(739.0)		
	19.4	75.1	94.4		
	(7.97)	*(4.28)*	*(12.25)*		
Small	**1991**	**691**	**2682**	25.76	+25.80
	(2132.7)	(549.3)	(2682.0)		
	9.4	36.6	46.0		
	(32.99)	*(11.45)*	*(44.44)*		
Micro	**2280**	**250**	**2530**	9.88	-51.76
	(2011.8)	(518.2)	(2530.0)		
	35.7	138.8	174.5		
	(37.78)	*(4.14)*	*(41.92)*		
Total	**4799**	**1236**	**6035**	**20.48**	**0.00**
(Expected Frequency)	(4799.0)	(1236.0)	(6035.0)		
Chi2 contribution	70.4	273.3	343.6		
(Cell percentage)	*(79.52)*	*(20.48)*	*(100.00)*		
Pearson chi2 (3) = 343.6483	Pr = 0.000				

Table 9J: *Tabulation of SIZE2 & SkillGap*

Whether established enterprise	Whether have skill gaps recode			Share of category answering "yes" (%)	Deviation from expected frequency (%)
	No	Yes	Total		
SME	**4752**	**1199**	**5951**		
(Expected Frequency)	(4732.2)	(1218.8)	(5951.0)	20.15	-1.62
Chi2 contribution	0.1	0.3	0.4		
(Cell percentage)	*(78.74)*	*(19.87)*	*(98.61)*		
Established	**47**	**37**	**84**		
	(66.8)	(17.2)	(84.0)	44.05	+115.12
	5.9	22.8	28.6		
	(0.78)	*(0.61)*	*(1.39)*		
Total	**4799**	**1236**	**6035**		
(Expected Frequency)	(4799.0)	(1236.0)	(6035.0)	**20.48**	**0.00**
Chi2 contribution	5.9	23.1	29.1		
(Cell percentage)	*(79.52)*	*(20.48)*	*(100.00)*		
Pearson chi2 (1) = 29.0512	Pr = 0.000				

Table 9K: *Tabulation of NoOfSites & SkillGap*

Whether single or multi site?	Whether have skill gaps recode			Share of category answering "yes" (%)	Deviation from expected frequency (%)
	No	Yes	Total		
Single	**2652**	**543**	**3195**		
(Expected Frequency)	(2540.6)	(654.4)	(3195.0)	17.00	-17.02
Chi2 contribution	4.9	18.9	23.8		
(Cell percentage)	*(43.94)*	*(9.00)*	*(52.94)*		
Multi	**2147**	**693**	**2840**		
	(2258.4)	(581.6)	(2840.0)	24.40	+19.15
	5.5	21.3	26.8		
	(35.58)	*(11.48)*	*(47.06)*		
Total	**4799**	**1236**	**6035**		
(Expected Frequency)	(4799.0)	(1236.0)	(6035.0)	**20.48**	**0.00**
Chi2 contribution	10.4	40.3	50.6		
(Cell percentage)	*(79.52)*	*(20.48)*	*(100.00)*		
Pearson chi2 (1) = 50.6380	Pr = 0.000				

Table 9L: *Tabulation of OrgType & SkillGap*

Type of establishment	Whether have skill gaps recode			Share of category answering "yes" (%)	Deviation from expected frequency (%)
	No	Yes	Total		
MAINLY seeking to make a profit	**3776**	**983**	**4759**		
(Expected Frequency)	(3784.3)	(974.7)	(4759.0)	20.66	+0.85
Chi2 contribution	0.0	0.1	0.1		
(Cell percentage)	*(62.57)*	*(16.29)*	*(78.86)*		
A charity or voluntary sector organisation or a social enterprise	**516**	**123**	**639**		
	(508.1)	(130.9)	(639.0)	19.25	-6.04
	0.1	0.5	0.6		
	(8.55)	*(2.04)*	*(10.59)*		
A local-government financed body	**317**	**71**	**388**		
	(308.5)	(79.5)	(388.0)	18.30	-10.69
	0.2	0.9	1.1		
	(5.25)	*(1.18)*	*(6.43)*		
A central government financed body	**173**	**56**	**229**		
	(182.1)	(46.9)	(229.0)	24.45	+19.40
	0.5	1.8	2.2		
	(2.87)	*(0.93)*	*(3.79)*		
Other	**17**	**3**	**20**		
	(15.9)	(4.1)	(20.0)	15.00	-26.83
	0.1	0.3	0.4		
	(0.28)	*(0.05)*	*(0.33)*		
Total	**4799**	**1236**	**6035**		
(Expected Frequency)	(4799.0)	(1236.0)	(6035.0)		
Chi2 contribution	0.9	3.5	4.4	**20.48**	**0.00**
(Cell percentage)	*(79.52)*	*(20.48)*	*(100.00)*		
Pearson chi2 (4) = 4.4077	Pr = 0.354				

6.3 Descriptive analysis

At n=6035 cases, the data utilised in this research provides a detailed picture of the geographic, sectoral, employment and skills make-up of the Scottish economy. In total, only around one out of every five sites surveyed (1,236 or 20.48%) in Scotland reported having (any) skill gaps (*at all*) within their existing workforce, with (by implication) the majority (4,799 or 79.52%) reporting that they were satisfied with the skills endowment of all of their employees. As detailed in Chapter 2 (*Skills Imbalance Research in Context*), however, this information does not necessarily mean that those very same sites, establishments or firms are fully satisfied with their ability to access desired, or indeed even *required*, levels of skills. For example, establishments or firms may be looking to improve their existing skill levels only by expanding the size of the workforce, in order to adopt and integrate new technologies, to further refine product development or introduce new offerings altogether, to respond to changes and exploit opportunities in market structure, or to drive new efficiency gains in firm processes and operations. In circumstances such as these, information regarding employers' skills experience and skills perception might only become apparent through data regarding firm vacancies.

Unfortunately, the number of cases in the ESS 2015 available for analysis of vacancies drops off considerably compared to the number of data available for analysis of internal skill gaps. The reasons for this disparity are unclear. The position (role) of the survey respondent within the firm, as a proxy for the extent and reliability of their knowledge of the hiring process, *may* explain some of the variation (Bosworth, 1992; Bosworth, 1993), but no information on this was collected in this iteration of the survey. Nonetheless, the following vacancy data remains worthy for inclusion in any descriptive analysis of skills gap data. Overall, a slightly higher proportion of firms (1,619 or 26.83%) report having at least one vacancy compared to those (above) reporting any internal skill gaps. The actual number of vacancies reported by these sites or establishments range from 1 (n=679) to 150 (n=1). Of the 1,619 sites or establishments reporting at least 1 vacancy, the number of those describing these vacancies as "hard-to-fill" (*n.b.* definition gone unreported in ES 2015 Technical Guide) was 612, or 37.80%. Of these 612 sites or establishments, 453 (or 74.02%) described having at least one "skill shortage" vacancy (SSV). In total, this means that

7.51% of Scottish establishments surveyed in ESS 2015 reported at least one SSV, compared to 20.48% responding in the affirmative when questioned on their current experiences of skill gaps. Of the 612 firms reporting at least one hard-to-fill vacancy, only 89 (or 14.54%) stated that the reason for this was their "remote location" or "poor" access to public transport. Vacancy data therefore were not numerous enough for inclusion in a Scotland-wide regression analysis of skills deficiencies.

Returning to focus on firms' internal skills picture, substantial geographic variation can be observed in the dataset along several constructed dimensions. The first geographic variable utilised in the analysis undertaken in this research (and taken directly from the ESS 2015 dataset) is an indicator of a given establishment's urban/rural locality, based upon categories configured using data from the 2011 UK Census. A plurality (though at ~37%, by no means a majority) of establishments surveyed were located in a large urban area (n=2,225), with those located in a very remote small town (the category with the smallest number of respondents) numbering 153, and those located in very remote rural areas numbering 300. Over 8% of the total number of firms reporting at least one skill gap were located in large urban areas (in relative terms, a figure which is ~6.6% greater than the expected frequency apportioned by its size. Interestingly, the greatest fluctuation between frequency and expected frequency was observed in the category of very remote small towns (which reported skill gaps at a rate 27.8% *higher* than expected). These eight categories were then collapsed into the second geographic variable utilised in the study, a binary variable denoting firms as being located in either an "accessible" or "inaccessible" area (see Table 17). Of the 5,072 establishments categorised as accessible, 1,047 (or 20.64%) reported experiencing skill gaps, with the corresponding figure for the 963 firms categorised as inaccessible standing at 189 (or 19.62%). Neither of these figures differed by more than 5% of their respective expected frequencies.

Scotland's Local Authority areas (the highest tier of local government) were then taken as the third geographic dimension utilised in this study (with variable categories numbering 32). These LAs have authority over the areas of primary and secondary education delivery. Geographically speaking, Scotland's population and economic dynamism are greatly concentrated in the "Central Belt" – an area stretching from Ayrshire in the West to Fife in the East, and up the coast to Dundee in Angus. This area is bookended by the sparsely populated regions of the Highland and Islands

to the North, and the Scottish Borders and Dumfries and Galloway to the South. A detailed map of the geographic location of each LA is given in Figure 18.

Looking purely at the descriptive statistics, it is difficult to ascertain any geographic patterns that fit the underlying data structures. In absolute terms, Glasgow City (unsurprisingly) has the greatest number of affirmative responses to skill gaps (at 127). The two areas reporting the highest share of affirmative to negative responses were Aberdeen City and the Shetland Isles (both at >27%), while the two areas reporting the lowest share were East Renfrewshire (~11.1%) and Clackmannanshire (~13.6%), all of which deviate substantially from the Scottish average of ~20.5%. These same geographically and economically variable areas also scored particularly high when expected frequencies were compared, although some of the sample sizes (Clackmannan (44) and East Renfrewshire and Shetland Isles (both 54)) were low. Interestingly, Scotland's two most economically vibrant LAs (and both with more substantive sample sizes) contrasted quite starkly compared to their expected frequencies (Glasgow with -11.3% and Edinburgh with +13.7).

Two measures of industry or sector classification were used in this study. The first organises respondent establishments into 15 categories while the second takes a higher level of aggregation and utilises 6 sectoral categories. Both of these are computed using the Standard Industrial Classification codes and minimum thresholds were assigned to the UKCES sample size in order to ensure that enough interviews were targeted towards (and achieved in) industries and sectors with low levels of competition. Still, the 15-sector variable category containing establishments operating in 'mining and quarrying' contained a case number of only 34. Taking the 15-sector categories first, manufacturing (29.4%) and hotels and restaurants (30.1%) had the greatest share of establishments responding in the affirmative regarding enquiries about their current experiences of skill gaps.

Conversely, only 8.5% of establishments in the agriculture, hunting, forestry and fishing sector, and 11.8% of those in the mining and quarrying sector reported skill gaps, which were the lowest shares reported. These four sectors all showed high deviation (in either direction) from their expected frequencies. Interestingly, however, while only 11.9% of establishments operating in the information and communications sector reporting skill gaps, this figure was 41.7% lower than the expected frequency. Very similar patterns of variability can be observed when examining the sector variable which utilised a lower number of more aggregated categories (n=6). Here, while only

9.73% of primary sector firms reporting skill gaps, this figure was 52% lower than the expected frequency. Conversely, while 29.4% of firms in the manufacturing sector reported skill gaps, this figure was 43.8% above the expected frequency.

Firm size was the third predictor which underwent iterative reconfiguration and was utilised for sensitivity analysis in this research. Given that no information on revenue, profit or assets (either in real terms or in rates of growth) was collected in ESS 2015, firm size has been operationalised here only as number of employees on site. The first size variable (A1RAN) utilised size-bands numbering 7 categories; the second size variable (SIZE) collapsed these into four; and the third size variable (SIZE2) reduced these once more to a binary classification. Taking A1RAN first, we can see that the three smallest categories (which encompass firms employing 24 or fewer people) account for ~70% of the total number of establishments interviewed, while those classified into the 250+ category number only 84, reflecting the SME-heavy nature of the Scottish economy. A very clear pattern can be detected between the relative frequencies of each of these size bands. Only ~6.01% of establishments with 2-4 employees reported current issues with skill gaps, compared to ~31.8% of establishments employing 50-99, ~41.0% of establishments employing 100-249, and ~44.1 of firms employing 250 or more. Moreover, even firms employing only 5-9 reported skill gaps at a rate over twice as high as that of firms employing 2-4. This pattern is even more prominent in the expected frequencies of each size band. Indeed, establishments employing 2-4 people were reporting skill gaps at a rate of ~70.7% *below* expected frequency with firms employing 5-9 also ~32.9% lower than expected. Conversely, firms employing 100-249 people reported skill gaps at a rate ~100.0% *higher* than expected, and firms employing 250 or more at a rate ~115.1% higher than expected.

The recoded variable SIZE reconfigured these size bands: combinations of two of the six smallest categories produced ‘micro’, ‘small’ and ‘medium’ categories, while the 250+ category was relabelled as ‘established’. The recoded binary variable SIZE2 then reconfigured these into either SME or established categories. While the same patterns of variability hold in both cases, aggregated together, SMEs only report skill gaps at a rate ~1.6% below their expected frequency.

Whether or not the establishment was part of a single- or multi-site organisation, and what ‘type’ of establishment it was (e.g. profit making, charity, etc.) were two additional control variables used in this study. Much less variability can be observed

in either predictor compared to the effects of establishment size, for example. Single and multi-site organisations were split fairly evenly in the data – 3,195 to 2,840. ~17.0% of single-site organisations reported skill gaps, compared to ~24.4 or multi-site establishments, figures which were, respectively, ~17.0% *lower* and ~19.2% *higher* than expected. Unsurprisingly, profit-seeking establishments formed the vast majority (almost 80%) of survey respondents. ~20.7% of these reported problems with skill gaps, a figure which was less than a percent higher than the expected frequency. These other categories here – (a) charities or voluntary sector organisations or social enterprise (~19.2%), (b) local-government financed bodies (~18.3%), and (c) central government financed bodies (~24.5%) – reported skill gaps at a roughly similar level, while only ~15.0% those establishments categories as 'other' – numbering only 20 – reported internal skill issues. Interestingly, the reported figures for government financed bodies differed in either direction from their expected frequencies: ~10.7% *lower* for local-government financed bodies and ~19.4% *higher* for central-government financed bodies.

Training policy is intimately related to a firm's experiences with skill gaps, although inference and comment on the underlying mechanisms at play are left until section 6.4. Just over half of the establishments in the dataset utilised both on- and off-the-job training, while 726 trained only off-the-job, 1109 trained only on-the-job and 1141 did not train their employees at all. Something of an inverse relationship appears to exist between intensity of training and experiences of skill gaps. Only ~7.4% of those establishments that utilised no employee training reported skill gaps, compared to ~17.0% of those who trained (only) on-the-job, ~19.6% of those who trained (only) off-the-job and ~26.8% of those who trained both on- and off-the-job. Noticeably, those establishments that utilised no training whatsoever were reporting skill gaps at a rate ~63.6% below their expected frequency. Conversely, those firms who undertook the most intense levels of training reported skill gaps at a rate ~31.0% above their expected frequency which suggests they may be more acute to the problems of upskilling workers with commensurately higher expectations.

ESS 2015 also provides information on firms' training outlook for the twelve months ahead. Data is collected on whether or not the establishment specifies in advance the level and type of training their employees require going forward, with respondents answering in the negative (2,473, or ~40.98%) or affirmative (3,468, or ~57.46%), with a small numbering specifying that they are 'not sure' (94, or ~1.56%).

~18.0% of those that had no plan in place reported problems with skill gaps, compared to ~22.5% of those who had a plan in place, and ~9.6 of those who were unsure. Interestingly, those who answered that they were unsure were reporting skill gaps at a rate ~53.4% below expected frequency.

6.4. Model assumptions

The two types of statistical models utilised in this study (see Section 6.6) are known as (1) 'probit' (i.e. probability unit), and (2) 'logit' (i.e. logistic) regression models – both of which are well suited (though not limited) to analyses where the dependent variable has a binary classification (see multinomial logistic regression for more generalised forms of the latter model). In either form, these models have wide application and popularity across the business school subjects, humanities and the health sciences, among others, where categorical outcomes are a common feature of enquiry. In the case of the dichotomous outcome probit and logit models utilised here, because the dependent variable can take on only one of two values (0=no skill gaps, 1=at least one skill gap), these models differ substantially from classical linear regression models (CLRM) in the way that independent variable values are fit to the data. Rather, instead of utilising a linear 'line of best fit', as is the case in CLRM, probit and logit regression utilise non-linear 'link functions' to best fit the data. Probit and logit classes have many similarities but differ substantively the link function utilised. Both models therefore follow similar sets of assumptions (Long & Freese, 2006; Gujurati & Porter, 2012).

In addition to this binary dependent variable characteristic, a formal checklist of these assumptions runs as follows. Firstly, probit and logit regression assumes that predictor variables are either continuous or categorical. All independent and control variables utilised in this study (across both Series 1 and Series 2 model sets) are nominal or ordinal categorical variables. Secondly, probit and logit regression assumes independence of observations. This was ensured in the design of UKCES 2015 and in the collection of its data. Thirdly, probit and logit regression assumes linearity of independent variables and log odds of the dependent variable. All independent and control variables utilised in this study (across both Series 1 and Series 2 model sets) are nominal or ordinal categorical variables, and thus are (by definition) linearly related to

the log odds of the dependent variable. Fourthly, probit and logit regression assumes a large sample size. The number of cases available for analysis in this research is sufficient (n=6,035). Lastly, probit and logit regression assumes little or no multicollinearity between the independent variables. Indeed, multicollinearity presents a challenge for researchers undertaking a wide variety regression techniques.

Pearson's r is commonly used to measure the degree of association between two variables. This is particularly useful when those variables take on continuous values. For categorical variables with values greater than two, X^2 is often used in its place. Moreover, where case numbers are small (i.e. as seen via crosstab), Fisher's exact test or Cramer's V are often utilised instead. However, this research is particularly interested in ascertaining the significance and influence of specific variable categories (e.g. the differences between Glasgow City or the Shetland Isles; between firms that train intensively and those that do not; between primary sector industries and financial services), rather than just the *overall* significance and influence of that given variable (e.g. geography; training intensity; sector). Therefore, rather than utilising X^2 to ascertain correlations, the analytically useful -1 to 1 measure of association provided by Pearson's r was deemed preferable. To do so, I first disaggregated all independent categorical variables into their corresponding set of dummy variables. For example, the classification bands for the variable *A1RAN* (a measurement of the number of employees on site) formed seven *new* dummy variables, each with a 0 or 1 response for that particular size band, thus facilitating suitable analysis of multicollinearity.

The results of these correlations matrices are presented in Appendix C, respectively, with * denoting significance at the 0.05 level. For presentation purposes, I present only two matrices in this thesis rather than the full eighteen (i.e. one for each regression configuration). Thus, association between variables which were not utilised in the same exact models (for instance, between two different industry and sector classification variables, SECTOR15 and SECTOR6) do appear side-by-side in the matrix. The models utilised in this research satisfy the assumption of little or no multicollinearity.

6.5 Regression models

All regression modelling was carried out using the Stata 12.0 statistical software package. Following from the work of Bennett and McGuinness (2009) and Healy et al. (2015), this study utilises probit regression as the primary method in each model set (Series 1 and Series 2) and run the corresponding (i.e. in terms of model variable configuration, duplicate) logit regression models only as robustness checks (see Appendix D). The choice of utilising either logit or probit regression is one largely at the discretion of the researcher, with little technical differences in either approach beyond the link function utilised (probit assumes errors are normally distributed, while logit assumes that errors follow the logistic distribution) (Gujarati & Porter, 2012). Thus, this study follows (to the extent that it exists) convention in the field by selecting probit regression as the primary tool of analysis. Sensitivity analysis is further enhanced by the reconfiguration of geographic, sectoral and size variables outlined in Section 6.2.

Interpretation of the results of probit (as well as logit) regression analysis is typically viewed as challenging (Gujarati & Porter, 2012), given that results are presented in a way less intuitive than those given in, for example, classical linear regression outputs. This is a technical feature of probit regression, where results take on the form of odds-ratios. To circumvent issues of stilted interpretation, the Stata "`margins`" post-estimation command was deployed, which instead provides the marginal effects of the independent variables as set against a pre-determined reference category.

Regression models in this research were separated into two sets. Series 1 regression models utilised the ESS 2015-provided urban/rural classification variable (*URBSC_2011)* as well as the reconfigured binary variable *GeoDetached* as the two geographic variables of interest. Models were constructed and run in order of the highest level of aggregation of the independent and control variables that were available. Specifically, model configurations differed by the alteration of the industry (*SECTOR6* first, then *SECTOR15*) and number of employees (*SIZE2* first, then *SIZE*, then *A1RAN*) variables[31]. Series 2 regressions then utilised Scotland's 32 Local

[31] In the event, the highest levels of *dis*aggregation produced unreliable findings, stemming from violations of model assumptions (VIFs) and errant g-o-f and specification diagnostic tests.

Authority Areas (*LA*) in place of *URBSC_2011* and *GeoDetached*. Series 1 and 2 models were thus indistinct expect from this treatment of geography. In total, 12 probit regressions were run in Series 1 and 6 in Series 2, with an equal number of logit regressions run as robustness checks (36 in total). Appropriate weightings were also utilised in each model. Specifically, because it was *the likelihood of a given establishment experiencing skill gaps* that formed the object of this study, rather than the extent or severity of the *volume* of gaps that firm experiences, the ESS 2015-provided *ROAUNITWEIGHT* variable was utilised.

Reference category selection was finalised with two considerations in mind. Firstly, binary variables were configured so that negative responses were coded as zero. Thus: the dependent variable (*D9GANY*) had the response for "no skill gaps" set as the reference category; the geographic binary *GeoDetached* had those locations deemed "accessible" as the reference category; the binary configuration for number of employees, *SIZE2*, had "SMEs" set as the reference category; and *NoOfSites* utilised single-site establishments as the reference category. Secondly, where variable categories were greater than two, theory and intuition was the guiding process. Thus, "Large Urban Area" and "Glasgow City" were set as the respective reference categories for the spatial variables *URBSC_2011* (Series 1) and *LA* (Series 2). Taking the same approach of highlighting divergence from negative responses, the two other independent variables of interest – *Training* and *TrainPlan* – had reference categories set to "do not train" and "no plan in place". Turning to non-binary control variables, as skill deficiencies are largely thought to disproportionately effect more knowledge-intensive industries, "primary sector and utilities" and the more disaggregated "mining and quarrying" categories were used as references in *SECTOR6* and *SECTOR15*, respectively. The variables assessing the effect of number of employees – A1RAN and SIZE – both utilised "established" enterprises, that is those employing 250 or more, as the reference category. Finally, those firms "mainly seeking to make a profit", the most ubiquitous type of establishment, was set as the reference against government-funded bodies, charities and other types of establishments.

Finally, a variety of post-regression diagnostic tests for each probit and logit regression (including those used for sensitivity analysis) across both Series 1 and Series 2 model sets were performed. In order, as an additional safeguarding check on multicollinearity (see correlation matrices discussed in Section 6.4 and presented in Appendix C), I assessed model-specific Variance Inflation Factors (VIFs). VIFs of less

than 5.00 are generally asserted as acceptable in the literature (Kim, 2019). Next, initial model assessments highlighted consistently low Pseudo-R^2, indicating potential problems with goodness-of-fit (g-o-f). To investigate this further, I ran three additional g-o-f tests. First, classification tables were constructed to assess the *actual* proportion of correctly and incorrectly classified case outcomes (compared to those *predicted* by the model). Second, Hosmer-Lemeshow tests (set for groups n=10), where a *non*-significant p-value indicates a well-fitted model, were ran. Third, the Stata command "`lroc`" which graphs the sensitivity of the model against its specificity; here, an integral value (for the area under the curve) of 0.5 indicates a model which has no better predictive power than random chance was used. Lastly, to assess model specification, link tests to identify if independent variables were suitable were deployed. Values for each post-estimation diagnostic are presented alongside the corresponding regression model, with the full set of tests for all models ran (i.e. including those that did not satisfy) presented in Appendix E. All tests of the models presented were satisfactory.

Table 10: *Variables Utilised in Series 1† Series of Regressions*

Variable	Eq. 1	Eq. 2	Eq. 3	Eq. 4	Eq. 5	Eq. 6	Eq. 7	Eq. 8	Eq. 9	Eq. 10	Eq. 11	Eq. 12
SkillGap	X	X	X	X	X	X	X	X	X	X	X	X
URBSC_2011	X		X		X		X		X		X	
GeoDetached		X		X		X		X		X		X
SECTOR15	X	X	X	X	X	X						
SECTOR6							X	X	X	X	X	X
A1RAN	X	X					X	X				
SIZE			X	X					X	X		
SIZE2					X	X					X	X
NoOfSites	X	X	X	X	X	X	X	X	X	X	X	X
OrgType	X	X	X	X	X	X	X	X	X	X	X	X
Training	X	X	X	X	X	X	X	X	X	X	X	X
TrainPlan	X	X	X	X	X	X	X	X	X	X	X	X

Note: Equations 1-6 utilise the SECTOR15 industrial classification system only; Equations 7-12 run the exact same regressions but utilise the condensed SECTOR6 classification instead. The even-numbered Equations on each side utilise the altered geography variable (2 categories); Equations 3, 4, 9 and 10 utilise the first altered size variable (4 categories), whereas the Equations 5, 6, 11 and 12 utilise the second amended size variable (2 categories)

†Series 2 regressions changed the geographic variable under focus to the Local Authorities of Scotland (n=32); for matters of presentation, only statistically significant LAs are include in the output tables in this thesis.

6.6 Regression results[32]

Table 11: *Regression Output for Series 1 Eq-12 Probit Model*

VARIABLES	(1) Marginal effects	(2) SE	(3) VIF	(4) 1/VIF
Base: Geographically accessible				
Geographically inaccessible	0.024*	(0.015)	1.15	0.87
Base: Do not train				
Train on-the-job only	0.114***	(0.020)	1.95	0.51
Train off-the-job only	0.131***	(0.021)	1.48	0.67
Train both on-and-off the job	0.182***	(0.017)	4.14	0.24
Base: No plan in place				
Plan in place	-0.002	(0.012)	3.14	0.32
Not sure	-0.038	(0.051)	1.05	0.95
Base: Primary sect. & utilities				
Manufacturing	0.073***	(0.025)	1.28	0.78
Construction	0.035	(0.024)	1.28	0.78
Trade, accom. & transport	0.047**	(0.019)	2.39	0.42
Business & other services	0.003	(0.022)	2.34	0.43
Non-market services	0.007	(0.023)	2.93	0.34
Base: Small & medium enterprises				
Established (250+)	0.133***	(0.033)	1.03	0.97
Base: Single site establishments				
Multi-site establishment	0.029**	(0.011)	2.35	0.43
Base: Mainly seeking to make profit				
Charity, voluntary, third sector	-0.022	(0.020)	1.43	0.70
Local government financed	-0.024	(0.022)	1.53	0.65
Central government financed	0.019	(0.027)	1.32	0.76
Other	0.160*	(0.088)	1.01	0.99
Observations	6,035	Mean VIF	1.87	
Wald chi2(17)	180.37			
Prob>chi2	0.000			
Pseudo R-squared	0.068			
Classification table (% correct)	79.60			
Hosmer-Lemeshow test	Satisfied			
LROC (under curve)	0.665			
Link test	Satisfied			

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

[32] Corresponding logit regression robustness checks shown in Appendix D.

Table 12: *Regression Output for Series 1 Eq-6 Probit Model*

VARIABLES	(1) Marginal effects	(2) SE	(3) VIF	(4) 1/VIF
Base: Geographically accessible				
Geographically inaccessible	0.023	(0.015)	1.28	0.78
Base: Do not train				
Train on-the-job only	0.114***	(0.020)	2.13	0.47
Train off-the-job only	0.132***	(0.021)	1.67	0.60
Train both on-and-off the job	0.182***	(0.017)	4.63	0.22
Base: No plan in place				
Plan in place	-0.003	(0.012)	3.17	0.32
Not sure	-0.038	(0.051)	1.05	0.95
Base: Mining and quarrying				
Agric., hunt., forest., fish.	0.053	(0.036)	1.31	0.76
Manufacturing	0.130***	(0.039)	1.36	0.74
Elec., gas & water supply	0.085	(0.056)	1.07	0.93
Construction	0.087**	(0.037)	1.36	0.73
Wholesale & retail trade	0.086**	(0.034)	1.94	0.51
Hotels & restaurants	0.120***	(0.037)	1.59	0.63
Transport & storage	0.128***	(0.040)	1.24	0.81
Info. & communications	0.039	(0.037)	1.17	0.85
Financial service	0.075**	(0.038)	1.23	0.82
Real estate, renting & business activities	0.054	(0.035)	1.76	0.57
Public administration	0.103**	(0.049)	1.33	0.75
Education	0.053	(0.037)	1.98	0.50
Health & social work	0.058	(0.036)	2.18	0.46
Community, social and personal service activities	0.060	(0.037)	1.63	0.61
Base: Small & medium enterprises				
Established (250+)	0.129***	(0.033)	1.04	0.96
Base: Single site establishments				
Multi-site establishment	0.031***	(0.011)	2.41	0.42
Base: Mainly seeking to make profit				
Charity, voluntary, third sector	-0.023	(0.021)	1.55	0.64
Local government financed	-0.031	(0.023)	1.77	0.57
Central government financed	0.009	(0.028)	1.38	0.72
Other	0.147*	(0.088)	1.02	0.98
Observations	6,035	Mean VIF	1.70	
Wald chi2(26)	196.85			
Prob>chi2	0.000			
Pseudo R-squared	0.070			
Classification table (% correct)	79.57			
Hosmer-Lemeshow test	Satisfied			
LROC (under curve)	0.670			
Link test	Satisfied			

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 13: *Regression Output for Series 1 Eq-11 Probit Model*

VARIABLES	(1) Marginal effects	(2) SE	(3) VIF	(4) 1/VIF
Base: Large Urban Area				
Other Urban Area	-0.002	(0.013)	1.66	0.60
Acc. Small Town	-0.031	(0.024)	1.14	0.88
Remote Small Town	0.011	(0.036)	1.07	0.94
V. Remote Small Town	0.007	(0.031)	1.07	0.94
Accessible Rural	-0.019	(0.016)	1.21	0.83
Remote Rural	0.017	(0.024)	1.08	0.93
V. Remote Rural	0.025	(0.026)	1.09	0.92
Base: Do not train				
Train on-the-job only	0.114***	(0.019)	2.01	0.50
Train off-the-job only	0.131***	(0.021)	1.55	0.65
Train both on-and-off the job	0.181***	(0.017)	4.31	0.23
Base: No plan in place				
Plan in place	-0.001	(0.012)	3.15	0.32
Not sure	-0.039	(0.051)	1.05	0.95
Base: Primary sect. & utilities				
Manufacturing	0.069***	(0.026)	1.34	0.75
Construction	0.030	(0.024)	1.35	0.74
Trade, accom. & transport	0.042**	(0.021)	2.59	0.39
Business & other services	-0.003	(0.022)	2.50	0.40
Non-market services	0.001	(0.024)	3.05	0.33
Base: Small & medium enterprises				
Established (250+)	0.132***	(0.033)	1.03	0.97
Base: Single site establishments				
Multi-site establishment	0.027**	(0.011)	2.36	0.42
Base: Mainly seeking to make profit				
Charity, voluntary, third sector	-0.022	(0.020)	1.44	0.70
Local government financed	-0.023	(0.022)	1.54	0.65
Central government financed	0.020	(0.027)	1.32	0.76
Other	0.158*	(0.088)	1.01	0.99
Observations	6,035	VIF	1.73	
Wald chi2(23)	197.54			
Prob>chi2	0.000			
Pseudo R-squared	0.069			
Classification table (% correct)	79.59			
Hosmer-Lemeshow test	Satisfied			
LROC (under curve)	0.668			
Link test	Satisfied			

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 14: *Regression Output for Series 1 Eq-5 Probit Model*

VARIABLES	(1) Marginal effects	(2) SE	(3) VIF	(4) 1/VIF
Base: Large Urban Area				
Other Urban Area	-0.002	(0.013)	1.77	0.56
Acc. Small Town	-0.031	(0.024)	1.16	0.86
Remote Small Town	0.011	(0.035)	1.08	0.92
V. Remote Small Town	0.004	(0.031)	1.08	0.92
Accessible Rural	-0.019	(0.016)	1.65	0.61
Remote Rural	0.017	(0.024)	1.35	0.74
V. Remote Rural	0.024	(0.026)	1.21	0.82
Base: Do not train				
Train on-the-job only	0.114***	(0.019)	2.13	0.47
Train off-the-job only	0.131***	(0.021)	1.67	0.60
Train both on-and-off the job	0.182***	(0.017)	4.64	0.22
Base: No plan in place				
Plan in place	-0.003	(0.012)	3.18	0.31
Not sure	-0.039	(0.051)	1.06	0.95
Base: Mining and quarrying				
Agric., hunt., forest., fish.	0.057	(0.037)	1.88	0.53
Manufacturing	0.131***	(0.040)	1.49	0.67
Elec., gas & water supply	0.086	(0.057)	1.10	0.91
Construction	0.088**	(0.037)	1.51	0.66
Wholesale & retail trade	0.086**	(0.035)	2.19	0.46
Hotels & restaurants	0.118***	(0.037)	1.70	0.59
Transport & storage	0.128***	(0.041)	1.35	0.74
Info. & communications	0.037	(0.037)	1.21	0.82
Financial service	0.073*	(0.039)	1.27	0.79
Real estate, renting & business activities	0.053	(0.035)	1.91	0.52
Public administration	0.101**	(0.049)	1.36	0.74
Education	0.051	(0.038)	2.05	0.49
Health & social work	0.057	(0.036)	2.35	0.43
Community, social and personal service activities	0.060	(0.038)	1.74	0.57
Base: Small & medium enterprises				
Established (250+)	0.128***	(0.033)	1.04	0.96
Base: Single site establishments				
Multi-site establishment	0.029**	(0.012)	2.43	0.41
Base: Mainly seeking to make profit				
Charity, voluntary, third sector	-0.023	(0.021)	1.56	0.64
Local government financed	-0.030	(0.023)	1.77	0.56
Central government financed	0.010	(0.027)	1.39	0.72
Other	0.145	(0.088)	1.02	0.98
Observations	6,035	Mean VIF	1.70	
Wald $chi^2(32)$	214.07			
Prob>chi^2	0.000			
Pseudo R^2	0.071			
Classification table (% correct)	79.55			
Hosmer-Lemeshow test	Satisfied			
LROC (under curve)	0.673			
Link test	Satisfied			

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 15: *Regression Output for Series 2 Eq-18 Probit Model*

VARIABLES	(1) Marginal effects	(2) SE	(3) VIF	(4) 1/VIF
Base: Glasgow City†				
Clackmannanshire	-0.063**	(0.030)	1.04	0.96
East Ayrshire	-0.053**	(0.025)	1.07	0.93
Perth and Kinross	0.067*	(0.038)	1.15	0.87
Base: Do not train				
Train on-the-job only	0.116***	(0.019)	2.03	0.49
Train off-the-job only	0.133***	(0.021)	1.57	0.64
Train both on-and-off the job	0.184***	(0.017)	4.34	0.23
Base: No plan in place				
Plan in place	-0.003	(0.012)	3.16	0.32
Not sure	-0.036	(0.049)	1.05	0.95
Base: Primary sect. & utilities				
Manufacturing	0.064**	(0.025)	1.46	0.69
Construction	0.027	(0.023)	1.51	0.66
Trade, accom. & transport	0.041**	(0.019)	3.11	0.32
Business & other services	-0.006	(0.021)	2.96	0.34
Non-market services	-0.001	(0.023)	3.30	0.30
Base: Small & medium enterprises				
Established (250+)	0.128***	(0.032)	1.04	0.96
Base: Single site establishment				
Multi-site establishment	0.026**	(0.011)	2.37	0.42
Base: Mainly seeking to make profit				
Charity, voluntary, third sector	-0.021	(0.020)	1.45	0.69
Local government financed	-0.020	(0.022)	1.54	0.65
Central government financed	0.019	(0.026)	1.33	0.75
Other	0.168*	(0.087)	1.02	0.98
Observations	6,035	Mean VIF	1.46	
Wald chi2(47)	277.30			
Prob>chi2	0.000			
Pseudo R-squared	0.077			
Classification table (% correct)	79.59			
Hosmer-Lemeshow test	Satisfied			
LROC (under curve)	0.672			
Link test	Satisfied			

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

† *N.b.* Only significant LAs included in output

The hypotheses formulated in Chapters 2 and 3 can thus be addressed as follows:

Hypothesis 1

Geographically more isolated firms will suffer more from skill deficiencies than firms located in or near urban areas (falsified)

Hypothesis 2

Firms operating in knowledge intensive sectors will suffer more from skill deficiencies than firms operating in non-knowledge-intensive sectors (falsified)

Hypothesis 3

Larger firms will suffer more from skill deficiencies than micro, small or medium size enterprises (confirmed)

Hypothesis 4

Firms which utilise less intensive employee training schemes will suffer more from skill deficiencies (confirmed)

6.7 Descriptive analysis and summary

While thorough interpretation and explanation of these results is presented in Chapter 8, in concert with those of the qualitative methods undertaken, several things are immediately clear. Firstly, all model variations have low pseudo r-squared statistics. Only a small proportion of the total variability in the data is explained in each model, roughly 7%, but interestingly, this value is extremely stable (differing by <1%) across each of the five models (as well as in each of the five corresponding logit robustness checks). However, these figures are very much consistent with Bennett and McGuinness (2009) and Healy et al. (2015). Moreover, the post-regression diagnostic tests indicate the reliability of both model estimation and model specification. Therefore, although these low r-squared values indicate poor explanatory power, this is arguably a defining feature of the phenomena understudy, insofar as quantitative methods can illuminate their underlying characteristics and interdependencies. Still, limitations regarding a lack of information on company performance, most importantly, inevitably must raise questions regarding omitted variable bias.

Secondly, a somewhat confusing picture emerges when geographical and spatial dynamics are examined. In Series 1 regressions, Model 1 produced the only findings which indicated any sort of significant influence held by establishment location, and even in that case, findings indicated that the average establishment located in an "inaccessible" location was only ~2 percentage points (p.p.) more likely to experience skill gaps than the average firm located in an "accessible" location – a set of findings which was mirrored virtually exactly in the logit robustness check models. When this variable was disaggregated into the *A1RAN* configuration (of 8 different urban/rural classifications), significant differences disappeared altogether – something also mirrored precisely in logit robustness checks. Turning to geographical examination of Series 2 regressions, only 3 of the 32 Local Authority Areas in Scotland showed any significant divergence from the reference category of Glasgow City – the LA with the greatest population and largest economy in the country, although the magnitudes of these divergences were greater than in Series 1 regressions. Specifically, the average establishment located in Clackmannanshire was ~6 p.p. and that in East Ayrshire ~5 p.p. less likely than their Glasgow counterpart to experience skill gaps. Only one LA had a significant coefficient where the direction of divergence swung in the other direction. The average establishment located in Perth and Kinross was ~7 p.p. *more* likely than their Glasgow counterpart to experience skill gaps. Once more, these results were robust.

Thirdly, very consistent findings emerge from an analysis of the two independent variables which focus on establishments' level and intensity of training: *Training* and *TrainPlan*. These examined (a) the type of training, if any, undertaken, and (b) whether an advance training plan was in place, respectively. These variables were not subjected to sensitivity analysis and were included in each of the 36 regression models which were run. Across each of the five primary probit models, the average establishment which trained on-the-job only (11 p.p.), that which trained off-the-job only (14 p.p.) and that which trained both on-and-off-the-job (18 p.p.) were all more likely than the average firm that provided no training at all to experience skill gaps. While the limitations of cross-sectional data and potential problems introduced by likely omitted variable bias largely constrain inferences of causality in these models, it is worth noting here that firms are likely to provide robust training *because* they experience persistent skill deficiencies. However, the findings of *TrainPlan* are far more confusing and unintuitive: no statistically significant difference can be found

between the average establishment that has an advance plan in place and the average establishment that does not. These results were consistent across all five models and their corresponding robustness checks. Again, the issue here may be one of causality: that they have an advance plan in place *precisely because* they are experiencing skill deficiencies. Nevertheless, this aspect emerged in far greater detail in the qualitative findings and is discussed in Chapter 7.

Turning to look at control variables, once more some consistent findings emerge. Regarding sectoral analysis, at the highly aggregated level (*SECTOR6*), (a) manufacturing (6-7 p.p.) and (b) trade, accommodation and transport (4-5 p.p.) stood out (in Models 1, 3 and 5) as showing statistically significant divergence from the reference category (primary sectors and utilities). In Models 2 and 4, where the more disaggregated *SECTOR15* classification system was incorporated, manufacturing (~13 p.p.), construction (~9 p.p.), the wholesale and retail trade (~9 p.p.), hotels and restaurants (~~12 p.p.), transport and storage (~13 p.p.), financial services (~7 p.p.) and public administration (~10 p.p.) all showed significant divergence from the reference category. Interestingly, no sector average establishment (across either the aggregated or disaggregated classifications) was *less* likely to experience skill gaps than that of the primary industry-configured reference categories. In addition, all models show that the average "established" establishment (defined as those employing +250 people) was ~12-13 p.p. more likely to experience skill gaps than the average SME establishment, and multi-site establishments (+2-3 p.p.) diverged significantly from single-site establishments. Finally, the average establishment whose "type" (read "objective") has been coded as "other" was consistently more likely than the average establishment seeking mainly to make a profit (15-17 p.p.), although this was only significant at the 10% level.

This analysis is key to examining skill deficiencies at the highest economy-wide level, where broad sector and geographic patterns come to light. However, as detailed in the first literature review chapter, this level of analysis alone is not sufficient, and much of the detail gets lost here. With this in mind, this study adopted a mixed methods approach, where exploratory interviews were conducted with a range of successful commercial firms and relevant policy makers and analysts to investigate important issues further. This is detailed in the following chapter.

CHAPTER 7: Qualitative Findings

7.1 Introduction

To better understand the nuances of these quantitative findings, exploratory interviews were conducted with owners/managers of a range of successful businesses across the country, as well as with a host of individuals involved in government and in the implementation and analysis of regional economic policy. A critical analysis and examination of the qualitative data these interviews yielded is provided below. This chapter is structured as follows. Section 7.2. sets out the method of data collection and analysis. Then, turning to discuss the findings, section 7.3 discusses four consistent aspects of skill deficiency issues which emerged from the data and which successful organisations encounter across the country, namely: (1) challenges and issues arising from their location; (2) a multitude of considerations surrounding pay rates, skilled labour affordability, and the extent to which "skills shortages" are the result of mispriced labour; (3) challenges in accessing adequate training; and (4) challenges in accessing important "soft" or "core skills". While the initial geographic considerations of the respondents form the core focus of the first of these four areas, any further relevant spatial aspects are covered in all four. Section 7.4 details how these successful firms were clear in their somewhat tempered expectations of new, particularly young, employees, and how they saw this in relation to the dominant narrative surrounding "skill gaps" more broadly. Section 7.5 then discusses how successful firms perceive of and account for their own ability to combat such skill deficiencies, with specific reference to staff training and development and skills retention procedures. The next chapter (Chapter 8) combines findings from both the preceding quantitative chapter (Chapter 6) and this chapter to address the specific research questions of this thesis.

7.2. Analysis

The data transcription process allowed for initial scanning of the data, which was itself then followed up by further rounds of analysis and review. Data were interpreted, codified and then analysed using the software programme Nvivo. The principal tool of this analysis was "thematic analysis" (Braun & Clarke, 2006), a

common method of analysing qualitative research data. In thematic analysis, the research must first familiarise themselves with the data in order for them to be intimate with the perspectives of their interviewees and the context of the discussion. Secondly, the researcher then begins the process of "coding" this data by identifying patterns that are emerging. Thirdly, the researcher then searches for broader clusters or themes which emerge from these codes, particularly as they relate to the research aims and objectives and the research question(s). The final three stages further analyse, codify and review this process, before names and labels are defined and the findings presented for write-up. See Table 16 below for an overview of this process of thematic analysis**.**

Table 16: *Organisation/Interviewee Summary*

Organisation	**Sector**	**Geography**	**Interviewee**
Company A	Manufacturing	Rural	Owner/Manager
Company B	Service Sector	Rural	HR Manager
Company C	Energy	Rural & Urban	Manager
Company D	Transport	Urban	Manager
Company E	Service Sector	Urban	Owner/Manager
Company F	Food and Drink	Rural	Owner/Manager
Company G	Construction	Urban	Owner/Manager
Company H	Service Sector	Urban	HR Manager
Organisation I	/	Urban	Policy Analyst
Organisation J	/	Rural	Policy Analyst
Organisation K	/	/	Government Minister

Table 17: *The Process of Thematic Analysis*

Phase of the process	**Description of the process**
1. Familiarisation	In-depth knowledge and engagement with the data. Reading and re-reading, helps the researcher move beyond the most obvious meanings
2. Coding	Systematic process of identifying and labelling relevant features of the data (in relation to RQ). First step to identifying patterns in the data.
3. 'Searching' for themes	Cluster together codes to create plausible mapping of key patterns in data
4. Reviewing themes	Pause theme generation to check whether potential themes are good fit with coded data and entire data set. Restart previous phase if necessary.

5. Defining and naming themes	Brief summary of each theme and selecting of a theme name. Provide a road-map for final write-up
6. Writing the results	Analytic conclusions drawn across themes. Narrative account of findings; explanation not description

Source: Braun & Clarke (2006)

The interview transcripts were reviewed and interpreted in this iterative fashion, with several key concepts coming to the fore early on and coded appropriately. These concepts were then grouped into second-order themes, and finally into aggregate dimensions, mirroring similar work undertaken using a Gioia method (Gioia et al., 2013). The creation of higher-level aggregate dimensions from the original coded data allows researchers to explore the relationship between constructs, permitting theorization which would have otherwise not have been achieved Arshed et al., 2017. Thus, one of the central dimensions emerging from the data was the finding that high-growth firms were experiencing just the same skill deficiency issues that their sectoral and industrial counterparts were so keen to report. Indeed, this was true of both core, urban and peripheral, rule employers. Secondly, HGFs were aware that they had to offer competitive incentives packages, but were keen to stress that financial increases have had and will have going forward no impact on the short-term capability of the candidates that they encounter. Thirdly, all of these firms had issues with the availability and affordability of the training that they require, particularly as it relates to managerial training. The next high-level dimension to emerge related to the role of expectations. HGFs were clear in their view that they thought employers unable to counter skill deficiencies effectively were placing unrealistic expectations on their staff, particularly on inexperienced or young new hires. They saw their own role as one of career stewardship or guidance for these members of staff, and took great pride in their emphasis on their initial career development influence. They viewed their own expectations as being in line with reality. Lastly, and relatedly, several key themes emerged in the organisational response dimension. HGFs placed real emphasis on training and development engagement and HR procedure and policies designed to identify, monitor, and plan for future skills supply and demand. Some of their approaches to retention were particularly innovative. The findings from the employers was then triangulated against the interview transcripts from the development agencies

and the government minister to ensure robustness of these data and to check for overlap and differences of opinion. All findings were consistent and had themes overlapping. The overall dimensions are detailed below and the findings elucidated starting in Section 7.3.

Table 18: Data structure & themes

First-order concepts	*Second-order themes*	*Aggregate dimensions*
Attraction and retention difficulties exist for HGFs in both core and peripheral areas	Spatial Picture	No such thing as immunity (for HGFs)
Entrepreneurs cognisant of ways that they can "sell" peripheral areas to prospective hires		
HGFs in populated, urban areas also saw location and geography as an issue (i.e., one of competition)		
Peripherally located HGFs unable to compete financially	Wage dynamics and skills shortage	
Understanding that wage increases do not make individual workers more skilled overnight		
HGFs keen to offer competitive incentives packages (packages not limited to financial remuneration)		
Peripheral HGFs have to send staff long distances for training	Issues in accessing and funding training	
Training providers teaching out-of-date material		
Access to managerial training in particular an issue		
Candidates hired for their "attitude"	Soft and core skills issues	
Soft skills seen as critical and of primary importance over technical skillsets for new hires and existing staff		
No intergenerational variances experienced by employers regarding endowment of soft skills		
(Young) new hires assumed to be as capable as experienced staff	Unrealistic expectations of non-high-growth competitors	The role of expectations
Changing nature of work (greater demands from employers today)		
Problem exaggerated to influence policy and support		
Employers actively engage with education and training providers much more	Tempered expectations of new hires in high growth firms	
Employers have the expectation that they'll have to train their staff		

Entrepreneurs honest and humble remembering their own starts		
HGFs viewed training and development as key	HGFs actively involved in training and development	Organisational response
Actively engage with education & training providers		
Work experience of young candidates valued and prioritised		
Long-term professional development valued and supported	HR and skills retention procedures key	
Long-term needs of the company monitored (e.g., exit interviews in place)		
Innovative approaches to retention (e.g., social and financial mechanisms, particularly for young new hires)		

7.3. No such thing as immunity

In all interviews it was apparent that those involved in the management of successful firms – regardless of the location of business premises or the sector of operations – still encounter the same employee and applicant skill deficiencies which come across so evidently in the quantitative survey data (ESS, 2015). Taking these exploratory insights into consideration, it is therefore possible to dispense with two potential conjectures: that successful firms are so because they either (1) (by luck or design) do not happen to face the same challenging skills issues that other firms face, or (2) are able to differentiate themselves from and excel past competitors only by capturing and exploiting the bulk of (or *all* of) the suitably- or sufficiently-matched skilled workforce in a given labour market. Rather, the findings which emerge from these interviews fit well with what we do already know about skill deficiencies (e.g. sectoral differentiation and variability exists; ongoing employee development is seen as an essential component of mitigation, etc.), both from previous studies and as indicated by the quantitative research undertaken for this research project (and set out in Chapter 6 of this thesis). In addition, however, the nuanced perspectives and opinions which these interviewees detail do illuminate important aspects of these phenomena which are not at all well covered, and which ostensibly cannot be covered, at the quantitative level, and which by-and-large have not been well studied by previous

researchers. More specifically, these findings help to advance, in particular, our understanding of the geographic and regional dynamics and differences at play, as well as the geospatial factors and others which drive them.

7.3.1 *The spatial picture*

Those interviewees based in Scotland's more economically peripheral areas – that is to say those located in either the Highlands and Islands area to the north of the country's economic core "Central Belt" region, or in the Borders and Dumfries and Galloway areas to its south – talked at length about the challenges they faced as a result of their location, and their attempts at mitigating them. In particular, they identified the issues of a low skills base locally, attracting staff to peripheral, poorly connected areas, and the subsequent problem of retaining them once they managed to appoint them. Consistent within this were discussions of non-skills related approaches to addressing their challenges, including lifestyle, training, job satisfaction, and recognising both the upsides and downsides of their locations to approach staff recruitment and skills deficiencies in different ways.

In relation to attracting employees, a number of respondent companies in peripheral locations discussed the particular challenges their remote location posed in addressing their skills needs.

> "Geographically, we find it difficult to attract people into the area. At least some vacancies we'd be looking to recruit from further afield." (Company B)

> "For me, I suppose it's a…right, if you come at it from a geographic direction, there's definitely a shortage up north." (Company F)

> "…because you're not going to pull someone from further down south unless it's a lifestyle change. And if it's young people, that's *not* [emphasis in original] going to happen." (Company D; reflecting on respondent's previous employment experience in the Highland region)

Each of these respondents were clear about how their companies' remote location was disadvantageous to their ability to meet their skills needs in terms of attracting skilled staff from elsewhere. Company B is based in the west coast port town of Fort William, the second most populated settlement in the Scottish Highlands after the city of Inverness. Nonetheless, at ~10,000 residents (ONS, 2011), Fort William places as only the 58th largest settlement, nationally, but is located a substantial distance from its nearest cities (~66 miles by road to Inverness; 102 to Perth; 109 to Glasgow (Google, n.d.)), and as highlighted by its popularity as a tourist and outdoor recreation centre across both Scotland and the UK (Lonely Planet, n.d.)), is surrounded by remote and rural communities which are wedged between difficult and winding coastal terrain and some of the country's most dramatic mountain landscapes. Company F is similarly based in a remote area (Forres, again in the Highland region, population ~9,500 (ONS, 2011)) and although collocated with rural communities, standing only ~26 miles from Inverness, Forres (unlike Fort William) is comfortably within reasonable commuting range to and from a larger neighbour (in this case Inverness or Aberdeen).

These towns also embody something more general about the region in which they are situated. Despite its reputation as the most scenic area of the UK, and its position as a fulcrum of the Scottish tourism sector, economic vitality in the Highland region has historically lagged (and in some respects, continues to lag) behind that of the more dynamic and populous core of the country (Deveney, 2015). Indeed, while unemployment rates (ONS, 2015) in the Highland region stand below the Scottish average – a figure which is itself skewed downward somewhat by the relative mass of the greater Glasgow region and its specific sociohistorical context of industrial change and persistent, intergenerational, multifactored deprivation – the region still fares poorly in national terms when data[33] detailing wage rates (ranking 24th out of Scotland's 32 Local Authority regions in 3-year growth rates in gross median weekly pay) and commercial dynamism and innovation (27th out of 32 for percentage of enterprises which are high growth enterprises) are examined.

Previously well-established insights from economic geography identify the ways in which spatial economic circumstances (such as relative detachment/isolation) help to determine the strength, resilience and trajectory of local economies (and local labour markets). Firstly, in trying to determine what constitutes a coherent, spatially-

[33] See ASHE (2015).

defined labour market[34], Heatley (2019) provides some valuable insight by stating that "labour markets are *inherently regional* [emphasis added] because commuting time subtracts from work and leisure time." As a consequence, policy makers in the UK define and track "travel to work areas"[35] (TTWAs) to analyse labour market dynamics and their related issues, such as infrastructure and housing considerations. In 2011, there were 228 TTWAs throughout the UK, including 45 in Scotland (with some additional cross-border TTWAs). Whilst factors beyond geography – such as the technological and skills requirements of particular job roles, or the demands, policies and idiosyncrasies of a given employer – will further determine the nature and boundaries of any given employee's commute, evidence shows that Scottish workers spend, on average, 54 minutes per day travelling to and from their place of work (ONS, 2016). Wide regional variation can also be seen across these figures: from a high of 35 minutes each way in both East Dunbartonshire and East Lothian, to a low of only 12.4 minutes for workers in the Orkney Islands, with the average in the Highland area standing at 20 minutes.

The very nature of the remote communities and the transport links and infrastructure which make up and connect this region therefore suggest that its employers may face greater challenges in accessing requisite or desired numbers of well-matched workers, both from within and outwith the region, than would be the case throughout much of the rest of the country. Indeed, Organisation I picked up on this in the interviews.

> "I think 97 per cent of our people live on three per cent of our land mass, I'm pretty sure that's what the stat is, and that has an impact on what you can do. We've got a massive area in the central belt with an easy travel [inaudible 11:25] area, and that should be a competitive advantage for us and we really need to make that work, and that's where we can really drive a bit more. And then we see a very high kind of level of entrepreneurial in there, we see a high amount of labour market adaptability in other areas, so the rural areas of Scotland, we know that people have multiple jobs, we know that they launch businesses,

[34] The extent to which recent technological change has impacted traditional local labour market structures is not yet quite clear – see Gubins et al. (2019) for a wider discussion on some relevant issues.

[35] See ONS (2016) for discussion on the working definition of TTWAs. Definitions are non-exact, reflecting the "statistical" rather than "administrative" nature of TTWAs and the coherency of the very concept of "local" or "regional" labour markets themselves. Deviation from thresholds and definitional cut-offs occur in some instances.

> they've got that more entrepreneurial and innovative response to a personal situation, but we also know that it's much more expensive to do these sorts of things up in rural areas." (Organisation I)

Furthermore, this is an issue which is also subject to negative scaling issues, with previous research highlighting the greater inclination for more skilled-workers to live in more densely populated areas (Di Giacinto et al., 2014; Glaeser & Resseger, 2010) as well as the tendency for this labour market to be rather well defined, at least to some degree, by a proximate spatial boundary (Raines et al., 2001; Saxenian 1994; Boschma et al., 2014; Cappelli et al., 2019; Fratesi & Percoco, 2014) – the core concept underlying the coherency of TTWAs. In extreme and persistent cases, inaccessibility to required levels of skills has been theorised to lead to what has been labelled the "low skills trap", where employers adjust their investment priorities to other areas of the business, realising that they will need to operate with lower levels of skilled labour than would be maximally desirable (Finegold & Soskice, 1988; Gospel, 1998).

The economic challenges of such spatial considerations go much deeper than this, however, and have been well studied in the literature. Pointing to what they call "agglomeration economies", economists have long identified the cost savings to businesses arising from higher densities of economic activity, including not just greater access and lower search costs to employers looking to identify suitably skilled workers, as alluded to above, but also to a greater assortment and choice of more specialised suppliers, as well as to the benefits induced by greater levels and intensities of knowledge and information spillover effects (Marshall, 1890; Porter, 1990; Krugman, 1991). While such effects have traditionally been viewed in light of same- or similar-industry clusters, others have more recently also examined the effects of clusters of different-industry firms who nonetheless utilise similar technologies (Potter & Watts, 2013) in their processes of production and operations. Moreover, through such cost savings, high levels of agglomeration have consistently been found to be associated with greater levels of economic performance and productivity (Ciccone, 2002; Combers, Mayer & Thisse, 2008; Fingleton & Lopez-Bazo, 2003), highlighting the potential consequences of persistent regional skills shortages to firms operating, for example, in sparsely populated regions such as Scottish Highland. Indeed, recent evidence suggests that skill deficiencies have greater impacts on performance for firms located in less agglomerated regions (Morris, Vanino & Corradini, 2019). The greater

concentration of skilled workers in more densely populated areas is also, perhaps unsurprisingly, mirrored by positive firm "pooling effects", where greater concentrations of firms result in better access gained to a more sizeable, and presumably more suitable, labour market (Andini et al., 2013; Combes & Duranton, 2006).

Still, while acknowledging the operational difficulties posed to remote businesses by detachment from these agglomeration economies and the more advanced services and infrastructure in place in urban communities, counter points exist to suggest that regional aspects of skill shortages might not be as influential as has been suggested above. The efficiency of the job-worker search and matching process in peripheral areas – such as the Highland region – could mirror that of more networked and more densely-populated regions if, say, the relative demand for more specialised (and therefore more limited) skillsets was commensurately lower. In the Highland region, where high growth enterprises comprise a relatively low percentage of total enterprises, and where businesses find access to essential forms of capital (financial, intellectual, social) more limited, local economies are demonstrably more reliant on a smaller range of sectors – chiefly primary industries, energy and tourism – in which low skilled jobs largely dominate the job landscape. Moreover, some have pointed to the negative externalities to business arising from their being located in dense areas, regions and cities – factors which may offset the benefits arising from access to a greater set of labour market skills. Among these, firms are more susceptible to competitor employers "poaching" highly skilled staff. In such situations, employers may be reluctant to bear the costs associated with employee training and personal development if they view the risk/reward calculation as being too great (Mohrenweiser, Zwick and Backes-Gellner, 2013; Muehlemann and Wolter, 2011).

In returning to the findings of the quantitative analysis of skill deficiencies across the Scottish economy undertaken in this research project (see Chapter 6), a complicated picture of the spatial dynamics emerged. When operationalising urban/rural considerations into a number of related but distinct variables, no consistent picture of the effects of location could be detected. In the first regression model run, those firms located in "geographically inaccessible" locations were found to be marginally more likely (~2.5 percentage points so) than their "geographically accessible" counterparts to report having at least one skill gap, although this finding was not repeated across each subsequent, iterative model, except in the corresponding (logit) robustness check. When examining differences across the specific regions of

Scotland (using the Local Authority definition) in the second set of regressions, again no clear pattern was found. Subject to suitable controls, the average establishments located in Clackmannanshire (population density rank 13th/32) and East Ayrshire (population density rank 19th/32) were less likely (-6.3 and -5.3 percentage points, respectively) than those in Glasgow (population density rank 1st/32) to report having skill gaps, while those located in Perth and Kinross (population density rank 25th/32) were 6.7 percentage points *more* likely to report the same. Beyond these notes, no other statistical significance was observed with respect to geography. Given the "incoherent" or unintuitive nature of these patterns, it is therefore arguable that this statistical "spatial murkiness" is simply just accurately reflecting the myriad ways in which geographic dynamics potentially hinder *all* firms (including those firms located in dense urban areas) looking for well-matched workers to employ over the medium-to-long term.

Such complexity in understanding is very much compatible with the picture that emerges from the research interviews outlined below. Respondents in both urban and rural areas of the country spoke in depth of these issues affecting a range of low-skilled, intermediate and high-skilled positions. Company B and Company F both identify the geographical challenges of attracting staff generally to the area.

> "It depends on the individual really, if they love the outdoors and everything that we've got to offer here... but other people don't [feel the draw to come here] because it's quite remote, and they haven't got the systems that you would in a major town or city." (Company B)

> "…again, where I'm selling it to somebody [is that], they're getting a different lifestyle. I'm always on about putting a border on Perth, because once you get north of Perth it's a different way of life – it's just a shame Dundee is in the wrong place. It's a different way of living. Just for you – a wee example. I was driving down for a meeting in Glasgow and I drove straight there and I stopped at a set of traffic lights and I saw somebody running across the road and I always wet myself laughing, because that's just something you wouldn't see in [location]…so if I am selling it, you've come up to a part of the world that is fresh air, you're in the country, just the lifestyle. It's not that I don't think [offering competitive] wages aren't important, it's just that you just have to sit

on the M8 a couple of times a week and it becomes quite attractive." (Company F)

Whilst there were clear challenges in attracting people to peripheral areas, companies were also acute to extolling the benefits of their areas – Company A, for example, was clear about ensuring staff felt very comfortable and valued when they did move to the area so that they are more likely to stay once they have:

"Yeah, but there aren't too many [sector specific] jobs in the Scottish Borders, so we get in there quickly, and we make them all very comfortable, and they cannae get out!" (Company A)

Although Company D, reflecting on a previous role operating in a rural geography, described a particular issue with attracting young people, they also highlighted a key mitigation strategy in their approach by identifying the importance of lifestyle to selling the location. This is similarly highlighted by Company A:

"Aside from that, we actually I think benefit from our rural location because there aren't other opportunities on the doorstep, so it somebody comes in, and after three or four years wants to move on, then they are looking at moving house and so on, so it makes our employees a little more sticky so to say. I think our staff turnover is something like 3 or 4%, it is pretty minimal…" (Company A)

In these examples, the respondents clearly identify the positive aspects of their location to sell the area to applicants to mitigate any perceived downsides. Lifestyle is promoted including factors such as pace of life, comfort, and scarcity of certain job types as a way of bringing people to the area. What this suggests is that successful companies in peripheral areas work with their environment to think holistically about recruitment and skills acquisition in relation to what they can offer workers as a way of not only bringing them to such areas, but also retaining them.

Again, this is very much in line with evidence from the literature on labour mobility – labour markets tend to be defined by spatial boundaries for a variety of personal, social, institutional and relational reasons (Boschma et al., 2014; Eriksson and

Lindgren, 2009; Eriksson and Lengyel, 2019; Morris, Vanino & Corradini, 2019). Evidence suggests that higher levels of labour mobility produce more efficient adjustments to economic shocks (Blanchard et al., 1992; Borjas, 2006). While monetary motivations remain the key driver of worker decision making, a variety of additional issues are also important, including benefits packages, flexibility and managerial style. In areas where financial rewards are harder for employers to absorb, competitive employers must remain an attractive choice for candidates by demonstrating non-financial benefits, as outlined in the quotations presented above.

Despite the perceived disadvantage that the peripherally located respondents discussed and their strategies to mitigate this, those respondents located in the country's economic core "Central Belt" region were not particularly bullish in their perception of greater skills accessibility resulting from their location.

> "I don't know [if being located in the Central Belt is actually beneficial]. It's hard to say but obviously there are lots of people looking for jobs so we never have a lack of CVs coming through. When we speak to companies up north it obviously is slightly harder because the communities are smaller but, yes, I wouldn't be too sure." (Company E)

> "I suppose what's interesting if we want to focus on Glasgow having worked at the college, I suppose there's that kind of social element, or you know, kind of looking at deprivation and looking at where young people are coming from in Glasgow and not having access and not having the same opportunities and if they can't get into a college or university to start with or even get an apprenticeship, they're not getting that opportunity to even fill the skills gap. So that's not completely answering your question, but actually that's blocking them to start with. So that can even stop them fulfilling that skills gap because they can't even get in there to start with, so that's really prevalent within further education and it's something that is looked on all the time and there's a focus on that as well into areas of social deprivation as well. But to answer I suppose from a wider context, is it geographical? I don't know. Yes and no is what I'd say. I don't know. I think in general what people say, there's a need for people in IT, we're crying out for people in IT, or we're crying out for doctors, or for whatever, that's UK wide, it's not just in the one location." (Company D)

> "Yeah. It is, it's difficult and that's when, or before Brexit I guess you used to get a lot of, you know, European immigrants coming in to fill those gaps but whether that'll happen going forwards or not, it's difficult. And that makes it, a lot of uncertainty as well. We, we do look at it because I mean last year, certainly, we were advertising in like Poland and Greece and we were advertising in Europe to try and attract people to come with the right skills. But obviously going forwards, that's probably not going to be a possibility. So yeah, it is worrying. So really all we can do at the moment is try and train, you know, local people, try and train young people." (Company H)

These companies were clear in their own difficulties in recruiting in what may otherwise be considered a "thick" labour market. In each of the quotes above companies, they didn't consider their Central Belt location to be a particular benefit, with each company communicating that they faced difficulties as a result of their industry, location, and external factors such as Brexit. This suggests that population agglomeration may not be a clear benefit and that competition in the labour market for these companies has its own challenges.

7.3.2. *Wage Dynamics and Shortage*

Spatial dynamics weren't the only consideration at play in the respondents' thoughts. Several companies were keen to stress how challenging staff retention can become, even in instances when they have managed to successfully recruit staff into the area from elsewhere. Specific to this, some respondents stated that issues surrounding competitive pay were often quite challenging to overcome, while others stressed that this issue was not quite as clear cut as this.

> "We always prided ourselves with a very low turnover of staff. But I would say in more recent sort of times, we've maybe found that our turnover has increased more than we would have liked to, and it is just because, you know, anybody that's desperate will pay more and yeah, it's back down to that kind of wages thing." (Company H)

"We do find it difficult to attract people into the area, and when we have done it, we haven't always retained them. They've stayed for… [I have] a couple of examples of people in management roles who were offered a good relocation package and they haven't stayed. We had people who done the job for six months, even twelve months, but then their families wouldn't settle, so they've left." (Company B)

"But, again, I suppose you say having whether it's a, I've tried to recruit a few times a management accountant, again I think it's a… geographically there's not so many up here, but I know in the central belt they have to pay a lot more. It's a two-edged sword. I suppose for our business, we're quite fortunate that I would at least half of the employees are, how could I put it, pretty low skilled. So, if I advertise for a [high-skilled role] I'll only get one or two people, whereas if I put in an advert for a biscuit packer, I'd get about a hundred people." (Company F)

"I think what's interesting having businesses in the far north, and having worked in construction, and we had them in manufacturing in the far north before, what you find is obviously is the skills pool is smaller, so there is more competition for it so that can make higher pay rates, but what you also find is there's quite a large element of young people that don't want to leave the village or area they were born in, so actually you'll get them. The other half do, and they've had enough, and they want to move away. So, it is limiting your skills pool. So, you might not necessarily get that all singing, all dancing skillset that you want. You will get *a* skillset, but sometimes that skillset just has to be good enough." (Company D)

The role that wage rates play in signalling and alleviating skill shortages is perhaps the area of most controversy and debate in the literature on skills deficiencies (Shah & Burke, 2003). Theoretically, like any other price mechanism in a market economy, any increase (or decrease) in wages should reflect the shortage (or surplus) of the labour supply (specific at the occupational level) in any given spatially-defined labour market, depending on how persistent and widespread the shortage is. These wage movements therefore act as a signal to workers, and in the case of a situation of

shortage, the newly changed and more attractive wage rates being offered by employers act as the primary incentive for new workers to relocate their labour to a new area (be it occupational, sectoral or geographic) to alleviate any market shortage. In instances where the training pipeline for the role is long and demanding, the wage signal alerts those further back, as it were, in the education and training pipeline (namely, university students and secondary school pupils) who are more likely to be in a better position to undertake and absorb or pass on the costs of more extensive training requirements.

Several factors can disrupt the effectiveness of this wage signal, however, particularly as it relates to the mitigation of shortages of *skilled* labour (as opposed to more generic labour shortages). Most importantly, a substantial amount of evidence exists to suggest that employers are unwilling and/or even un*able* to increase pecuniary incentives in the face of persistent skills problems, both from previous academic research (Haskel & Martin, 1993; Mason & Stevens, 2003) and from nationwide surveys. Indeed, looking at the ESS (2015), survey responses suggest that in Scotland, only 7% of employers who had reported skill shortage vacancies (SSVs) had increased the salaries they were offering for the specific role as a result. Rather tellingly, employers were far more likely to see the issue as being a search and matching problem, with 32% of employers responding to the shortage by increasing advertising and recruitment spend. Other actions more likely to be undertaken were the redefinition of existing jobs (16%), an increased and expanded traineeship programme (13%), contracting work to other providers (9%), offering training to those less qualified (9%), the active recruitment of non-UK national workers (4%), as well as an effort to make the job more attractive (2%). Interestingly, "no action taken" was also noted by 13% of respondents. Moreover, wages may fail to reflect shortages in instances where pay rates are subject to additional "non-market" forces (e.g. by legislation or collective bargaining).

Conceptual issues induced by considerations of inadequate data meant that wage dynamics could not be included in the quantitative analyses undertaken as an integral component of this research project (see Chapter 6 for results, and Chapter 8 for discussion on the limitations this placed upon the findings presented). More specifically, due to response rates, robust statistical analysis on regional dynamics could only be conducted with the dependent variable focusing on issues of firms' internal skill problems ("skill gaps") and not on their challenges in finding suitable applicants from the external pool of available workers ("skill shortages"), however related these two

phenomena might be. Moreover, because the research questions produced an approach favouring *breadth of analysis* over *depth of analysis*, any wage data included (which, to be meaningful, would have to have been collected and inputted at the occupational level) would have been masked by the inclusion of large sectors in the analysis. The insights gleaned from the company respondents are thus valuable in helping understand what role wages play in the attraction and retention of staff which would otherwise be missed from the quantitative aspect of the study.

What the qualitative data gathered suggests is that firms are experiencing different problems regarding the role that wages play in signalling and fixing shortages of skilled labour. Company F perceives high wages in Scotland's economic core are the result of increased competition for the skilled labour that's in place there, while Company D suggests that a lack of supply of skilled labour in more peripheral areas has increased the wage rates for skilled labour there. Thus, again, a confusing picture emerges of the spatial dynamics at play. Respondents actually experiencing problems accessing required levels of skilled labour in geographic areas detached from the country's economic core have opposing views of how (and where) this manifests itself on employee wages dynamics which is supposedly, according to both literature (Shah & Burke, 2003) and practice (MAC, 2008), one of the best indicators available to policy makers in detecting issues of skills shortages. This demonstrates the complexity of the issues at hand when it comes to understanding the perceived skills shortages by companies and the manifest different explanations of the issue.

Company C and Company G were much more pointed in how hazy they find the wage mechanism to be in alleviating shortages of skilled labour, identifying that paying more doesn't necessarily create or attract more skilled workers:

> "So, there's the attraction piece, would you attract more skilled people by paying them better? Yes. But you would also attract people that are not skilled, and it's the process you go through to get the right ones. So, that's fine, but it might be the case that there's someone that you want to take on that's not that skilled because their attitude is great, so it then becomes about approach of the employer, and the people that approach the employer. Again, I think, for me, this whole piece you're looking at, is something around employer's approach to their staffing." (Company C)

> "Right, okay. Are you doing any paid work at the present moment in time? You're teaching? Right. Okay. See if I came along and gave you ten grand extra on your salary tomorrow, would it make you a better teacher instantly? Well…no it wouldn't, would it? If somebody's got the skills then they've got the skills; they're not given them. So automatically giving more…paying more money doesn't automatically solve a problem… But it's a fact. You know, simply by paying somebody more money doesn't necessarily make them better." (Company G)

It is important to recognise that not all respondents felt this way, however. Company A saw the highly specialised nature of their industry as a challenge, identifying that they need to train their workers to such an extent that they doubted a salary uplift would make much difference, and instead focusing on the

of their applicants and workers:

> "We're probably a bit different, because our industry is very, very specialised, so without – you know, I could offer, I could poach somebody from the open market, or let's say I could offer a graduate £35k starting salary, and it probably wouldn't make any difference to the amount of training I've got to give them, just because we're so specialised, so for me it would make economic sense to take the graduates with the lowest amount of potential – and I'm not talking academic sense here, I'm talking about ability to enter the workplace that's why we get them in at the 3rd or 4th year level on placement and see how they look, how they integrate, if they've got the right mind-set, then for us it's not about starting salary, it is around just recognising, that we've got to make that investment for the first year."(Company A)

7.3.3. *Issues in Accessing and Funding Training*

Accessing funding training was identified as a concern amongst several respondents. For some their location was a particular problem for this, with Company A identifying particular problems with their peripherality and the lack of online delivery of training (nb. this interview was conducted pre-COVID 19 pandemic).

"We have an issue. We're a [SECTOR] company but we're located in [South of Scotland]. And so, the number of both apprenticeships and [SECTOR] training courses in the Borders are minimal. I have to send my apprentices two days per week to Falkirk in order to get trained – the training that's required of [large international competitor]. However, the whole sector in Scotland is 8 times bigger with small companies like mine dotted all around the country. But because there's no critical mass in any one geography, and there's such poor use of online learning, we've got to send people to Falkirk. And also, Falkirk College own the training, and they have no incentive to release the training materials to any other college… We can do bits and pieces online. In our industry in particular, the drive is always towards accredited learning, because insurers and so on want you not just to deliver the skills but to validate that you've done it to some external certification. So, there's strong influences on industry to get the training, but the delivery network is not there. There's the beginning of things there with the [potential new industry training scheme] and so on, where the colleges are again being dragged kicking and screaming into working together, but again that is extremely patchy." (Company A)

Peripherality and accessing appropriate skills training and funding weren't the only issues identified on this point; Company C and Organisation J also pointed out that the provision of education for potential workers wasn't always appropriate. Company C identified a lack of personal development at universities as an issue, as well as skills like negotiation and communication being insufficiently developed amongst applicants. Organisation J identified the peripherality of their business and lack of computing science teachers in the region as problematic. In both instances it is clear they view the education provision as lacking in order to help their businesses:

"So skills in universities first of all, I think probably don't do enough to, give people the skills that when you get into a workplace that you need. Now that depends what the workplace is, so taking for example what I do, there's no personal development aspects that are picked up truly in university. Now there's personal development and I think it's led by the student and driven by themselves – I think the universities could probably offer up workshops and

make it more visible to students or at least make it more visible the importance of when you get into business and employment that you could be using these skills. So for example, negotiation skills…different ways that you can approach people and communicate with people in how you engage with people, so the "softer" elements, is probably something the universities could do better. Because they do the actual skills basis of, you need to know this, how to do this task, to do that job – they do that fairly well…" (Company C)

"I mean, what we are finding is the same as every other place is that, you know, our businesses are being forced to invest in the kind of digital automation side of things. You know, we're finding that we've got a very low kind of skills base when it comes to actual digital skills and it's like I just said. And that kind of marries back to the fact that we've got, you know, probably only one per cent of Scotland's computer science teachers in our region, so we've got an issue around the whole kind of provision of education there, which is having this knock-on effect now in industry and business. What we're finding as well is that, you know...we're finding that businesses...I mean, obviously business has to move at industry speed, so they've got to keep up with various, you know, evolutions and innovations in the workplace and what we're finding is that education hasn't really kept up at that same level of speed." (Organisation J)

Organisation J considered the challenge to be around how to address these perceived skills gaps in applicants, but again identified their peripheral location as being a hindrance to accessing training to this end:

"I mean, probably the first thing I would say is that what we're finding is that our skills issues and our skills needs in the Highland region is no different to the rest of Scotland. The biggest problem is the application of the solution because like I say we've got a small population spread across, you know, an enormous geography. You know, so the opportunities for training and learning are more complex and difficult for various reasons like viability of training. You know, the actual cost to deliver something on an island, you know, that sort of stuff. But what we are finding is that the national perspective as to where these skills shortages and the future skills needs are, is no different in our region. There are

no major differences when it comes to the actual subject or sector. The differences come in, you know, how we actually approach filling the gaps." (Organisation J)

Despite the focus on location, interviewees were not uniformly disparaging of the economic consequences of their physical placement. Rather, several were keen to stress that there were indeed benefits arising from their more peripheral location which consistently provide counter arguments to any desire to relocate to the more economically dynamic "Central Belt" of the country – quality of life was a major factor in this.

7.3.4. *Soft and Core Skills Issues*

Whilst Company A identified mindset as a key constituent part of their criteria for hiring and retaining staff, they weren't alone in this. Company D were very sure that attitude was critical in their assessment of the candidate's suitability for a position with the firm:

"I think it's that old adage isn't it – you're hiring for attitude. Of course, the technical skills are important, especially in the workshop. But to be honest I think we're pretty good at that whole attitudinal thing where if someone has got the right mindset or the right attitude, anything else is trainable. Now it might sound a bit twee right, but I've saw it the whole time I was here, and that's the kind of thing we're focusing on…Could it be more refined? Yes, it could, but hey it's working, and we've got something to work with." (Company D)

Similarly, Company F, Company A, and Company C were also very clear in their preference for candidates with the correct mindset, attitude, and values over skills:

"I'm a great believer in values, you know? If someone has the right work ethic, and values, you can train them to do anything, whereas so many times I've come across with great skills, but absolutely terrible values. You ask them to do something else and they, you know, can't be bothered (?) so what we tend to use is the biscuit line, and then from there, we would appoint within. But again,

I do think for management, it's really good every now and again to get somebody from outwith, because if you appointed everyone from within, I think we'd stagnate pretty quickly." (Company F)

"Where we struggle is if we take somebody on who's never worked before, you know, a 17 year old or 18 year old, and they didn't have a Saturday job, I always look for people to have had a paper round or to have done something, and the ones who haven't are absolutely, living in Cuckoo land. That's me just being pretty hard…" (Company F)

"I think you'll also generally find with us, if somebody's got a poor attitude, they're not going to put themselves forwards to the kinds of programme that we attract. So if somebody's a lazy git, they're not going to put themselves forward for an internship programme in the summer, so we're not going to see them. So that would be the difference. That being said, we've also gone through Strathclyde, engaged in employability training with kids from disadvantaged backgrounds and so on, and their motivation has actually been really good, so nah, I don't think…you know when I was at university there was probably about half the students that had a bad attitude as well, I don't think it's anything new. I think it's old people looking at the past through rose tinted glasses. And I'm still on the right side of 40 so I'll continue talking like this for a good few months." (Company A)

"I think at the end of the day, skills are skills because people want to have them, i.e. there is a demand for them. If I was an employer, and I had this conversation with my boss a couple of weeks ago and he said the reason we employed you wasn't because you necessarily had the right skills it's more because you had the right attitude, you seemed the right fit, you got on well with the team, you seemed hard working…there's things that I don't understand…solve it and get an answer to it…so it's those kind of attitudes that are kind of – from my point of view – that are actually more important than technical skills sometimes. Because you have to have the skills, technical skills, to be competent to do a job. You can be competent in something, but you can exceed it. Now it is the actual question that the people in that paper I talked about earlier on answered

a different question: not are they competent? But are they exceeding it? That's the question for me. Is someone competent enough but they might not have all the skills, … then the answer there is correct, they don't have all the skills, but is that really a problem? Cause you can still get the skills later on, cause it's like you pass your driving test – you're a competent driver, but you're not an experienced driver – you learn as you go – people make mistakes, which is why you see insurance companies making millions of pounds each year off people crashing car. They younger ones might be competent at driving, but there are outlier situations of which they have no experience…a very similar analogy." (Company C)

"If I'm being honest, I probably feel a bit an of an immigrant when I came from the Isle of Lewis, and I think you do, when you come from outside, you try to make a positive impression, and I would say that they definitely have a better work ethic, compared to our local kids, who, who, I suppose, do see some of the jobs as a little bit demeaning, you know, but again, I've been to Japan, I was quite fascinated there they're virtually zero immigration and they just gave me the impression that they loved their job and they weren't just, I mean, take the example of those tidying the room, they weren't just there to be tidying the rooms, they wanted to be the best at tidying the room. They had a great pride of work, and it's just something I don't see us having too much of." (Company F)

Whilst the respondents identified a range of challenges and problems relating to their ability to attract and train staff, their focus on attitude and mindset is revealing in terms of their valuing 'non-trainable' characteristics. Wages, location, and access to funding were all considered in both positive and negative ways, but workers' mindset and attitude were uniformly considered to be critical in their perceptions of what's important in attracting, retaining, and training staff. This suggests that a focus on instilling the correct characteristics in employees goes beyond tradition training and consideration of adaptability and enterprise may be an appropriate consideration.

7.4. The Role of Expectations

Interestingly, several of the interviewees were keen to point out the role that unrealistic expectations on the part of the employer might have in exacerbating part of the problem with reported skill deficiencies. One manager was explicit in saying that the problem even be exaggerated by employers:

> "Okay. I think the skills gap is often played up by companies. I think there's – sometimes companies have got an unrealistic expectation of what somebody coming out of either secondary or tertiary education is going to bring to the table. They – you know, to expect somebody to come out of academia or an undergraduate programme, and to be entirely work ready, is frankly never going to happen, without huge amounts of data and input from employers as part of the learning process. One thing that we've done very successfully at [company] is work in partnership with [University] in [city] and [University] and actually [University] now that I think about it, is providing placements for 3rd and final year undergraduates to come and work with us either on summer placements or as actually part of their coursework. And I think that, whether or not they actually come to work with us that it has a massive impact on employability and it's something I certainly try to push at whatever level I can to have it adopted by more institutions, more universities in particular. As actually a credit part of the coursework, because it's, I think it's vitally important for the undergraduates to understand they know how to conduct themselves in an office, and commercial objectives that might be entirely different from the learning they've carried out up to that point." (Company A)

Here, the interviewee is keen to suggest that employers often have unrealistic expectations regarding what recent graduates and young employees might be capable of. In order to improve dynamics here, they suggest that employer engagement in the learning process is vital. Indeed, they were not the only interview to pick up on this point.

> "In terms of the gap, when I sort of speak to other businesses, a lot of them complain that graduates aren't ready for work, and my response to that is that

without the engagement, without the mechanisms being in place for businesses to engage more widely at tertiary education, then that's just not going to change...I graduated twenty years ago. I don't think I was any better prepared for work than somebody coming out now. I think the expectations of employers is something, I think the business climate at the moment is more dynamic, I think there are less, shall we call it graduate milk round jobs that are there, I think employers are looking for graduates to come in and hit the ground running, instead of spending two years filing papers in the corner. I think that might be where the difference lies." (Company A)

"I think probably…if 80% of employers are saying there's a skills deficit, then I think in my mind…their expectations are incorrect. So from my point of mind, if someone thinks someone will go through university and think someone is going to be amazing at their job, then it's obviously an unrealistically high expectation. And I think there has to be more thought process around what these employers have to do to make and mould these people...but I think there's probably a piece there where you think about accepting that the skills might not always be there, because the universities can only do so much, and they've only got so much time with the students…otherwise you have to rely on more years of university degrees…which is what they actually do in the legal profession." (Company C)

"But I guess at the end of the day if they bring something to the business, are they expecting something to just grab something and run with it all the time, they're graduates: they're going to expect that they'll be trained and mentored and that kind of stuff, so it's more about the systems they have in place to train and benefit from that person. … now at the end of the day, once that process has run through and they're not happy with their employee, that's a different question, and then you go back to the, "how do we get people performing better at university?", and then that becomes a bigger obligation on universities." (Company C)

Interestingly, Company A wasn't the only manager to relate their own experiences and work/interview history to the problem of skill shortages. Company C

believes that employer expectations are a problem, but can also be tempered somewhat by candidates being more honest about their existing skillset and developmental and training needs.

> "I've only been employed in one position where I've fitted the bill, and in… actually I didn't even there – that's lies! Every single job I had I've not ticked every box, and they've been happy to let me develop. Listen, I've done this, I've don't that, and I can't do this or do that, and be honest about it, so that then they can make a calculated decision and it's fair. So for example, one job was with my job with [employer] as the contracting and purchasing manager, I certainly was honest about, yeah I've done these types of negotiations but not those, I've never done purchasing contracts, or I've never drafted a services contract or certain procurement contract, and I was honest with them. What I would say is that I was at university studying law and that was the only reason they wanted to employ me in that role and I had done [some] contracts. So it doesn't necessarily fit that the skills you're asking for, or the experience you're asking for, but I've certainly done something close to it, so it's almost the transferability of skills [that he stresses to them], it is something that I think employers certainly look for, in my experience." (Company C)

Company D also agreed, and suggests that from their point of view, employers need to drastically alter their mindset here, opining that "sometimes that skillset just has to be good enough" for employers, and the duty is then upon them to develop that employee to their fullest.

> "I think what's interesting having businesses in the far north, and having worked in construction, and we had them in manufacturing in the far north before, what you find is obviously is the skills pool is smaller, so there is more competition for it so that can make higher pay rates, but what you also find is there's quite a large element of young people that don't want to leave the village or area they were born in, so actually you'll get them. The other half do, and they've had enough, and they want to move away. But sometimes what it'll do is limiting your skills pool. So you might not necessarily all singing, all dancing, that skillset that you want. You will get a skillset, but sometimes that skillset just

has to be good enough. Because you're not going to pull someone from further down south unless it's a lifestyle change. And if it's young people, that's not going to happen. That's usually when they form their opinions, and someone tends to go back home again, and that's when you tend to get them." (Company D)

It is therefore clear that these successful companies are experiencing the same sorts of skill deficiency issues that are so common in the literature, in the reported statistical data sets, and that have become so prevalent in the skills gap narrative write large. They report to having experienced issues relating to their location and geography and relating to the soft or core skills of their employees and candidates. Interestingly, these companies have been able to overcome their difficulties and succeed in competitive markets, even international competitive markets. The following section details their perspectives regarding this success.

7.5. Organisational Response

Managers overwhelmingly viewed employee training and development as lying at the heart of the issue. Interestingly, these successful enterprises seemed keen to focus internally on what they could do themselves to combat these issues, rather than lamenting a lack of quality candidates, or deficiencies in educational provision, or any other consideration outwith their locus of control. Even when they discussed interfacing with the national education or skills system, the focus mostly rested on what more they could do as organisations to improve the likelihood of securing better equipped candidates on their incoming graduate programme lists. For example, Company A suggests the university system in Scotland is actually solid by international comparison, and explicitly states that they prioritise students graduating from degrees with practical experience incorporated into the curriculum.

"You know, if you get a cohort of 40 students, you're always going to get some [expletive]. I don't think the universities can screen that out at the age of 18. I don't, I really do think employability qualities and so on are so much down to the individual and if you can engage at an earlier stage it is, there aren't many

bad degrees out there either, it's not like we've got Trump University in Scotland – they all tick the right boxes. I think from an employer's perspective, what makes the difference between a good and a bad degree is how much practical exposure the kid's been given, and we might not see that because at [company] we're providing them with that exposure, so everyone who's coming out the end will have good industrial exposure, whether the other 39 kids in that cohort have the same exposure I don't know. Certainly, for trades like this. I'll use chemical engineering as the most useful example, but any institution doing a chemical engineering degree that doesn't have some element of industrial exposure, to me that's a bad degree. If I'm recruiting, I would expect someone to have spent at least three months preferably six doing something practical, that's supervised by industry rather than by an academic." (Company A)

This perhaps suggests that a difference in mentality might (a) reduce the likelihood of viewing the issue as one of shortage, and rather as a development one, and secondly (b) lead to successful employee development and fulfilled potential over the medium to longer term. Focus on internal training and external developmental opportunities was something that interviewees volunteered time after time as evidenced by the following company responses:

"We have a very developed training programme and we've always invested heavily in training so we do our own inhouse service standards. Training, we do lots of…we do regular training sessions on Wednesdays for the full-time team. Any kind of need, business training need we identify and we address by creating a training programme. I'd say 95 per cent in house... and we occasionally go and pay for somebody to do a course at college. We do personal development reviews with every single employee and we identify what they'd like to focus on. If we see a specific course advertised, say organisational skills, IT skills, leadership skills, we would send somebody to do it. We do a lot of benchmarking and we do look at other businesses and always try to aim for the best." (Company E)

"For me it would make economic sense to take the graduates with the lowest amount of potential – and I'm not talking academic sense here, I'm talking about

ability to enter the workplace...that's why we get them in at the 3rd or 4th year level on placement and see how they look, how they integrate, if they've got the right mind-set, then for us it's not about starting salary, it is around just recognising, that we've got to make that investment for the first year. We've got one graduate entry who's just started with us, he's chemical engineer and he's on £26k starting salary, but we've just paid £10k on external training in his first year alone, so he's gone off and done project management and done certain technical skills courses, so that's typical for us, so it doesn't matter whether we caught someone in the market and paying them £36k starting salary, we'd still be paying that £10k, so you can see the importance of us making sure that person is the right fit, and that they're going to stick around with us." (Company A)

"You're never going to employ someone right from scratch, so the approach that we set is, you need to two things. You need the right mechanisms from the business to be able to employ that and you need the right attitude to employ that you do it. See if the right attitude the employee doesn't do it, then if they're incompetent at their job, then they'll get fired through a legitimate process to do so, or moved about the business appropriately and put into the right role. And if they have the drive, then they'll go on and be better at their job. If they're happy staying in that job, but being good at it, that's fine, they'll also move onto higher positions. And that's mainly what the skill deficit is, mainly for me, is growth, more than anything else." (Company C)

"So, what we have here, we have 10% of our workforce that are apprentices, which is really high. So, we have 50 apprentices out of, well almost 600 hundred staff now: that's really, really high. When I came in I was very surprised by that, I think that's fantastic, and I don't think we make enough of that. That's both male and female apprentices; that's both school leavers and older people; it's completely mixed. So in our heavy workshop, you know, working on obviously the heavier goods vehicles you might have 20 boys and girls in different age groups working in there. We have throughout the UK apprentices on the administration side. We have apprentices on our rental side. We have apprentices on our light workshops. Every site that we have – Airdrie obviously has more being the head office – but every other site has at least one

apprentice. And also what this organisation is really good at is keeping them. We don't bring them into train them and let them go. We bring them in and if they're good we keep them on. So actually we've got that loyalty factor. We've got many people who were apprentices and they're still with us. Not all of them. Some of them you're going to lose because there's more money down the road or someone else comes along, and that's okay, but some of them come back to you again, and you've not lost that skillset. So, the whole apprentice agenda which is our there just now because there's an apprentice levy as well, really, really works for this organisation. Which is maybe a bit unusual in other organisations." (Company D)

Mentality was also something that Company G brought up:

"It's what they do…successful companies, the companies who I believe will not complain about the apprenticeship levy for instance who will get value for money from education and who will in the long term have the best results are those who align their internal development policies and internal development improvement programmes with the people…with the education system we're working on. Now, what do I mean by that? What's the best way…? ...It's to have a plan...Those who think ahead, those who look three/four/five years ahead and start to plan just now. For instance, who'll look at the…their current resource, their current workers who are loyal to them and say…tell you, why don't I put....why don't I put Wee Jimmy there? Wee Jimmy's got a wee bit about him. Why not…why don't I put Wee Jimmy through a degree? Why don't I put him through an MBA? Why don't I do…those who actively look at developing…pushing forward their own workforce are those." (Company G)

Here, Company A suggests that employees particularly value investment in their long term career as well as in their short term remuneration.

"The success - that's come from with engaging with graduates early, engaging with things like the Santander graduate programme, and so on. An exposure to graduates at a very early stage, it's not about offering starting salary, or packages, or offering them a Mercedes on the first day or any of that, it's about

the investment you make in them to begin with when they enter in the company, and for us, about the responsibility we give them. I've got a placement student who's just finishing up their last week with us next week, and he is totally responsible for delivering £250,000 new chemical plant...We've given him lots of back-up. We're having an external consultant review his paperwork and everything, but when he came in on his first day I said "there's your project, I expect you to deliver x y and x by then" and by the end of the next week he'll have delivered about 95% of what we asked him to do... He's actually just yesterday come back from, we had a conversation about his future career angle and so on, go out and do the milk run interviews etc, he had an assessment day yesterday with a multinational chemical engineering firm, and he came back and said "I've went into their office and I saw these guys working at cubicles and it's nothing like what we do in here, and I don't want to do that, I want to work, or be given the responsibility rather than be sitting in the corner." So if nothing else, we've had a lot of work done very cheaply out of the placement and it has been done to a high standard, but that undergrad has been thrown right in at the deep end and he's been treated as an entirely integral part of the team as if he was a graduate, he's only six months away from graduating, and he's been giving that exposure, so if nothing else, he doesn't come to us at the end, he's going to be great for whoever else takes him on." (Company A)

Company C suggest that internal performance and development review (PDR) procedures need to be regular, structured and linked to strategic development outcomes:

"And that's where your internal PDR systems come into play. So you sit down on a yearly basis and you say, and you need to be very, very, very, very...[previous company] were amazing at this and I can see [current company] aren't actually amazing at it, you need to be very prescriptive. So you say we're going to break things into categories, personal management, people management, technical. Whatever these different categories are…within each of them you have 5 different areas. You have time management, resource management, whatever way you want to break these up, and then you rate yourself out of five where you say, yeah I'm a 5, I'm below 3 then you're not competent, if you're 3 you're competent, if above you're exceeding, and you're

succeeding substantially if you're a five, and that then throws out development needs, and it also throws out … you can also tie in business goals with that." (Company C)

"Again, I think, for me, this whole piece you're looking at, is something around employer's approach to their staffing...offering up benefits like good pensions, flexible working hours, all that kind of stuff means that you're putting an employee in position that you're going to get the best out of them...Having PDR in there, having people setting their goals...and you have a manger reviewing that. Every single time you think a staff member isn't doing well, you have a sit down with a manger, so as a project director I sit down with project managers on a weekly basis, a monthly basis and ask "where are we with things?" and finding out why if they aren't doing well? And that's you analysing whether that's because they don't have the right skills, experience or whether they need a mentor, and again that's something we can talk about." (Company C)

Again, the stress on emphasising the role of positive employer engagement and patience in driving employee development was evident. Company F in particular provided an enlightening insight when they revealed the positive impact that a "warm" and encouraging managerial tone can take when engaging young employees, particularly those who might not have full confidence in themselves yet as valued and valuable workers.

"Where I think we do really well is with non-high performing students, we do work experience and we get kids, I would call them rough diamonds, who probably haven't been given too much positive feedback in their time in school, and then they'll come here, and they'll do six hours, and somebody will say to them "bloody hell mate, you were really good", and you can almost see them say to themselves, "my god, somebody just praised me there. All I've ever gotten is 'I'm late', 'I'm slow', I've never gotten this before". I just think quite a few kids have been, if you want to say, turned into quite mature and responsible adults, where they might have been on, I don't know if you'd call it a danger list or something, but I do think these people should be given work experience." (Company F)

> "I always put myself in the situation of my employees on a Saturday night sitting in the pub – what are they going to tell their mates about, you know, how you always just get half-truths in the pub, "aw I get a tenner an hour!", and what they don't tell you is that they get 20 hours when they get asked, and some weeks they don't get any, you know, and then say let's go and work there, until they find out. But I hope our guys would be sitting there and say, "I tell you what, it was bloody warm this week, but I got four days off... there's nothing sexy about starting at four o'clock in the morning, but if you're getting off for four days…and so I was inside for those days, but I had two really nice days where I did this, and I did that", and I suppose what I'm really looking for is just people to do a good shift, but have a good time away from work as well, because I do think that is more important than working sixty hours a week." (Company F)

Company A articulated a relatively innovative clever approach to young graduates:

> "We settled in the borders 20 years ago because we got a £15,000 grant from Scottish enterprise to start here, and £15k went a long way in those days – we were a three person outfit – so that's why we moved here. We do a couple of things, obviously we're in a rural area, so what we do is we rent a house where we put either placement students or graduates, we call it the Frat House and they all go in there and they spend, they get a minimum of six months in there until they find their feet and so on, and it gives them local exposure and social interaction because they're coming to a town with a population of 6,000 in the Borders that can be a little, you know?... Providing that has a massive impact on retention of placement students when they're at undergrad, because they're not having to sign up to a six month lease on a flat, or having that unknown as it were, so that's probably the best money we've ever spent on retention. Aside from that, we actually I think benefit from our rural location because there aren't other opportunities on the doorstep, so it somebody comes in, and after three or four years wants to move on, then they are looking at moving house and so on, so it makes our employees a little more sticky so to say. I think our staff turnover is something like 3 or 4%, it is pretty minimal... so we get in there

quickly, and we make them all very comfortable, and they cannae get out!" (Company A)

This is a clever aspect of dealing with skill deficiencies brought on my local geographical isolation, or relative isolation, as it can help with issues of loyalty and long-term skill solutions. Company H suggest that this sort of value, particularly focused on local areas, with emphasis on generational development and family employment, can ingrain employee loyalty and alleviate skill issues with long term development programmes, such as apprenticeships. Companies D, G and K also brought up similar considerations.

"What gives us the edge is that we can take young people or any, or long term unemployed, in fact people that maybe nobody else would touch, or people that are, kids that have been rejected from anywhere else. We'll give them a start... So, that's it. They can move into the factory or stores or dispatch or there's loads of different departments. And when they start with us, we give them a full time contract and to put them on a modern apprenticeship straight away...So they not only get the sort of living wage, they start to work towards a proper qualification straight away. It's not a case of, you know, giving them the modern apprenticeship and then trying to maybe give them a job at the end of it, or maybe not giving them a job. We employ them fully and put them on the Modern Apprenticeships straight away... we've over 100 young people have done modern apprenticeships with us." (Company H)

"It's interesting because the organisation has got a good reputation and genuinely they are really good to their staff. I think they work long hours but I don't think that's exceptional for the industry. So people work long hours but they are rewarded. So in the market place we are a good payer, so I don't think people would leave because of that. So, do people want to come and work for us, yes? Because of that family element when the business started, we do have a couple of generations of families working for us, especially in [town]. You know, father and son, it sounds a bit stereotyping, but it is, and there might be even me grandfather, father, son or daughter here. So we have that pull, I think because this is the head office, it's [town], it's local, we're probably one of the

largest employers here...And what we always do within the organisation, which I think is brilliant, and there must be at least, within the last seven weeks, ten or twenty, we will always as much as we can accommodate, people at school who are looking for work placements. But if you think about that, that's quite clever. Because then, you're keeping an eye out for your future apprentices as well." (Company D)

"Because you rightly said, graduates won't be the highest paid because there's no loyalty built in. Whereas if somebody's been working for somebody for a while, they're seeing their employer develop them, that's worth as much as a guy on a wage rise, if you know what I mean...So that for me…the companies that I see progressing and with the best prospects are those who look at their own staff and say, how can I develop my own people? And give them the best opportunities, rather than constantly looking to recruit new people to…almost on an emergency basis to fill skill shortages because it always becomes reactive. And if you do something reactive, like, it cannot possibly be efficient. And what you're not doing is you're not building loyalty and what you're also not doing is you're not…you're not necessarily getting the best candidate because you're reacting to a situation and you're taking people on who are not necessarily the best candidates 'cause you don't have the time to get the best candidates. So that's…these are the companies that we see doing." (Company G)

"You know I can think of examples of going to see very small companies indeed. One that always sticks out in my mind works in the IT sector, web development basically. They were a really, really small company. I think they were about three or four people so a micro business essentially. And then they took on two apprentices. They got to the stage where the workforce was getting older, what do we do going forward? They were quite reticent about it actually. You know, what's this going to involve? And they said it was the best thing they ever did, and it's given them a boost and they're now being able to grow because they've taken on two new employees. Given two young people a chance to come in, get the chance to progress in the world of work, acquire the skills that they'll need for the rest of their life. But also as a company it's just given

them new ideas to be able to respond to the world we're in, in a way that they hadn't thought of before. So, that can give companies an edge." (Organisation K)

Another aspect of this is mentoring schemes and exit interviews with companies seeking to understand their employees' skills and reasons for leaving in order to mitigate any future problems of a similar nature.

"We do exit interviews with all our employees to find out how we did and we often get quite a lot of good frank opinions but in terms of why they leave many of them, we have full and part-time employees, about half and half because we never shut. We only shut on Christmas Day and we are here from 7.30, 8.00 in the morning until midnight on sort of shift work et cetera. The part-timers are students generally and they do one day at the weekend, full-time over holiday periods, so Christmas, Hogmanay, Easter, summer. It suits us really well and most of the time when they graduate they will go full-time for a wee bit until they get something more to their liking, either that or they go travelling. Seasonal jobs, there are a few musicians who decide to go and explore other avenues, people going away for skiing season as instructors. Yes, and sometimes the students find it quite hard to juggle both work and studies so that's another reason for losing them." (Company E)

"Generally, we'll have one person going out the door, so it isn't really that bad. We'll always do our best to speak to the person and try and understand why they're leaving...We have our chemical engineers who are mentored by someone with a lot of experience, so a consultant comes in. Also, we've got a couple of retired guys who we keep on a part time contract. And they come in and do four hours a week. And they provide a lot of guidance for them, and they also bore the hell out of the younger guys with their stories. They're sort of 68 or 69, so they've got their pension. They come from other industries. They come from the local area, so they've been a goldmine of hints and tips and contacts which have helped our employees." (Company A)

"And it's about selling it to an employee, that you're not going to get pigeonholed over there, so doing that would also benefit you in a role that's currently a level above you where you are, so you almost zig zag up to that role, rather than go directly to it. So that would be the retention piece but it's a hard thing to manage, because you could do all of this, succession management plans for your business, and see at the end of the day, someone could just leave because they get more money, and then that's the whole complex plan gone, and you'd have to redo it, so you could sit and redo that all the time, so it's a very fluid thing I think." (Company C)

CHAPTER 8: Discussion & Conclusion

8.1. Introduction

Detailed holistic analyses of the extent, severity and composition of skill shortages and skill gaps across Scotland are lacking in the existing literature, particularly when viewed through the regional lens. Moreover, little research exists, even in an extra-Scotland context, examining the regional cause(s) – or at least determinants – as well potential responses to these issues. These facts "fly in the face" of the popular narrative regarding widespread and persistent economy-wide skills deficiencies, which are often thought – by industry, public and politicians alike – to produce detrimental effects at the micro (firm) and macro (national economy) levels. The research aim of this project, therefore was to investigate the distribution, severity and determinants of regional skill shortages and skill gaps in Scotland, with additional focus on the ability of employers to combat these deficiencies. In doing so, a mixed-methods study was carried out, with both wide-scope (regression) and narrow-focus (interviews) analyses undertaken. The results and findings of this research are set out in the preceding two chapters.

Moving from descriptive to explanatory analysis, this chapter combines findings from the literature review, the quantitative analysis, and the qualitative analysis to address each of the four research questions set down in the Introduction (Chapter 1) and expounded in the research methods chapter (Chapter 6). Specifically, these research questions are as follows:

1. To what extent are so-called "skill gaps" appropriately conceptualised and measured? [Addressed in Section 8.2. below]
2. To what extent does Scotland suffer from skill deficiencies? [8.3.]
3. To what extent are sector-specific skill gaps distributed evenly across all firms and organisations? [8.4.]
4. To what extent can firms mitigate the effects of industry skill deficiencies? [8.5.]

The key contributions of this thesis and research project are detailed below (8.6), and some notes have been made on practitioner implications and pathways to impact (8.7). The chapter further explains the limitations of this research project and thesis and recommends some avenues of potential future research (8.8). It finishes by proposing four recommendations for policymakers in Scotland (8.9).

8.2. Differing Perceptions of the Issue

Research Question 1

To what extent are so-called "skill gaps" appropriately conceptualised and measured?

In concurrence with previous literature (Bosworth, 1992; Bosworth, 1993; Shah & Burke, 2003), this study has found that there remains substantial confusion among employers as to what precisely is meant by the terms "skill shortages" or "skill gaps". Indeed, what many employers mean by "skill shortages" could also be described as generic labour shortages, where the skill element plays a secondary role with the quantity issue prevailing over the quality issue. In essence, skills shortages can be viewed as a subset of generic labour shortages, demarcated by their persistent nature and the difficulty of "quick-fix" firm adjustment mechanisms. In addition, when firms were often reporting issues in attaining the right quality and number of appropriately skilled employees, the issue often revolves around strong core, or what are often termed soft, skillsets (such as negotiation skills, people skills, managerial skills, or sales skills). Over and above that, this study finds that a dearth of positive attitudes and good values among employees and candidates is a common complaint of employers, something which previous (albeit now dated) literature has also found, and which has been termed the "good bloke syndrome" (Oliver and Turton, 1982). Decency, integrity, hard-work, and honesty were values and concepts which firms had associated with the issue of skill deficiencies and which, by extension, the viewed as attractive or even necessary in candidates and applicants.

One of the key new contributions to come out of this study regards the identification of the role that appropriately placed expectations play in determining employer attitudes to skill shortages and skill gaps. Successful employers were keen to point out that this

perhaps determined the overall response of survey responses regarding employer perceptions with skills deficiencies, with one interviewee (Company A) even going so far as to suggest that this was to direct government focus (and perhaps investment) into subsidising or otherwise supporting employee training. From their point of view, the likelihood of an employer reporting a skill shortage, or a skill gap was *increased* the less likely they were to combat the issue themselves – this suggests that companies may view it as the role of government to provide the skillsets in potential employees they are looking for rather than considering training as an integral part of their business. Interviewees contended that appropriately placed expectations, particularly regarding young graduates and their immediate abilities, were an essential part of the overall narrative surrounding skills deficiencies. Tempered expectations allow the employee to be given time and space to develop and grow into their potential in the workplace. This also has important implications concerning the very *meaning* of skill gaps and shortages – what one employer would view as a skills deficiency, another might view through the lens of long-term employee investment and professional development. One interviewee even suggested explicitly that employers were exaggerating the issue to produce more favourable training outcomes by way of government support. Researchers need to be sure in these circumstances that concept validity is safeguarded (Mane & Corbella (2017).

Moreover, this study finds that firms are largely reluctant to raise wages and salaries to combat skill shortages, and from a market economic perspective, it is therefore questionable as to whether any proclaimed shortage could be considered a "genuine" shortage (Shah & Burke, 2003). In a mixed market economy like Scotland, labour is priced largely like any other good, service or commodity, and employers have by-and-large taken other avenues to alleviate their skill deficiency issues, by, for example, increasing the workload of more skilled employees, by outsourcing that work to other firms and organisations, or by extending employee overtime (again highlighting the quantity issue over the quality issue) (ESS, 2015) – arguably a case of "having their cake and wanting to eat it too". Having said that, this says nothing about the internal skills gap issue, where wage increases would have no impact on raising the skill level of existing employees, although further investment in training is perceived, unsurprisingly, as having a positive effect.

In terms of detecting skills issues, this study finds that monitoring vacancy rates alone is insufficient to determine whether shortages exist or are even growing, and that

properly commissioned and implemented survey research data remains an invaluable tool for collecting information regarding potential shortages. This data would ideally come from both the employer and employees of an organisation, to give, if not a more objective view of the issue, then certainly a more balanced one. Moreover, the monitoring of unemployment rates and, on their own, wage rates, is problematic in that these measures are subject to many other influences which can have equal, or even greater, weight in determining fluctuations and directions of travel.

Overall, upon close examination, it is evident that there is a certain "ethereal" aspect to the study of potential skill deficiencies. What might seem like a simple enough issue at first sight is, for a wide variety of conceptual, definitional and technical issues, in actual fact quite a challenging phenomenon to precisely pin down, not least because employer understanding of what constitutes a skills shortage or a skills gap is very much a subjective matter. This is for all intents and purposes, going to remain an intractable issue for (and limitation of) future skills gap research, although the holistic approach and methodology outlined in this paper can go some way to suppressing these research limitations.

8.3. Assessing Scotland's Skill Deficiencies

Research Question 2

To what extent does Scotland suffer from skill deficiencies?

This research took a novel approach to studying the geographic aspects of skill gaps and skill shortages, looking at Scotland from the within-country regional perspective. Moreover, this was done at several different levels of analysis, using both modifications of the urban-rural definition of geographic variation and the more granular NUTS 3 definition, which in Scotland corresponds to the Local Authorities or "council areas" of the country. Apparently very little difference between urban/"accessible" firms and rural/"inaccessible" firms, at least at the statistical level, exists. Only one of the Series 1 regression analyses detected any statistically significant geographic variation, and even then, "geographically inaccessible" firms were only two percentage points more likely to report skills gaps, and this has to be balanced against the results of the four other Series 1 regressions which passed assumption and validity tests, which reported

no statistically significant variation. Even looking at the LA level, only three areas (Clackmannanshire (-), East Ayrshire (-), and Perth and Kinross (+)) were statistically different in their likelihood of reporting skill gaps than Glasgow was meaning no obvious pattern in the way of Scotland's geography (or economic geography) can be detected. It is therefore difficult to draw any conclusions, at least at the national level, regarding geographic influences on the likelihood of experiencing skills issues beyond those outlined above.

Despite these findings above, it is not the perception of rural employers, however, who are clear in their view that their location, and specifically their distance from any large population centre, hampers their ability to attract and retain talented and skilled employees. They are clear in their view that this stands in contrast to firms who operate in more geographically centred locations, and whose ability to retain employees is purportedly enhanced by, for example, large-city entertainment offerings and the amenities associated with large, agglomerated populations. Nevertheless, urban employers themselves are also likely to report experiencing persistent skills accessibility issues, viewing the problem as much more widespread than their more rural colleagues and identifying competition for staff with the right skillsets in particular as a key determinant of their challenges. What might explain some of the confusion with the lack of patterns in the geographic data is that geography just may not be a good enough lens through which to view skills issues in the economy with the existing datasets available to researchers.

Despite the lack of a clear geographical explanation for the reporting of skills gaps, this study has found that there are sector and industry determinants of skills deficiencies, just as previous (non-Scottish) studies have found (Bosworth, 1993; Green & Ashton, 1992; Green & Owen, 1993). Findings from the regression analyses show that in Scotland the manufacturing, construction, financial services, retail, hotels & restaurants, transport & storage, and public administration sectors are all likely to report skill shortage issues. Importantly, much of the focus on public sector skilled shortages (particularly concerning the education and health sectors) which is so prevalent in the skills deficiency narrative, seems to be misplaced as no statistically significant results could be detected in those two areas of the public sector. Finally, echoing previous literature, SMEs were substantially less likely to experience (or at least report) skill gaps than established firms (those +250 employees), perhaps pointing to a scaling issue either in the management of skill assets within the firm or perhaps even a scaling issue

in the monitoring and reporting skill deficiencies. Future studies might examine differences in expectations between these two different-sized employers around skills gaps which considers their sectoral, size, and growth characteristics.

8.4. Organisational Perspectives

Research Question 3

To what extent are sector-specific skill gaps distributed evenly across all firms and organisations?

Even superficial analysis will show that Scotland has many firms which compete successfully on the national, even international, stage. Many of these successful Scottish firms still operate in sectors where skill gaps are self-reported by employers themselves. Given the extent of this problem – with gaps reported across the manufacturing, construction, financial services, retail, hotels & restaurants, transport & storage, and public administration sectors – this is unsurprising.

This thesis took the approach of interviewing successful organisations within these sectors to explore this issue in greater detail. These firms were keen to point out that, even though they were successful and growing quickly, they also experienced skills deficiency issues and problems accessing skilled labour, just as any other firm within that particular sector might be likely to. These issues were often attributed to geography (with rural firms being likely to attribute their skills inaccessibility to their isolated location) but not always. Successful firms also experienced issues relating to sector dynamics, with several sectors – manufacturing, construction, financial services, retail, hotels & restaurants, transport & storage, and public administration sectors – highlighted in the quantitative analysis also showing problems in the qualitative analysis.

Importantly, these firms also had problems accessing requisite training, particularly when they were located in more remote and isolated locations, with access to managerial training being reported in the qualitative data. Indeed, core or soft skills was something that was mentioned by most interviewees, which stands in line with previous research. It is telling that these issues, that are commonly depicted in the literature, are also mirrored by successful firms, which suggests that skill deficiencies are not insurmountable challenges which firms are powerless to overcome. Indeed,

several interviewees explicitly suggested that employer expectations regarding skill levels need to be tempered, and that this might be one aspect of what is driving the popular narrative surround skill deficiencies.

These respondents were optimistic in their outlook on business prospects writ large as well as the particular issue of skill deficiencies. They were honest in their experiences of dealing with skill gaps and skill shortages, but were insightful, contemplative, reflective and "philosophical" about their approach to such problems. Indeed, these successful employers were keen to suggest that other firms might adopt a similar approach in more effectively mitigating, adapting to, and overcoming their skill problems. A solution-oriented mindset was forthcoming from all interviewees, and those familiar and experience with sector-wide engagement initiatives had a firm belief that their approach was one which was best suited to alleviation.

In short, it appears quite likely that all (or most) firms which operate in these sectors encounter the same challenges in accessing required and desired skill levels.

8.5. Responding to Skill Deficiencies

Research Question 4

To what extent can firms mitigate the effects of industry skill deficiencies?

The firms that were interviewed for this research project were keen to point out that firms are more than capable of confronting these issues without the need for large-scale government help. Successful firms place a lot of focus on training and solidifying robust internal HR, skills retention and skills diffusion procedures, much in line with the literature on knowledge management within the firm (see Literature Review 2 – Skills Utilisation at the Level of the Firm). Previous researchers have identified disconnection between policy formulation and policy implementation in Scotland (Arshed et al., 2014). Similarly, findings from this research suggest a disconnect between evidence and the policy narrative surrounding skill deficiencies.

Thus, internal firm processes appear to be key to addressing internal and external issues of skill deficiencies. Most importantly, firms who take a dedicated, long-term view of employee training and professional development (Hughes & Rog, 2008; Van den Brink et al., 2013) valued this as the approach which helped them most. These firms employed clever and innovative ways of attracting and retaining skilled

employees, particularly early on in their career journey, helping to build employee capacity and capability, while at the same time, also helping to foster more deeply embedded employee-employer loyalty (Terera & Ngirande, 2014). For example, Company A offer to house young new-hires in a firm-owned property to allow them reduced-rent accommodation in the rural area, reducing employee anxiety, before they can then get a "feel" for the area, settle, and decide on more permanent living arrangements. Thus, candidate recruitment and employee development were very much seen as being deployed in harmony, both aspects helping to support business growth and opportunity exploitation. Importantly, these firms pointed to tempered expectations in the recruitment of employees, particularly young employees – several interviewees explicitly pointed to a change in mentality being needed for those employers who regularly lament the skillsets of new hires – attitudes towards providing training, extolling locational and lifestyle positives, providing accommodation, favourable working conditions, wages, and opportunities for advancement were all identified as key behavioural traits in addressing the challenges companies faced in addressing perceived skills gaps. If companies aren't of the mindset of being prepared to provide these in combination or individually for whatever reason, then their complaints around the issue of skills gaps may appear to be intractable. Based on the foregoing, it was clear from the responses that the issue of skills deficiency was very much seen as being one that is encountered, experienced, and best dealt with at the firm-level, where individual firm context is an essential and unavoidable element, unable to be solved with, for example, generic, national wide education or training programmes. Nevertheless, a nationwide programme could for example focus on helping companies 'sell' themselves and their locations etc. more effectively to candidates, as well as encouraging them to invest in the different types of mitigatory behaviours outlined above that help address skills deficiencies including training. Here, Skills Development Scotland are leading by example, although firm-uptake in programmes such as the Graduate Apprenticeship Programme would need to strengthen compared to current participation levels.

The retention of skills was seen as being multi-pronged, with retention of employees, and retention of skillsets (a separate concept) being proposed as a successful measure of combatting skills issues by respondents. Thus, firm level programmes like skills mentoring schemes, employee exit interview, and long-term skills monitoring and skills planning programmes (e.g. dealing with issues like retirement) allowed

employers to overview, manage, and proactively maintain their required in-house skillsets, helping to avoid the pernicious effects of skills atrophy (particularly skills atrophy to market competitors and other rival employers). As per the previous paragraph's point about national programmes, a government-sponsored initiative focusing on encouraging these behaviours within firms in Scotland may be an area of potentially valuable benefit to addressing the perceptions of skills deficiencies in firms with tangible outcomes of focusing attention on the issue and supporting firms to take action accordingly.

8.6. Key contributions

In addition to explicitly answering the research questions, this thesis has multiple contributions of a more universal and non-location-specific nature which have implication for researchers and policymakers operating outside of the Scottish context as well. Indeed, perhaps the central contribution of this work has been to extend and deepen existing statistical analyses of the Employer Skills Survey, affording new insights into the regional understanding of skills imbalances and their determinants. Three unique approaches were taken towards incorporating geographical dimensions into the quantitative analysis undertaken here. The concept of geography, location, or peripherality was operationalised as both an 8-bin rural-urban variable and a 2-bin rural urban variable, as well as a 32-bin Local Authority variable more amenable to real-world policy and practitioner work. In the end, this produced a comprehensive assessment and measurement of whether or not rurality was an important determinant influencing (i.e., increasing) the likelihood of a firm or organisation experiencing a skills gap. This is a much more robust measurement of geography than has previously been the case. Regardless of the national context or setting under study, researchers can follow suit and adopt a more granular local authority level approach, or make adaptations of their own, and utilise a measure which makes sense given the unique economic-geography and skill-policy/governance makeup of the locality that they are studying.

This geographical component described above is furthermore part of a larger methodological contribution that this thesis makes towards existing skills gap and skills shortage literature. This contribution comes in the outlining of the multi-method holistic approach, which promises a much more rounded and objective assessment of the

distribution and severity of skills gaps and skills shortages than has previously been the case. To the extent that data limitations could be overcome, and within the confines of this funded project, this study has followed this approach. Importantly, by utilising a range of different indicators and data sources, by incorporating the essential component of wage dynamics in a market economy, and by undertaking simultaneous and complementary qualitative studies, future researchers can utilise this approach to make detailed and robust assessments in a non-location specific way, helping to guide policymakers, practitioners and even employees alike. Moreover, the quantitative work undertaken here, split into multiple series, and incorporating one-for-one robustness checks, totalled 36 regression equations. This produces a far more reliable quantitative statistical assessment of skill gaps in Scotland than has hitherto been undertaken, and a similar approach can be followed in any setting. As outlined in the multi-method holistic approach, future researchers will also be able to capture more than one perspective when assessing the skills shortage narrative by comparing and contrasting the viewpoints and perspectives of both management and general employees within a given firm. This will provide additional insight into how different viewpoints can be understood and reconciled. This methodological approach represents the central contribution of this research project.

Another key contribution of this research comes in how the research methodology and research findings help inform the debate regarding adequate responses to skill deficiencies. By taking a novel approach and assessing the perspectives of fast-growing firms, and importantly by doing so in a qualitative manner, this research has helped to shed light on how successful firms manage to navigate, tackle, and respond to their own perceived skill deficiencies. Specifically, these firms place a great deal of emphasis on training, making sure that they assess new hire performance with suitable expectations in mind, and – perhaps most interestingly – incorporated novel and innovative approaches to employee retention (which worked especially well in settings commonly reporting a high degree of skill problems, namely in rural areas). These findings contrast somewhat with calls for macro-government interventions to alleviate skill gaps and skill shortages throughout the economy. If high-growth firms are no less likely to actually experience skill deficiency issues, then this suggests that they can be managed, and their impact and effects muted. Future policy would therefore be better directed at, for instance, supporting, via adequate funding, the proliferation of management training programmes which diffuse these knowledge

management skills and novel approaches throughout the sectors and firms of the economy. Again, this finding is non-location-specific and represents a universal contribution of this thesis.

Academically, this research project has extended the nexus of human-resource management and knowledge management literature (Soliman et al., 2000; Gope et al., 2018) into the realm of fast-growth firms and contributes to theorization thusly. It finds that fast growth firms effectively engage in best-practice human resource processes, especially as they relate to employee recruitment and selection (Hurrell & Scholarios, 2014), employee training and development (Tulgan, 2015; Bautista, 2016; Okay-Somerville & Scholarios, 2019), employee reward management (Spain & Groysberg, 2016), and employee retention (Van den Brink et al., 2013; Romo, 2015). Their employee retention procedures were particularly innovative, and the findings detailed above will advance knowledge and literature on how organisations can use such measures fully to their advantage. Moreover, these fast-growth firms utilised knowledge management processes, particularly regarding tacit-to-tacit knowledge transformations (Nonaka & Takeuchi, 1995; Patel et al., 2012; Borggren et al., 2016) to enable younger staff to gain knowledge and insight from more experienced employees, even retired employees in once instance, furthering the organisations' aims of reducing and mitigating internal skill gaps.

8.7. Practitioner Implications & Pathways to Impact

There are several actors who will benefit from the findings of this research. Firstly, future researchers will be able to utilise the multi-method holistic approach that has been outlined in Chapter 3, and (subject to data availability) harnessed and utilised as much as has been possible in the primary research sections of the thesis itself. Previous skills gap and skills shortage research has been hampered in its ability to provide holistic objective assessments of skills supply and demand imbalance because of the one-sided nature that more focused, and therefore more limited and one-sided, analysis entails. In particular, the complementary combination of quantitative and qualitative approach, investigated either simultaneously or sequentially, will allow researchers to assess both the breadth and depth of imbalances in a much more accurate way than has previously been the case. Moreover, this method is not location-specific

to Scotland and can be utilised by researchers across geographies, and those examining the issue from a high-level national perspective as well as those conducted localised assessments at the most granular level.

Secondly, this research will be useful for the funders of this project, namely the Scottish Government. As a contributor towards the Employer Skills Survey, the Scottish Government have for years possessed a relatively detailed high level statistical description of skills shortages and skills gaps throughout the country, with detail at the sectoral, skill, and (to a lesser extent) geographic level. However, this research will expand this knowledge in three important ways. Firstly, rather than affording a description of skills imbalance across the country, this research looks at the determinants of skills imbalance, examining specifically what factors increase the likelihood of a given company reporting a skills gap. Secondly, the geographic components – which constitute a vital element of the quantitative and qualitative elements of this study – will greatly expand location-specific information for the Government. Thirdly, the qualitative (and more exploratory) qualitative findings will provide a level of granular detail and insight which the Scottish Government has hitherto been without. No previous research in Scotland has combined these two elements into a single approach, and policy makers will benefit from the extra insight afforded by successful, fast-growing firms.

Third, and on a related note, this research will prove useful to companies and organisations up and down the country who have reported and are currently reporting issues related to skill gaps and skill shortages. This holds true regardless of whether the organisation is commercial or non-profit, well established or SME, fast growing or stagnating, and whether they are located in the rural, economically peripheral areas of the country, or in the densely populated and more economically dynamic "Central Belt". Organisations will take comfort from learning that high growth firms still experience skill deficiencies and will benefit from learning about the approach they have taken to combat such issues. This dissemination and diffusion of knowledge will hopefully provide these companies with the tools to tackle and overcome their own skills issues. In particular, managers will benefit from learning about the approaches fast growing firms have taken towards training and skills development and the internal human resource processes that they utilise to develop and retain skills "in-house". Moreover, the unique approaches to employee retention, which some of the interview participants detailed, will provide invaluable insight into how human resources and

skills can be enticed to and retained in geographically isolated and economically more peripheral areas.

Regarding pathways to impact, as part of the PhD process, the author spent three months working for the funders of this project, the Scottish Government, in an analytical, policy-focused role, assessing the evidence base surrounding skills supply and demand issues in the country. This gave the author the opportunity to network with relevant people in a practitioner and policy setting role and to discuss and disseminate the findings of this research project. This placement also presented the opportunity to learn from experienced colleagues, who among other things, had been involved in data requirements during the planning stages of the Employer Skills Survey, a conversation which proved invaluable for this study. Furthermore, once this work has been finalised, and pending approval of corrections, the author plans to disseminate the findings of this research in a number of different ways. Two research papers can be constructed from the thesis itself, and the author and supervisory team have plans to target these works towards journals which will be most impactful given considerations surrounding the methodological and regional aspects of the research. Firstly, a conceptual and methodological paper will be constructed from the thesis which harnesses the literature review and methodological analysis work, and which will culminate in the outlining of the multi-method holistic approach. This paper will be targeted towards the journal Labour Economics on first instance. Secondly, an empirical paper will be constructed from the thesis which will utilise this approach and outline the results and findings of the quantitative and qualitative work undertaken here. Like the thesis, this work will focus on the regional dimension at play and will be targeted towards the journals Regional Studies and Entrepreneurship and Regional Development. Moreover, upon completion of the degree, the author will present the findings of the research to the project funders.

8.8. Limitations and Future Research

It is important to recognise that despite the holistic approach taken within this study, a number of limitations with this research project remain. Firstly, due to the parameters set for this research of looking specifically at the question of skills gaps in Scotland, this project focuses only on a narrow geography, and the conclusions drawn

are therefore contextually-dependent on the country's set of unique economic and geographic characteristics. Future research could replicate these methods at the UK level and beyond to ascertain the generalisability of these findings where skills gaps and shortages are regularly reported. Secondly, resource constraints meant that simultaneous qualitative and quantitative analysis over an extended period of time could not be achieved. Time-series analysis mixed with consecutive rounds of qualitative insights, monitoring the views of the same set of respondents, would allow for the temporal dynamics to be understood on a much more reliable and ongoing basis. Thirdly, regarding the quantitative analysis more specifically, limitations with the dataset meant that only one dependent variable – that examining firms' views of skill *gaps* – could be utilised. This has implications for the skills *shortage* analysis, and future research should look to ascertain data regarding firms' experiences of external candidates' suitability at the economy-wide, statistical level. Fourthly, at the firm level, qualitative data would have benefitted from a wider selection of firms, and this should be a priority for future regional analyses of skills deficiencies. Fifthly, the issues under investigation are complex and could benefit from better specification with more independent regressors utilised, and – as mentioned in Chapter 5 – perhaps the adoption of multilevel analysis or other insightful techniques.

Lastly, as with previous literature, this study has been unable to overcome data constraints on objective information regarding firms' wage payments, which constitutes a conceptual limitation of this study. This component gets to the very heart of the meaning of a shortage in goods, services, or commodities in a market economy. Future research on skill deficiencies should look to overcome this constraint, although this will not be without resource and modelling challenges. In trying to make sense of the effects of wage fluctuations on reported skill mismatches, researchers will inevitably be forced into a trade-off between the scope and ambition of their subject focus (which will be more limited) and the depth and accuracy of their analysis (which will be greatly strengthened).

8.9. Recommendations

Based upon the above, the following recommendations can be made to policymakers:

1. Large-scale government intervention is not necessary to combat purported economy-wide skills issues, which are too subtle in nature for this approach to work. Skills issues are very specific to individual firms so government intervention in this area should be highly targeted towards helping firms recognise how to help themselves and incentivising training programmes tailored to address the specific sectoral- specific and quantifiable needs of firms.

2. Government should help to support training aimed at diffusing research findings and best practices garnered from the knowledge management literature to managers throughout those sectors where skill deficiencies are persistently reported. This should help to combat skills issues at the firm level where they are best met.

3. Employer engagement with the education system (see the recent example of the Graduate Apprenticeships programme run by Skills Development Scotland) should be greatly strengthened. Employers have much to contribute to aspects of curriculum building, and by way of internships and work experience opportunities. The widest possible rollout of this should be exploited and supported, to the benefit of employees and employers alike over both the short and longer terms. Firms that reported engagement with the education system were also less likely to report skills deficiencies and more likely to invest in their own training to address any issues they were facing. They value education and training accordingly and make it a central part of not only their business but the offer they make to workers.

4. Improve data collection examining potential linkages between skill deficiencies and firm performance as existing data does not capture enough of the nuance in what is a very complex area and problem. This data should be objectively

measured (e.g., by linking with the tax revenue system) and not based on subjective reporting by employers themselves. This would help to illuminate the true economic effects of skill deficiencies.

This research project aimed to investigate the distribution, severity, and determinants of regional skills mismatch in Scotland, with additional focus on the ability of employers to combat any deficiencies. With reports of widespread and persistent imbalances in skills supply and demand being a common feature of the Scottish political and industry landscape, this issue has serious economic and policy implications. This thesis contributes to the literature in two main ways. Firstly, it outlines conceptual and methodological weaknesses with much of the existing (influential) research, and in aiming to overcome these weaknesses, proposes a holistic multi-method approach that can be used to better study and understand these phenomena. Secondly, insofar as data constraints could be overcome, it utilises this multi-method approach to explore the phenomena of skill deficiencies in Scotland. In doing this at the regional (in-country) level, it helps to advance the existing empirical work that has been conducted on geographic skills mismatch. Overall, the evidence uncovered in this research suggests that skills mismatch is a far more subjective and nuanced phenomena than is commonly understood: separating signal from noise in skills imbalance research is no mean feat. Moreover, research findings suggest that mitigation is most effectively met by individual firms, with government action playing a supporting role. In short, there is no "plug-and-play" solution to the problem of skill deficiencies.

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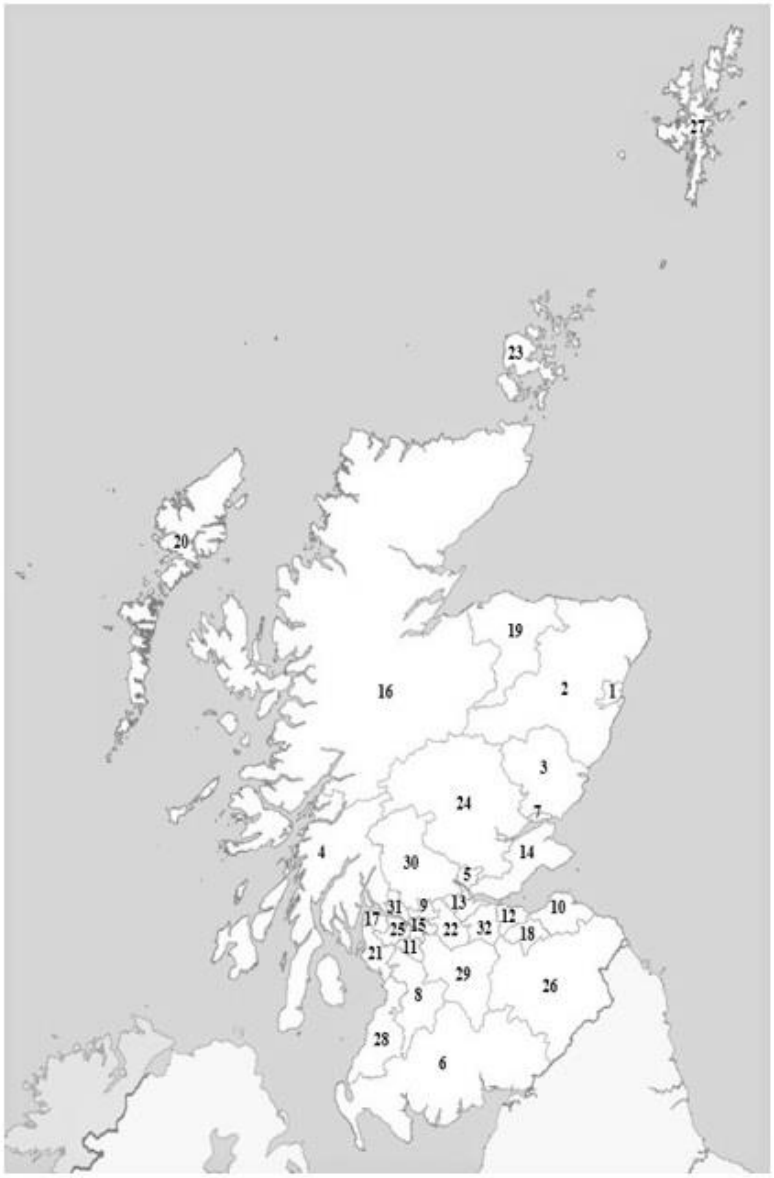
Appendices

APPENDIX A: Geographic breakdown of study

Regional division within this study is closely aligned to the EU's Nomenclature of Territorial Units for Statistics (NUTS) reference standard at NUTS 3 level. These areas roughly correspond to the Local Authority (council areas) of Scotland, of which there are 32 in total, and which form the regional demarcations of this study.

Figure 11: *Scotland's Local Authorities*



1 Aberdeen (City)
2 Aberdeenshire
3 Angus
4 Argyle & Bute
5 Clackmannanshire
6 Dumfries & Galloway
7 Dundee (City)
8 East Ayrshire
9 East Dunbartonshire
10 East Lothian
11 East Renfrewshire
12 Edinburgh (City)
13 Falkirk
14 Fife
15 Glasgow (City)
16 Highland
17 Inverclyde
18 Midlothian
19 Moray
20 Na h-Eileanan Siar
21 North Ayrshire
22 North Lanarkshire
23 Orkney
24 Perth & Kinross
25 Renfrew
26 Scottish Borders
27 Shetland
28 South Ayrshire
29 South Lanarkshire
30 Stirling
31 West Dunbartonshire
32 West Lothian

APPENDIX B: Variable List Codes

Table 19: *Variable List Codes for Correlation Matrices*

Matrix 1		Matrix 2 only (not shown)	
1a	Large Urban Area	3a	Aberdeen City
1b	Other Urban Area	3b	Aberdeenshire
1c	Accessible Small Town	3c	Angus
1d	Remote Small Town	3d	Argyll and Bute
1e	Very Remote Small Town	3e	City of Edinburgh
1f	Accessible Rural	3f	Clackmannanshire
1g	Remote Rural	3g	Dumfries & Galloway
1h	Very Remote Rural	3h	Dundee City
2a	GeoDetached (1=Detached)	3i	East Ayrshire
4a	Does not train	3j	East Dunbartonshire
4b	Trains only on-the-job	3k	East Lothian
4c	Trains only off-the-job	3l	East Renfrewshire
4d	Trains both on and off the job	3m	Eilean Siar
5a	No training plan in place	3n	Falkirk
5b	Training plan in place	3o	Fife
5c	Not sure	3p	Glasgow City
6a	Agriculture, hunting, forestry and fishing	3q	Highland
6b	Mining and quarrying	3r	Inverclyde
6c	Manufacturing	3s	Midlothian
6d	Electricity, gas and water supply	3t	Moray
6e	Construction	3u	North Ayrshire
6f	Wholesale and retail trade	3v	North Lanarkshire
6g	Hotels and restaurants	3w	Orkney Islands
6h	Transport and storage	3x	Perth and Kinross
6i	Information and communications	3y	Renfrewshire
6j	Financial services	3z	Scottish Borders
6k	Real estate, renting and business activities	3aa	Shetland Islands
6l	Public admin. and defence; compulsory social security	3ab	South Ayrshire
6m	Education	3ac	South Lanarkshire
6n	Health and social work	3ad	Stirling
6o	Community, social and personal service activities	3ae	West Dunbartonshire
7a	Primary Sector and Utilities	3af	West Lothian
7b	Manufacturing		
7c	Construction		
7d	Trade, Accommodation and Transport		
7e	Business and Other Services		
7f	Non-Market Services		
8a	Employees (2-4)		
8b	Employees (5-9)		
8c	Employees (10-24)		
8d	Employees (25-49)		
8e	Employees (50-99)		
8f	Employees (100-249)		
8g	Employees (250+)		
9a	Established		
9b	Medium		
9c	Small		
9d	Micro		
10a	SIZE2 (1=Established)		
11a	NoOfSites (1=Multi)		
12a	MAINLY seeking to make a profit		
12b	A charity or voluntary sector organisation or SE		
12c	A local-government financed body		
12d	A central government financed body		
12e	Other		

APPENDIX C: Correlations Matrices

Table 20: *Correlations Matrix 1 (Series 1 Regression Variables)*

	1a	1b	1c	1d	1e	1f	1g
1a	1						
1b	-0.4731*	1					
1c	-0.1870*	-0.1515*	1				
1d	-0.1277*	-0.1035*	-0.0409*	1			
1e	-0.1232*	-0.0998*	-0.0395*	-0.0270*	1		
1f	-0.3060*	-0.2479*	-0.0980*	-0.0669*	-0.0646*	1	
1g	-0.1885*	-0.1527*	-0.0604*	-0.0412*	-0.0398*	-0.0988*	1
1h	-0.1748*	-0.1416*	-0.0560*	-0.0382*	-0.0369*	-0.0916*	-0.0564*
2a	-0.3330*	-0.2697*	-0.1066*	0.3836*	0.3701*	-0.1745*	0.5660*
4a	-0.0585*	-0.0483*	-0.000900	0.00260	0.00560	0.0703*	0.0775*
4b	0.00810	0.0237	0.0192	0.0286*	-0.0194	-0.0363*	-0.0232
4c	-0.0567*	-0.0104	-0.00450	0.0196	0.00520	0.0438*	0.0315*
4d	0.0764*	0.0263*	-0.0113	-0.0370*	0.00730	-0.0554*	-0.0633*
5a	-0.0620*	-0.0829*	-0.0230	-0.0108	-0.00360	0.1067*	0.1119*
5b	0.0524*	0.0885*	0.0160	0.0119	0.00440	-0.1022*	-0.1064*
5c	0.0370*	-0.0240	0.0272*	-0.00460	-0.00330	-0.0155	-0.0195
6a	-0.2264*	-0.1736*	-0.0650*	-0.0461*	-0.0365*	0.3352*	0.2938*
6b	-0.00700	-0.0367*	-0.00880	-0.0126	0.00190	0.0468*	0.0100
6c	-0.0369*	0.0238	0.0169	-0.00520	-0.0111	0.0315*	-0.00180
6d	-0.0186	0.0159	0.000300	-0.0181	0.0121	0.0194	-0.0134
6e	-0.0331*	0.00340	0.0325*	-0.00110	0.0178	0.00950	-0.00790
6f	0.0239	0.0512*	0.0139	0.0239	0.0123	-0.0671*	-0.0350*
6g	0.0645*	-0.0128	-0.00940	-0.0166	0.0152	-0.0625*	-0.0154
6h	-0.0306*	0.00740	0.0120	0.00550	-0.0149	0.0178	0.0110
6i	0.0764*	-0.00190	-0.0272*	-0.0204	-0.0186	-0.0258*	-0.0348*
6j	0.0421*	0.0197	0.00440	0.0205	0.00140	-0.0514*	-0.0450*
6k	0.0906*	0.00630	-0.00460	-0.00230	-0.0169	-0.0628*	-0.0552*
6l	-0.00160	0.0280*	-0.00980	0.0176	0.0525*	-0.0339*	-0.0323*
6m	0.0125	0.00540	-0.00650	0.00800	-0.00260	-0.0286*	-0.0229
6n	0.00580	0.0378*	0.0155	0.0235	0.00330	-0.0485*	-0.0241
6o	0.0139	0.0148	0.0187	0.00730	0.0109	-0.0287*	-0.0451*
7a	-0.2161*	-0.1627*	-0.0618*	-0.0519*	-0.0287*	0.3261*	0.2672*
7b	-0.0369*	0.0238	0.0169	-0.00520	-0.0111	0.0315*	-0.00180
7c	-0.0331*	0.00340	0.0325*	-0.00110	0.0178	0.00950	-0.00790
7d	0.0451*	0.0357*	0.0107	0.0109	0.0121	-0.0841*	-0.0320*
7e	0.1274*	0.0207	-0.00290	0.00210	-0.0141	-0.0965*	-0.1019*
7f	0.0117	0.0428*	0.00490	0.0295*	0.0190	-0.0674*	-0.0440*
8a	-0.1072*	-0.0994*	-0.00780	-0.00840	-0.0312*	0.1538*	0.1393*
8b	-0.0259*	-0.00430	0.0431*	0.0140	0.0153	-0.00350	-0.00980
8c	0.0368*	0.0247	0.00150	0.0165	0.00830	-0.0574*	-0.0416*
8d	0.0519*	0.0376*	-0.0229	-0.0176	0.0130	-0.0511*	-0.0420*
8e	0.0407*	0.0302*	-0.0202	-0.00490	0.00220	-0.0364*	-0.0289*
8f	0.0211	0.0428*	-0.000300	-0.00390	-0.0176	-0.0275*	-0.0404*
8g	0.0294*	0.00550	-0.0107	-0.0112	0.00780	-0.0107	-0.0232
9a	0.0294*	0.00550	-0.0107	-0.0112	0.00780	-0.0107	-0.0232
9b	0.0467*	0.0511*	-0.0170	-0.00650	-0.00880	-0.0471*	-0.0486*
9c	0.0713*	0.0499*	-0.0152	0.00230	0.0170	-0.0895*	-0.0685*
9d	-0.1098*	-0.0855*	0.0292*	0.00460	-0.0131	0.1239*	0.1068*
10a	0.0294*	0.00550	-0.0107	-0.0112	0.00780	-0.0107	-0.0232
11a	0.0990*	0.0966*	0.000800	-0.00440	0.00420	-0.1486*	-0.1011*
12a	-0.0249	-0.0304*	-0.00510	-0.0183	-0.0585*	0.0862*	0.0683*
12b	0.0619*	0.0108	-0.0119	0.00870	0.0130	-0.0645*	-0.0548*
12c	-0.0169	0.0279*	0.0236	0.0185	0.0265*	-0.0404*	-0.0356*
12d	-0.0241	0.00300	0.000200	0.00410	0.0673*	-0.0242	-0.00790

12e	-0.00220	0.0287*	-0.00160	-0.00960	0.00900	-0.0147	-0.0142

Table 20: *Correlations Matrix 1 (cont.)*

	1h	2a	4a	4b	4c	4d	5a
1h	1						
2a	0.5249*	1					
4a	0.0298*	0.0704*	1				
4b	-0.0121	-0.0175	-0.2291*	1			
4c	0.0303*	0.0489*	-0.1786*	-0.1755*	1		
4d	-0.0336*	-0.0734*	-0.4895*	-0.4811*	-0.3749*	1	
5a	0.0544*	0.0970*	0.3446*	-0.000400	0.0948*	-0.3312*	1
5b	-0.0515*	-0.0910*	-0.3541*	-0.00720	-0.0981*	0.3467*	-0.9685*
5c	-0.0103	-0.0219	0.0452*	0.0302*	0.0152	-0.0686*	-0.1048*
6a	0.1436*	0.2356*	0.2057*	-0.0569*	0.0909*	-0.1761*	0.2295*
6b	0.0235	0.0156	0.00320	-0.00140	-0.0210	0.0122	-0.0312*
6c	-0.0212	-0.0209	-0.0180	-0.0217	0.00560	0.0273*	0.00910
6d	-0.00340	-0.0134	-0.00490	-0.00340	0.00280	0.00470	-0.00530
6e	0.0131	0.00990	0.0551*	-0.0405*	0.0787*	-0.0630*	0.0329*
6f	-0.0560*	-0.0396*	0.0113	0.0846*	-0.0152	-0.0644*	0.0127
6g	0.0105	-0.00440	-0.0259*	0.0580*	-0.00350	-0.0225	-0.0257*
6h	0.00660	0.00700	0.0450*	0.00500	0.0365*	-0.0629*	0.0504*
6i	-0.0298*	-0.0568*	0.0372*	0.00470	0.00180	-0.0339*	0.0920*
6j	-0.0252	-0.0338*	0.00460	0.0411*	-0.0276*	-0.0175	-0.0319*
6k	-0.0365*	-0.0650*	-0.0385*	-0.0389*	-0.0288*	0.0790*	-0.0270*
6l	-0.00630	0.00610	-0.0305*	-0.00250	-0.0208	0.0393*	-0.0439*
6m	0.0338*	0.00800	-0.1029*	-0.0411*	-0.0502*	0.1451*	-0.1033*
6n	-0.0244	-0.0179	-0.1056*	-0.0275*	-0.0640*	0.1457*	-0.1475*
6o	-0.000500	-0.0210	-0.0377*	0.0213	-0.00130	0.0139	-0.0370*
7a	0.1364*	0.2152*	0.1877*	-0.0538*	0.0791*	-0.1568*	0.2008*
7b	-0.0212	-0.0209	-0.0180	-0.0217	0.00560	0.0273*	0.00910
7c	0.0131	0.00990	0.0551*	-0.0405*	0.0787*	-0.0630*	0.0329*
7d	-0.0341*	-0.0305*	0.0143	0.1062*	0.00360	-0.0958*	0.0181
7e	-0.0514*	-0.1003*	-0.0317*	0.00320	-0.0329*	0.0438*	-0.0135
7f	-0.000800	-0.00720	-0.1567*	-0.0477*	-0.0884*	0.2172*	-0.1947*
8a	0.0865*	0.1227*	0.3547*	-0.0245	0.0650*	-0.3011*	0.3163*
8b	0.0151	0.0155	0.0246	0.0498*	0.0647*	-0.0999*	0.0821*
8c	-0.0170	-0.0256*	-0.1216*	0.0470*	-0.0178	0.0704*	-0.1012*
8d	-0.0384*	-0.0517*	-0.1368*	-0.0210	-0.0364*	0.1470*	-0.1444*
8e	-0.0401*	-0.0434*	-0.1017*	-0.0424*	-0.0726*	0.1597*	-0.1367*
8f	-0.0321*	-0.0540*	-0.0810*	-0.0447*	-0.0434*	0.1263*	-0.1051*
8g	-0.0207	-0.0286*	-0.0501*	-0.0308*	-0.0265*	0.0804*	-0.0501*
9a	-0.0207	-0.0286*	-0.0501*	-0.0308*	-0.0265*	0.0804*	-0.0501*
9b	-0.0529*	-0.0689*	-0.1339*	-0.0624*	-0.0869*	0.2097*	-0.1776*
9c	-0.0435*	-0.0610*	-0.2104*	0.0277*	-0.0427*	0.1711*	-0.1973*
9d	0.0838*	0.1140*	0.3127*	0.0209	0.1070*	-0.3307*	0.3286*
10a	-0.0207	-0.0286*	-0.0501*	-0.0308*	-0.0265*	0.0804*	-0.0501*
11a	-0.0751*	-0.1089*	-0.1958*	0.0361*	-0.1415*	0.2174*	-0.3259*
12a	-0.0309*	-0.00820	0.1567*	0.0225	0.0792*	-0.1917*	0.1872*
12b	-0.00190	-0.0264*	-0.0919*	-0.0145	-0.0312*	0.1035*	-0.0896*
12c	0.0240	0.0112	-0.0921*	0.0117	-0.0596*	0.1018*	-0.1332*
12d	0.0424*	0.0508*	-0.0715*	-0.0382*	-0.0415*	0.1126*	-0.0773*
12e	-0.0132	-0.0173	0.00900	-0.00500	-0.00360	-0.000800	-0.0246

Table 20: *Correlations Matrix 1 (cont.)*

	5b	5c	6a	6b	6c	6d	6e
5b	1						
5c	-0.1462*	1					
6a	-0.2214*	-0.0277*	1				
6b	0.0245	0.0263*	-0.0224	1			
6c	-0.0134	0.0173	-0.0769*	-0.0194	1		
6d	-0.00380	0.0364*	-0.0323*	-0.00820	-0.0280*	1	
6e	-0.0332*	0.00190	-0.0885*	-0.0224	-0.0766*	-0.0322*	1
6f	-0.00930	-0.0133	-0.1278*	-0.0323*	-0.1107*	-0.0465*	-0.1274*
6g	0.0267*	-0.00480	-0.0973*	-0.0246	-0.0843*	-0.0354*	-0.0970*
6h	-0.0486*	-0.00610	-0.0708*	-0.0179	-0.0614*	-0.0258*	-0.0706*
6i	-0.0898*	-0.00690	-0.0632*	-0.0160	-0.0548*	-0.0230	-0.0630*
6j	0.0239	0.0314*	-0.0589*	-0.0149	-0.0510*	-0.0214	-0.0587*
6k	0.0248	0.00850	-0.1133*	-0.0286*	-0.0982*	-0.0412*	-0.1130*
6l	0.0452*	-0.00610	-0.0391*	-0.00990	-0.0338*	-0.0142	-0.0389*
6m	0.0988*	0.0159	-0.0726*	-0.0183	-0.0629*	-0.0264*	-0.0723*
6n	0.1504*	-0.0146	-0.0984*	-0.0249	-0.0853*	-0.0358*	-0.0981*
6o	0.0381*	-0.00480	-0.0842*	-0.0213	-0.0729*	-0.0306*	-0.0839*
7a	-0.1983*	-0.00580	0.9000*	0.2274*	-0.0854*	0.3273*	-0.0983*
7b	-0.0134	0.0173	-0.0769*	-0.0194	1.0000*	-0.0280*	-0.0766*
7c	-0.0332*	0.00190	-0.0885*	-0.0224	-0.0766*	-0.0322*	1.0000*
7d	-0.0139	-0.0166	-0.1975*	-0.0499*	-0.1712*	-0.0718*	-0.1969*
7e	0.0100	0.0136	-0.1863*	-0.0471*	-0.1614*	-0.0677*	-0.1856*
7f	0.1946*	-0.00390	-0.1355*	-0.0342*	-0.1174*	-0.0493*	-0.1350*
8a	-0.3100*	-0.0187	0.4062*	-0.0115	-0.0706*	0.00130	0.0337*
8b	-0.0860*	0.0174	-0.0405*	0.0102	-0.00690	-0.00260	0.0886*
8c	0.1001*	0.00210	-0.1479*	-0.00910	0.00830	0.00910	-0.0295*
8d	0.1422*	0.00570	-0.1170*	0.0108	0.0284*	-0.00330	-0.0509*
8e	0.1392*	-0.0129	-0.0886*	0.0100	0.0160	-0.0209	-0.0349*
8f	0.1026*	0.00750	-0.0588*	-0.00450	0.0463*	0.000900	-0.0280*
8g	0.0507*	-0.00350	-0.0302*	-0.00890	0.0336*	0.0268*	-0.0249
9a	0.0507*	-0.00350	-0.0302*	-0.00890	0.0336*	0.0268*	-0.0249
9b	0.1782*	-0.00620	-0.1094*	0.00570	0.0414*	-0.0169	-0.0461*
9c	0.1948*	0.00600	-0.2201*	-0.000500	0.0282*	0.00590	-0.0639*
9d	-0.3266*	-0.00110	0.3016*	-0.00110	-0.0639*	-0.00110	0.1009*
10a	0.0507*	-0.00350	-0.0302*	-0.00890	0.0336*	0.0268*	-0.0249
11a	0.3176*	0.0262*	-0.2081*	0.0310*	-0.0143	-0.00910	-0.1692*
12a	-0.1894*	0.0127	0.1469*	0.0227	0.1303*	0.00300	0.1463*
12b	0.0935*	-0.0172	-0.0986*	-0.0259*	-0.0844*	0.00800	-0.0982*
12c	0.1312*	0.00520	-0.0781*	-0.00170	-0.0677*	-0.00320	-0.0729*
12d	0.0814*	-0.0180	-0.0497*	-0.0149	-0.0513*	-0.0215	-0.0558*
12e	0.0146	0.0393*	-0.0172	0.0342*	-0.0149	0.0207	-0.0171

Table 20: *Correlations Matrix 1 (cont.)*

	6f	6g	6h	6i	6j	6k	6l
6f	1						
6g	-0.1401*	1					
6h	-0.1020*	-0.0777*	1				
6i	-0.0910*	-0.0693*	-0.0505*	1			
6j	-0.0848*	-0.0646*	-0.0470*	-0.0419*	1		
6k	-0.1632*	-0.1243*	-0.0905*	-0.0807*	-0.0752*	1	
6l	-0.0562*	-0.0428*	-0.0312*	-0.0278*	-0.0259*	-0.0499*	1
6m	-0.1045*	-0.0796*	-0.0579*	-0.0517*	-0.0482*	-0.0927*	-0.0319*

6n	-0.1417*	-0.1079*	-0.0786*	-0.0701*	-0.0653*	-0.1257*	-0.0433*
6o	-0.1212*	-0.0923*	-0.0672*	-0.0599*	-0.0558*	-0.1075*	-0.0370*
7a	-0.1420*	-0.1081*	-0.0787*	-0.0702*	-0.0654*	-0.1259*	-0.0434*
7b	-0.1107*	-0.0843*	-0.0614*	-0.0548*	-0.0510*	-0.0982*	-0.0338*
7c	-0.1274*	-0.0970*	-0.0706*	-0.0630*	-0.0587*	-0.1130*	-0.0389*
7d	0.6470*	0.4927*	0.3586*	-0.1407*	-0.1311*	-0.2522*	-0.0869*
7e	-0.2682*	-0.2042*	-0.1487*	0.3394*	0.3162*	0.6085*	-0.0820*
7f	-0.1951*	-0.1486*	-0.1081*	-0.0965*	-0.0899*	-0.1730*	0.2884*
8a	-0.0590*	-0.1226*	-0.0229	0.1415*	0.0909*	-0.0476*	-0.0106
8b	0.0250	-0.0511*	0.0836*	0.0129	0.0522*	-0.0160	-0.00440
8c	0.0328*	0.0852*	-0.0208	-0.0513*	-0.0344*	0.0432*	-0.0329*
8d	-0.0106	0.0955*	-0.0198	-0.0498*	-0.0602*	0.00630	-0.00610
8e	-0.00190	0.0282*	-0.0303*	-0.0422*	-0.0492*	0.00560	0.0269*
8f	0.0214	-0.0367*	0.00250	-0.0358*	-0.0323*	0.0163	0.0439*
8g	-0.00800	-0.0244	-0.00310	-0.0252	-0.00860	-0.00690	0.0612*
9a	-0.00800	-0.0244	-0.00310	-0.0252	-0.00860	-0.00690	0.0612*
9b	0.0114	0.00130	-0.0237	-0.0569*	-0.0606*	0.0146	0.0491*
9c	0.0222	0.1473*	-0.0334*	-0.0830*	-0.0752*	0.0441*	-0.0345*
9d	-0.0280*	-0.1433*	0.0501*	0.1274*	0.1180*	-0.0524*	-0.0124
10a	-0.00800	-0.0244	-0.00310	-0.0252	-0.00860	-0.00690	0.0612*
11a	0.1618*	0.0440*	-0.0531*	-0.0758*	0.0404*	0.0109	0.0721*
12a	0.1807*	0.1362*	0.0961*	0.0519*	0.0512*	0.0517*	-0.2186*
12b	-0.1030*	-0.0759*	-0.0675*	-0.0173	-0.0114	-0.00780	-0.0117
12c	-0.1124*	-0.0765*	-0.0533*	-0.0390*	-0.0483*	-0.0692*	0.1700*
12d	-0.0780*	-0.0649*	-0.0280*	-0.0293*	-0.0347*	-0.00510	0.2498*
12e	0.00710	-0.0188	-0.000900	-0.0122	0.0189	-0.0133	0.0595*

Table 20: *Correlations Matrix 1 (cont.)*

	6m	6n	6o	7a	7b	7c	7d
6m	1						
6n	-0.0805*	1					
6o	-0.0688*	-0.0933*	1				
7a	-0.0806*	-0.1094*	-0.0935*	1			
7b	-0.0629*	-0.0853*	-0.0729*	-0.0854*	1		
7c	-0.0723*	-0.0981*	-0.0839*	-0.0983*	-0.0766*	1	
7d	-0.1615*	-0.2191*	-0.1873*	-0.2195*	-0.1712*	-0.1969*	1
7e	-0.1523*	-0.2066*	0.4518*	-0.2070*	-0.1614*	-0.1856*	-0.4145*
7f	0.5357*	0.7266*	-0.1284*	-0.1505*	-0.1174*	-0.1350*	-0.3015*
8a	-0.1165*	-0.1304*	-0.0115	0.3701*	-0.0706*	0.0337*	-0.1362*
8b	-0.0671*	-0.0678*	0.0162	-0.0355*	-0.00690	0.0886*	0.0277*
8c	-0.0352*	0.0618*	0.0397*	-0.1347*	0.00830	-0.0295*	0.0703*
8d	0.1417*	0.0548*	-0.0380*	-0.1058*	0.0284*	-0.0509*	0.0432*
8e	0.0674*	0.0993*	-0.00740	-0.0862*	0.0160	-0.0349*	0.00180
8f	0.0763*	0.0238	-0.0268*	-0.0547*	0.0463*	-0.0280*	-0.00550
8g	0.0510*	0.00820	0.00970	-0.0204	0.0336*	-0.0249	-0.0235
9a	0.0510*	0.00820	0.00970	-0.0204	0.0336*	-0.0249	-0.0235
9b	0.1025*	0.0972*	-0.0224	-0.1050*	0.0414*	-0.0461*	-0.00180
9c	0.0708*	0.0963*	0.00870	-0.1999*	0.0282*	-0.0639*	0.0955*
9d	-0.1514*	-0.1635*	0.00390	0.2759*	-0.0639*	0.1009*	-0.0894*
10a	0.0510*	0.00820	0.00970	-0.0204	0.0336*	-0.0249	-0.0235
11a	0.0808*	0.0908*	-0.0202	-0.1864*	-0.0143	-0.1692*	0.1295*
12a	-0.3522*	-0.3820*	-0.2120*	0.1415*	0.1303*	0.1463*	0.2764*
12b	0.0286*	0.3166*	0.2260*	-0.0941*	-0.0844*	-0.0982*	-0.1627*
12c	0.4533*	0.0994*	0.0680*	-0.0732*	-0.0677*	-0.0729*	-0.1635*
12d	0.1289*	0.1848*	-0.0163	-0.0570*	-0.0513*	-0.0558*	-0.1166*
12e	-0.0140	-0.0191	0.0609*	0.000200	-0.0149	-0.0171	-0.00690

Table 20: *Correlations Matrix 1 (cont.)*

	7e	7f	8a	8b	8c	8d	8e
7e	1						
7f	-0.2843*	1					
8a	0.0605*	-0.1778*	1				
8b	0.0255*	-0.0960*	-0.2652*	1			
8c	0.0173	0.0161	-0.3293*	-0.3297*	1		
8d	-0.0654*	0.1277*	-0.2196*	-0.2198*	-0.2729*	1	
8e	-0.0401*	0.1289*	-0.1530*	-0.1532*	-0.1902*	-0.1268*	1
8f	-0.0333*	0.0803*	-0.1068*	-0.1069*	-0.1327*	-0.0885*	-0.0617*
8g	-0.0145	0.0586*	-0.0612*	-0.0612*	-0.0760*	-0.0507*	-0.0353*
9a	-0.0145	0.0586*	-0.0612*	-0.0612*	-0.0760*	-0.0507*	-0.0353*
9b	-0.0536*	0.1561*	-0.1923*	-0.1925*	-0.2390*	-0.1593*	0.7958*
9c	-0.0317*	0.1075*	-0.4603*	-0.4608*	0.7154*	0.4769*	-0.2659*
9d	0.0710*	-0.2259*	0.6058*	0.6064*	-0.5436*	-0.3624*	-0.2526*
10a	-0.0145	0.0586*	-0.0612*	-0.0612*	-0.0760*	-0.0507*	-0.0353*
11a	-0.0208	0.1457*	-0.2642*	-0.1156*	0.0483*	0.1590*	0.1694*
12a	-0.0401*	-0.5917*	0.1389*	0.0744*	-0.0361*	-0.0861*	-0.0660*
12b	0.1131*	0.2637*	-0.0593*	-0.0252	0.0657*	0.00240	0.00420
12c	-0.0497*	0.4133*	-0.1050*	-0.0571*	-0.0263*	0.1222*	0.0705*
12d	-0.0412*	0.3102*	-0.0660*	-0.0491*	0.00670	0.0306*	0.0362*
12e	0.0281*	-0.00330	-0.00130	0.0128	-0.00510	-0.0246	0.0251

Table 20: *Correlations Matrix 1 (cont.)*

	8f	8g	9a	9b	9c	9d	10a
8f	1						
8g	-0.0246	1					
9a	-0.0246	1.0000*	1				
9b	0.5553*	-0.0444*	-0.0444*	1			
9c	-0.1855*	-0.1063*	-0.1063*	-0.3341*	1		
9d	-0.1762*	-0.1009*	-0.1009*	-0.3174*	-0.7599*	1	
10a	-0.0246	1.0000*	1.0000*	-0.0444*	-0.1063*	-0.1009*	1
11a	0.1199*	0.0438*	0.0438*	0.2139*	0.1596*	-0.3132*	0.0438*
12a	-0.0660*	-0.0701*	-0.0701*	-0.0950*	-0.0955*	0.1759*	-0.0701*
12b	0.00440	0.0143	0.0143	0.00620	0.0618*	-0.0697*	0.0143
12c	0.0611*	0.0208	0.0208	0.0958*	0.0647*	-0.1337*	0.0208
12d	0.0547*	0.1022*	0.1022*	0.0634*	0.0283*	-0.0949*	0.1022*
12e	0.00250	-0.00690	-0.00690	0.0224	-0.0226	0.00940	-0.00690

Table 20: *Correlations Matrix 1 (cont.)*

	11a	12a	12b	12c	12d	12e
11a	1					
12a	-0.1598*	1				
12b	0.0122	-0.6646*	1			
12c	0.1697*	-0.5062*	-0.0902*	1		
12d	0.0994*	-0.3835*	-0.0683*	-0.0521*	1	
12e	0.0150	-0.1114*	-0.0198	-0.0151	-0.0115	1

Table 21: *Correlations Matrix 2 (Series 2 Regression Variables)*

	3a	3b	3c	3d	3e	3f	3g
3a	1						
3b	-0.0613*	1					
3c	-0.0388*	-0.0403*	1				
3d	-0.0386*	-0.0402*	-0.0254*	1			
3e	-0.0802*	-0.0834*	-0.0527*	-0.0525*	1		
3f	-0.0208	-0.0216	-0.0137	-0.0136	-0.0283*	1	
3g	-0.0502*	-0.0522*	-0.0330*	-0.0329*	-0.0682*	-0.0177	1
3h	-0.0369*	-0.0384*	-0.0242	-0.0242	-0.0501*	-0.0130	-0.0314*
3i	-0.0320*	-0.0333*	-0.0210	-0.0210	-0.0435*	-0.0113	-0.0272*
3j	-0.0274*	-0.0285*	-0.0180	-0.0180	-0.0373*	-0.00970	-0.0233
3k	-0.0281*	-0.0293*	-0.0185	-0.0184	-0.0383*	-0.00990	-0.0239
3l	-0.0231	-0.0240	-0.0152	-0.0151	-0.0314*	-0.00810	-0.0196
3m	-0.0210	-0.0219	-0.0138	-0.0138	-0.0286*	-0.00740	-0.0179
3n	-0.0364*	-0.0379*	-0.0240	-0.0239	-0.0496*	-0.0129	-0.0310*
3o	-0.0589*	-0.0612*	-0.0387*	-0.0386*	-0.0800*	-0.0208	-0.0501*
3p	-0.0879*	-0.0914*	-0.0578*	-0.0576*	-0.1195*	-0.0310*	-0.0748*
3q	-0.0607*	-0.0632*	-0.0399*	-0.0398*	-0.0825*	-0.0214	-0.0516*
3r	-0.0271*	-0.0281*	-0.0178	-0.0177	-0.0368*	-0.00950	-0.0230
3s	-0.0288*	-0.0300*	-0.0190	-0.0189	-0.0392*	-0.0102	-0.0245
3t	-0.0353*	-0.0367*	-0.0232	-0.0231	-0.0480*	-0.0125	-0.0300*
3u	-0.0369*	-0.0384*	-0.0242	-0.0242	-0.0501*	-0.0130	-0.0314*
3v	-0.0509*	-0.0529*	-0.0335*	-0.0334*	-0.0692*	-0.0180	-0.0433*
3w	-0.0224	-0.0233	-0.0147	-0.0147	-0.0305*	-0.00790	-0.0191
3x	-0.0463*	-0.0482*	-0.0305*	-0.0304*	-0.0630*	-0.0164	-0.0394*
3y	-0.0433*	-0.0450*	-0.0285*	-0.0284*	-0.0589*	-0.0153	-0.0368*
3z	-0.0433*	-0.0450*	-0.0285*	-0.0284*	-0.0589*	-0.0153	-0.0368*
3aa	-0.0231	-0.0240	-0.0152	-0.0151	-0.0314*	-0.00810	-0.0196
3ab	-0.0386*	-0.0402*	-0.0254*	-0.0253*	-0.0525*	-0.0136	-0.0329*
3ac	-0.0534*	-0.0555*	-0.0351*	-0.0350*	-0.0725*	-0.0188	-0.0454*
3ad	-0.0349*	-0.0363*	-0.0229	-0.0229	-0.0474*	-0.0123	-0.0297*
3ae	-0.0269*	-0.0280*	-0.0177	-0.0176	-0.0365*	-0.00950	-0.0229
3af	-0.0393*	-0.0409*	-0.0258*	-0.0257*	-0.0534*	-0.0139	-0.0334*
4a	-0.0453*	0.0277*	0.0181	0.00500	-0.0215	-0.0115	0.0391*
4b	0.00230	-0.00270	-0.00160	-0.0148	-0.0143	0.00960	-0.0181
4c	0.00350	0.00950	0.0162	0.0199	-0.0228	0.00420	0.0290*
4d	0.0314*	-0.0258*	-0.0235	-0.00540	0.0428*	-0.00120	-0.0355*
5a	-0.0260*	0.0463*	0.0206	0.00420	-0.0226	0.00380	0.0422*
5b	0.0203	-0.0410*	-0.0176	-0.00130	0.0205	-0.00510	-0.0422*
5c	0.0220	-0.0205	-0.0115	-0.0114	0.00790	0.00490	0.00100

Table 21: *Correlations Matrix 2 (cont.)*

	3a	3b	3c	3d	3e	3f	3g
6a	-0.0671*	0.1237*	0.0652*	0.0619*	-0.0983*	-0.0113	0.1555*
6b	0.0686*	0.0369*	0.0164	-0.0120	-0.0174	-0.00650	0.00680
6c	0.0239	0.0386*	0.0204	-0.0234	-0.0346*	0.00200	0.0193
6d	-0.0128	0.0183	-0.0173	0.0127	-0.0358*	0.00890	0.00110
6e	-0.00850	-0.000800	-0.00450	0.00750	-0.0205	0.00310	-0.0154
6f	0.0195	-0.00630	-0.000900	-0.0417*	-0.00790	-0.00450	-0.0286*
6g	-0.00830	-0.0471*	-0.0305*	0.00590	0.0374*	0.0116	-0.0108
6h	0.0129	0.0267*	0.0141	0.00960	-0.0340*	0.00560	0.00290
6i	0.0125	-0.0227	-0.00240	-0.0127	0.0478*	0.0106	-0.0356*
6j	-0.0138	-0.0243	0.00760	-0.00900	0.0371*	-0.0169	0.0163
6k	0.0294*	-0.0289*	-0.0255*	-0.0155	0.0771*	-0.0267*	-0.0308*

6l	0.0242	-0.00610	-0.0127	-0.0126	0.0258*	0.00390	-0.00760
6m	-0.00890	0.00830	-0.0296*	0.0170	-0.00540	-0.00390	-0.0176
6n	-0.000200	-0.0296*	0.0116	0.00840	-0.00260	0.0109	-0.0149
6o	-0.0272*	-0.0420*	-0.00850	0.00810	0.00680	0.0205	-0.0264*
7a	-0.0489*	0.1292*	0.0577*	0.0583*	-0.1074*	-0.00880	0.1447*
7b	0.0239	0.0386*	0.0204	-0.0234	-0.0346*	0.00200	0.0193
7c	-0.00850	-0.000800	-0.00450	0.00750	-0.0205	0.00310	-0.0154
7d	0.0163	-0.0220	-0.0134	-0.0243	0.00110	0.00660	-0.0280*
7e	0.00570	-0.0663*	-0.0217	-0.0163	0.0983*	-0.0102	-0.0473*
7f	0.00270	-0.0204	-0.0133	0.0127	0.00350	0.00760	-0.0251
8a	-0.0504*	0.0603*	0.0381*	0.0257*	-0.0290*	0.0181	0.0602*
8b	-0.0151	-0.0170	0.00920	-0.00330	-0.0169	-0.0107	0.00450
8c	0.00860	-0.0125	-0.0177	0.0158	0.0169	0.00520	-0.00510
8d	0.0326*	-0.0265*	-0.0180	-0.00870	0.0165	-0.0204	-0.0279*
8e	0.0204	0.00670	-0.0124	-0.0277*	-0.00230	-0.0112	-0.0277*
8f	0.0114	-0.0103	-0.00640	-0.0169	0.0127	0.0312*	-0.0176
8g	0.0267*	-0.0181	-0.000800	-0.0189	0.0273*	-0.0102	-0.0245
9a	0.0267*	-0.0181	-0.000800	-0.0189	0.0273*	-0.0102	-0.0245
9b	0.0239	-0.000700	-0.0142	-0.0334*	0.00570	0.00960	-0.0338*
9c	0.0315*	-0.0307*	-0.0293*	0.00810	0.0274*	-0.0100	-0.0249
9d	-0.0540*	0.0357*	0.0391*	0.0185	-0.0379*	0.00610	0.0533*
10a	0.0267*	-0.0181	-0.000800	-0.0189	0.0273*	-0.0102	-0.0245
11a	0.0635*	-0.0340*	-0.0268*	-0.0323*	0.0412*	-0.00280	-0.0440*
12a	0.0284*	0.0248	0.0253*	-0.0327*	-0.0281*	-0.0224	0.0291*
12b	-0.0248	-0.0461*	-0.0273*	0.0147	0.0510*	0.00220	-0.0249
12c	-0.00770	0.0191	-0.0158	0.0192	-0.0139	0.00140	-0.00640
12d	-0.0104	-0.0100	-0.00390	0.0243	-0.00440	0.0340*	-0.0104
12e	-0.00140	0.0219	0.0464*	-0.00920	0.000300	0.0289*	-0.0119

Table 21: *Correlations Matrix 2 (cont.)*

	3h	3i	3j	3k	3l	3m	3n
3a							
3b							
3c							
3d							
3e							
3f							
3g							
3h	1						
3i	-0.0200	1					
3j	-0.0171	-0.0149	1				
3k	-0.0176	-0.0153	-0.0131	1			
3l	-0.0144	-0.0125	-0.0107	-0.0110	1		
3m	-0.0132	-0.0114	-0.00980	-0.0100	-0.00820	1	
3n	-0.0228	-0.0198	-0.0170	-0.0174	-0.0143	-0.0130	1
3o	-0.0368*	-0.0319*	-0.0274*	-0.0281*	-0.0230	-0.0210	-0.0364*
3p	-0.0550*	-0.0477*	-0.0409*	-0.0420*	-0.0344*	-0.0314*	-0.0543*
3q	-0.0380*	-0.0329*	-0.0282*	-0.0290*	-0.0238	-0.0217	-0.0375*
3r	-0.0169	-0.0147	-0.0126	-0.0129	-0.0106	-0.00970	-0.0167
3s	-0.0180	-0.0157	-0.0134	-0.0138	-0.0113	-0.0103	-0.0178
3t	-0.0221	-0.0192	-0.0164	-0.0169	-0.0138	-0.0126	-0.0218
3u	-0.0231	-0.0200	-0.0171	-0.0176	-0.0144	-0.0132	-0.0228
3v	-0.0318*	-0.0276*	-0.0237	-0.0243	-0.0199	-0.0182	-0.0315*
3w	-0.0140	-0.0122	-0.0104	-0.0107	-0.00880	-0.00800	-0.0139
3x	-0.0290*	-0.0251	-0.0215	-0.0221	-0.0181	-0.0165	-0.0286*

3y	-0.0271*	-0.0235	-0.0201	-0.0207	-0.0169	-0.0155	-0.0268*
3z	-0.0271*	-0.0235	-0.0201	-0.0207	-0.0169	-0.0155	-0.0268*
3aa	-0.0144	-0.0125	-0.0107	-0.0110	-0.00900	-0.00820	-0.0143
3ab	-0.0242	-0.0210	-0.0180	-0.0184	-0.0151	-0.0138	-0.0239
3ac	-0.0334*	-0.0290*	-0.0248	-0.0255*	-0.0209	-0.0190	-0.0330*
3ad	-0.0218	-0.0189	-0.0162	-0.0166	-0.0136	-0.0124	-0.0216
3ae	-0.0168	-0.0146	-0.0125	-0.0128	-0.0105	-0.00960	-0.0166
3af	-0.0246	-0.0213	-0.0183	-0.0188	-0.0154	-0.0140	-0.0243
4a	-0.0106	0.0148	-0.0166	-0.000500	-0.000900	0.0221	-0.00620
4b	0.0173	0.00680	0.0155	0.00110	0.0185	0.0285*	0.00450
4c	-0.0218	0.0103	0.00850	0.0195	-0.00270	-0.00240	0
4d	0.00910	-0.0236	-0.00450	-0.0132	-0.0119	-0.0378*	0.00130
5a	-0.0198	0.0255*	-0.0155	0.0183	-0.00400	0.0139	-0.0333*
5b	0.0177	-0.0212	0.0130	-0.0234	0.00340	-0.0111	0.0355*
5c	0.00790	-0.0166	0.00980	0.0205	0.00230	-0.0109	-0.00980

Table 21: *Correlations Matrix 2 (cont.)*

	3h	3i	3j	3k	3l	3m	3n
6a	-0.0452*	0.0309*	-0.0336*	0.0237	-0.0154	-0.0188	-0.0323*
6b	-0.0114	-0.00990	-0.00850	-0.00870	-0.00720	0.0449*	-0.0113
6c	-0.00230	-0.0182	0.00770	0.00600	-0.0100	-0.0144	-0.0108
6d	-0.00600	-0.0143	0.00160	0.00100	0.0226	0.00860	0.0154
6e	0.00810	-0.0110	0.00460	0.0187	-0.00890	0.00250	0.000900
6f	0.00880	0.0106	-0.00330	-0.0137	-0.00190	-0.00530	0.0228
6g	0.0109	-0.00400	0.0235	-0.0182	0.0166	0.0108	-0.00320
6h	-0.0212	0.00280	-0.0269*	0.0239	0.00870	0.0136	0.0145
6i	0.0118	-0.00910	0.0126	-0.0175	-0.0115	-0.00890	-0.00960
6j	-0.00650	0.000800	-0.00670	-0.00770	-0.00950	0.0132	0.00590
6k	0.00270	-0.0232	-0.0251	0.00820	0.00620	0.00180	-0.00280
6l	0.0147	0.00260	-0.00330	-0.00400	-0.0125	0.0633*	0.0329*
6m	-0.00300	0.00690	0.0242	0.00330	-0.000200	0.00400	0.00270
6n	0.0210	0.0123	0.0126	-0.00910	-0.0137	-0.0222	-0.0155
6o	0.00410	0.00680	0.0192	-0.0106	0.0337*	-0.0171	0.00510
7a	-0.0465*	0.0207	-0.0324*	0.0199	-0.00790	-0.00290	-0.0270*
7b	-0.00230	-0.0182	0.00770	0.00600	-0.0100	-0.0144	-0.0108
7c	0.00810	-0.0110	0.00460	0.0187	-0.00890	0.00250	0.000900
7d	0.00360	0.00710	-0.000700	-0.0108	0.0134	0.00940	0.0230
7e	0.00690	-0.0169	-0.00450	-0.0112	0.0150	-0.00710	-0.000900
7f	0.0198	0.0148	0.0236	-0.00660	-0.0152	0.00660	0.000600
8a	-0.00410	0.00130	-0.0143	0.0258*	0.0160	-0.00200	-0.0218
8b	-0.0152	0.0232	0.00390	0.0150	0.0202	0.0168	-0.0164
8c	-0.00620	-0.00820	-0.0133	-0.0167	-0.00650	0.00390	0.0133
8d	0.0157	-0.0243	0.0218	-0.0213	-0.0210	-0.0103	0.0110
8e	0.0284*	0.00300	-0.00640	-0.00260	-0.00250	-0.0187	0.00500
8f	-0.0147	-0.00160	0.0289*	-0.00950	-0.0109	0.00140	0.0199
8g	0.00100	0.0171	-0.0134	0.0110	-0.0113	0.00610	0.00140
9a	0.00100	0.0171	-0.0134	0.0110	-0.0113	0.00610	0.00140
9b	0.0148	0.00150	0.0122	-0.00790	-0.00870	-0.0148	0.0162
9c	0.00580	-0.0252	0.00370	-0.0308*	-0.0212	-0.00390	0.0202
9d	-0.0159	0.0203	-0.00860	0.0337*	0.0298*	0.0122	-0.0315*
10a	0.00100	0.0171	-0.0134	0.0110	-0.0113	0.00610	0.00140
11a	0.0201	-0.0191	-0.00230	-0.0280*	-0.0367*	-0.0238	0.0371*
12a	-0.0307*	-0.00380	-0.00700	0.0103	0.0147	-0.0212	0.00590
12b	0.0239	0.00450	0.00460	0.00720	-0.00410	0.0140	-0.0150
12c	0.00570	-0.00320	0.0189	-0.0127	-0.0106	0.00870	0.0159

12d	0.0166	0.00730	-0.0147	-0.0154	-0.00970	0.0130	-0.0121
12e	0.0107	-0.00760	-0.00650	-0.00670	-0.00550	-0.00500	0.0110

Table 21: *Correlations Matrix 2 (cont.)*

	3o	3p	3q	3r	3s	3t	3u
3a							
3b							
3c							
3d							
3e							
3f							
3g							
3h							
3i							
3j							
3k							
3l							
3m							
3n							
3o	1						
3p	-0.0877*	1					
3q	-0.0606*	-0.0905*	1				
3r	-0.0270*	-0.0403*	-0.0279*	1			
3s	-0.0288*	-0.0430*	-0.0297*	-0.0132	1		
3t	-0.0353*	-0.0526*	-0.0364*	-0.0162	-0.0173	1	
3u	-0.0368*	-0.0550*	-0.0380*	-0.0169	-0.0180	-0.0221	1
3v	-0.0508*	-0.0759*	-0.0524*	-0.0234	-0.0249	-0.0305*	-0.0318*
3w	-0.0224	-0.0334*	-0.0231	-0.0103	-0.0110	-0.0134	-0.0140
3x	-0.0463*	-0.0691*	-0.0477*	-0.0213	-0.0227	-0.0277*	-0.0290*
3y	-0.0432*	-0.0645*	-0.0446*	-0.0199	-0.0212	-0.0259*	-0.0271*
3z	-0.0432*	-0.0645*	-0.0446*	-0.0199	-0.0212	-0.0259*	-0.0271*
3aa	-0.0230	-0.0344*	-0.0238	-0.0106	-0.0113	-0.0138	-0.0144
3ab	-0.0386*	-0.0576*	-0.0398*	-0.0177	-0.0189	-0.0231	-0.0242
3ac	-0.0533*	-0.0795*	-0.0549*	-0.0245	-0.0261*	-0.0320*	-0.0334*
3ad	-0.0348*	-0.0520*	-0.0359*	-0.0160	-0.0171	-0.0209	-0.0218
3ae	-0.0268*	-0.0400*	-0.0277*	-0.0123	-0.0131	-0.0161	-0.0168
3af	-0.0392*	-0.0586*	-0.0405*	-0.0180	-0.0192	-0.0235	-0.0246
4a	-0.00800	-0.0333*	0.0178	-0.0153	0.0185	-0.00190	-0.0163
4b	0.00640	0.00210	-0.00220	0.0249	0.00210	0.000100	-0.00570
4c	0.0127	-0.0367*	0.0180	-0.00420	0.0169	-0.000100	-0.00120
4d	-0.00700	0.0484*	-0.0239	-0.00450	-0.0271*	0.00150	0.0180
5a	-0.00630	-0.0268*	0.0136	-0.0347*	0.00740	-0.000500	0.00520
5b	0.00360	0.0255*	-0.0157	0.0349*	-0.00650	0.000400	-0.00260
5c	0.0104	0.00470	0.00840	-0.00190	-0.00350	0.000500	-0.0101

Table 21: *Correlations Matrix 2 (cont.)*

6a	0.0124	-0.1078*	0.0542*	-0.0277*	-0.0147	0.0162	-0.0208
6b	-0.0182	-0.0203	0.0188	-0.00840	-0.00890	0.00460	-0.0114
6c	0.00620	-0.0442*	-0.00630	-0.0101	0.0278*	0.00570	0.0300*
6d	-0.0195	0.00430	-0.0205	0.00200	-0.0129	0.0168	0.00440
6e	-0.00570	-0.0354*	0.0238	-0.0276*	0.0373*	0.00370	-0.0124
6f	0.0358*	-0.00520	-0.0159	-0.0187	0.0193	-0.00140	-0.00970
6g	-0.0277*	0.0519*	0.0114	0.00440	-0.0196	-0.000200	0.0147

6h	0.0131	-0.0424*	0	-0.00640	-0.0220	-0.00360	0.00360
6i	-0.00870	0.0584*	-0.0114	-0.00140	-0.0113	-0.0194	-0.0157
6j	-0.00610	0.0264*	-0.0235	0.00960	-0.00860	-0.00430	-0.0124
6k	-0.00950	0.0602*	-0.0337*	0.00290	0.0144	-0.0133	0.00610
6l	-0.00930	-0.0274*	0.0219	0.00880	-0.0156	0.00800	-0.0112
6m	0.000700	0.0109	-0.00580	0.0252*	-0.0105	0	0.00190
6n	0.00250	0.0177	0.0120	0.0137	-0.0155	0.0183	0.00980
6o	-0.00490	0.0224	-0.0141	0.0433*	0.00430	-0.0188	0.00830
7a	-0.000200	-0.1025*	0.0471*	-0.0268*	-0.0204	0.0221	-0.0203
7b	0.00620	-0.0442*	-0.00630	-0.0101	0.0278*	0.00570	0.0300*
7c	-0.00570	-0.0354*	0.0238	-0.0276*	0.0373*	0.00370	-0.0124
7d	0.0168	0.00850	-0.00520	-0.0150	-0.00810	-0.00300	0.00360
7e	-0.0163	0.0951*	-0.0482*	0.0308*	0.00440	-0.0314*	-0.00300
7f	-0.000800	0.0113	0.0134	0.0293*	-0.0240	0.0172	0.00500
8a	-0.0145	-0.0590*	0.0496*	-0.0240	-0.0125	-0.0120	-0.0150
8b	0.00840	-0.0173	0.00960	-0.0130	0.0222	-0.000600	-0.00420
8c	0.00750	0.0319*	-0.0266*	0.00170	0.0112	0.0274*	0.00860
8d	-0.00110	0.0293*	-0.0169	0.00670	-0.0272*	-0.00400	0.0126
8e	-0.0217	0.0156	0.000500	0.0275*	0.00610	-0.00490	0.00390
8f	0.0188	0.0134	-0.0235	0.0223	0.00380	-0.0243	-0.0147
8g	0.0144	-0.00760	-0.0117	-0.000400	-0.0141	0.00260	0.0105
9a	0.0144	-0.00760	-0.0117	-0.000400	-0.0141	0.00260	0.0105
9b	-0.00670	0.0212	-0.0139	0.0365*	0.00740	-0.0188	-0.00560
9c	0.00600	0.0504*	-0.0365*	0.00640	-0.00950	0.0221	0.0170
9d	-0.00500	-0.0630*	0.0488*	-0.0306*	0.00800	-0.0104	-0.0159
10a	0.0144	-0.00760	-0.0117	-0.000400	-0.0141	0.00260	0.0105
11a	0.00340	0.0426*	-0.0114	0.0216	-0.0242	0.0261*	-0.00450
12a	0.0227	-0.0320*	-0.0137	-0.0603*	0.00610	-0.00160	-0.000700
12b	-0.0105	0.0606*	-0.0105	0.0448*	0.00970	-0.00470	-0.00870
12c	-0.00750	-0.0147	-0.0138	0.0199	-0.0196	0.00930	0.0239
12d	-0.0178	-0.00950	0.0609*	0.0173	-0.00140	0.00160	-0.0126
12e	-0.0140	-0.00290	0.0101	0.0460*	-0.00690	-0.00840	-0.00880

Table 21: *Correlations Matrix 2 (cont.)*

	3v	3w	3x	3y	3z	3aa	3ab
3v	1						
3w	-0.0194	1					
3x	-0.0400*	-0.0176	1				
3y	-0.0374*	-0.0165	-0.0340*	1			
3z	-0.0374*	-0.0165	-0.0340*	-0.0318*	1		
3aa	-0.0199	-0.00880	-0.0181	-0.0169	-0.0169	1	
3ab	-0.0334*	-0.0147	-0.0304*	-0.0284*	-0.0284*	-0.0151	1
3ac	-0.0461*	-0.0203	-0.0419*	-0.0392*	-0.0392*	-0.0209	-0.0350*
3ad	-0.0301*	-0.0133	-0.0274*	-0.0256*	-0.0256*	-0.0136	-0.0229
3ae	-0.0232	-0.0102	-0.0211	-0.0197	-0.0197	-0.0105	-0.0176
3af	-0.0339*	-0.0149	-0.0309*	-0.0289*	-0.0289*	-0.0154	-0.0257*
4a	-0.00220	0.0340*	0.0136	0.00200	0.0265*	-0.00540	0.00500
4b	0.00710	-0.0204	0.00940	-0.000400	-0.00290	-0.0133	-0.0176
4c	-0.0116	-0.000800	0.00140	-0.0306*	0.00480	0.0135	-0.00630
4d	0.00370	-0.0103	-0.0188	0.0186	-0.0216	0.00570	0.0138
5a	-0.0203	0.0593*	0.00760	-0.00240	0.0366*	-0.0112	0.00860
5b	0.0151	-0.0560*	-0.00330	0.00410	-0.0308*	0.0141	-0.00570
5c	0.0203	-0.0116	-0.0167	-0.00690	-0.0224	-0.0120	-0.0114
6a	-0.0534*	0.0717*	0.0517*	-0.0531*	0.0940*	-0.00260	0.0345*
6b	-0.0158	0.0172	-0.0144	-0.0134	0.0122	-0.00720	-0.0120
6c	0.0311*	-0.00890	-0.0121	-0.00640	0.00150	0.00460	-0.0234
6d	0.000400	-0.0100	0.0130	0.0165	-0.00140	0.00610	0.00270

6e	0.0255*	-0.00750	0.0324*	-0.000200	0.0103	0.0105	-0.000300
6f	0.00120	-0.00460	-0.00240	0.0161	-0.00770	-0.0165	0.0231
6g	0.0154	-0.0118	-0.00750	0.00670	-0.0323*	-0.0191	-0.00860
6h	0.0308*	0.0102	-0.00940	0.0428*	0.000200	-0.00700	-0.00460
6i	-0.0120	-0.0107	-0.0183	-0.00480	-0.000100	-0.0202	-0.0180
6j	0.0280*	-0.00870	-0.0141	0	-0.0151	-0.000300	-0.0258*
6k	-0.00770	-0.0188	-0.00760	-0.0101	-0.0303*	-0.00440	-0.0188
6l	-0.0211	0.00190	-0.0111	-0.0159	-0.0159	0.0148	0.00400
6m	-0.00440	-0.00670	-0.0112	0.0149	-0.0142	0.0151	-0.0155
6n	-0.0222	-0.0244	-0.00560	-0.00420	0.0119	0.0336*	0.00840
6o	-0.00240	0.0224	-0.00230	0.00830	-0.0101	0.000100	0.0285*
7a	-0.0528*	0.0665*	0.0485*	-0.0462*	0.0888*	-0.00200	0.0297*
7b	0.0311*	-0.00890	-0.0121	-0.00640	0.00150	0.00460	-0.0234
7c	0.0255*	-0.00750	0.0324*	-0.000200	0.0103	0.0105	-0.000300
7d	0.0259*	-0.00620	-0.0112	0.0379*	-0.0266*	-0.0286*	0.0104
7e	-0.000700	-0.00940	-0.0212	-0.00480	-0.0347*	-0.0124	-0.0163
7f	-0.0274*	-0.0228	-0.0151	0.000300	-0.00480	0.0409*	-0.00150
8a	-0.0410*	0.0504*	0.0212	-0.0164	0.0566*	-0.0273*	0.0126
8b	0.0278*	-0.00310	0.00120	0.00700	0.0211	0.0159	0.00190
8c	-0.0214	0.000700	0.0147	-0.000100	-0.0254*	0.00510	-0.0242
8d	0.00660	-0.0243	-0.0215	-0.00700	-0.0229	0.00820	0.00310
8e	0.0314*	-0.0208	-0.0172	0.0172	-0.0249	0.00400	0.0192
8f	0.00220	-0.0192	-0.0170	0.0112	-0.0177	-0.0197	-0.00620
8g	0.0314*	-0.0110	0.000400	-0.00480	-0.0130	0.0188	-0.000700
9a	0.0314*	-0.0110	0.000400	-0.00480	-0.0130	0.0188	-0.000700
9b	0.0274*	-0.0290*	-0.0246	0.0211	-0.0315*	-0.00870	0.0122
9c	-0.0147	-0.0170	-0.00220	-0.00510	-0.0399*	0.0106	-0.0198
9d	-0.0108	0.0390*	0.0185	-0.00770	0.0642*	-0.00940	0.0120
10a	0.0314*	-0.0110	0.000400	-0.00480	-0.0130	0.0188	-0.000700
11a	0.0190	-0.0580*	-0.0302*	0.0124	-0.0375*	-0.00500	-0.00450
12a	0.0317*	-0.00540	0.0261*	0.0196	0.00550	-0.0542*	-0.00130
12b	-0.0319*	-0.00240	0.00450	-0.0209	-0.00530	0.00730	0.00420
12c	0.00900	0.0127	-0.0353*	0.0158	0.000200	0.0181	-0.00250
12d	-0.0287*	0.000600	-0.0143	-0.0254*	-0.000300	0.0732*	0.00190
12e	0.00230	-0.00530	-0.0110	-0.0103	-0.0103	0.0251	-0.00920

Table 21: *Correlations Matrix 2 (cont.)*

	3ac	3ad	3ae	3af	4a	4b	4c
3ac	1						
3ad	-0.0316*	1					
3ae	-0.0243	-0.0159	1				
3af	-0.0356*	-0.0232	-0.0179	1			
4a	0.0150	-0.0122	-0.00310	-0.00300	1		
4b	0.00390	0.00180	0.0101	-0.0198	-0.2291*	1	
4c	-0.00840	-0.00240	0.00100	0.0177	-0.1786*	-0.1755*	1
4d	-0.00930	0.00980	-0.00610	0.00620	-0.4895*	-0.4811*	-0.3749*
5a	-0.0127	-0.0120	-0.0121	-0.0109	0.3446*	-0.000400	0.0948*
5b	0.00840	0.00930	0.00940	0.0138	-0.3541*	-0.00720	-0.0981*
5c	0.0170	0.0105	0.0106	-0.0119	0.0452*	0.0302*	0.0152
6a	-0.0221	-0.0127	-0.0274*	-0.0405*	0.2057*	-0.0569*	0.0909*
6b	0.00460	0.00490	-0.00830	-0.0122	0.00320	-0.00140	-0.0210
6c	0.0151	-0.0176	-0.00350	0.0277*	-0.0180	-0.0217	0.00560
6d	0.0205	0.0174	0.00220	0.00210	-0.00490	-0.00340	0.00280
6e	0.00720	0.00480	-0.0217	0.0174	0.0551*	-0.0405*	0.0787*
6f	0.00610	-0.00640	0.00270	0.0234	0.0113	0.0846*	-0.0152
6g	-0.0129	0.0129	0.0203	-0.0279*	-0.0259*	0.0580*	-0.00350
6h	-0.0136	-0.0185	0.000600	0.0175	0.0450*	0.00500	0.0365*
6i	0.000100	-0.0189	0.00640	0.0433*	0.0372*	0.00470	0.00180
6j	0.0147	0.00870	0.00200	-0.00990	0.00460	0.0411*	-0.0276*

6k	-0.00270	-0.00500	0.00350	0.0112	-0.0385*	-0.0389*	-0.0288*
6l	-0.0104	0.00860	0.00900	-0.00490	-0.0305*	-0.00250	-0.0208
6m	-0.00200	0.0418*	-0.000600	-0.0120	-0.1029*	-0.0411*	-0.0502*
6n	-0.00630	-0.00400	0.00410	-0.0147	-0.1056*	-0.0275*	-0.0640*
6o	0.0165	0.00440	0.00930	-0.0256*	-0.0377*	0.0213	-0.00130
7a	-0.0118	-0.00410	-0.0265*	-0.0395*	0.1877*	-0.0538*	0.0791*
7b	0.0151	-0.0176	-0.00350	0.0277*	-0.0180	-0.0217	0.00560
7c	0.00720	0.00480	-0.0217	0.0174	0.0551*	-0.0405*	0.0787*
7d	-0.0101	-0.00580	0.0155	0.00910	0.0143	0.1062*	0.00360
7e	0.0138	-0.00600	0.0118	0.00870	-0.0317*	0.00320	-0.0329*
7f	-0.00970	0.0253*	0.00600	-0.0206	-0.1567*	-0.0477*	-0.0884*
8a	-0.00430	-0.00160	-0.0123	-0.0136	0.3547*	-0.0245	0.0650*
8b	-0.000600	-0.00750	-0.0123	-0.00600	0.0246	0.0498*	0.0647*
8c	-0.0170	-0.0167	0.0160	0.00990	-0.1216*	0.0470*	-0.0178
8d	0.0180	0.0333*	0.0200	0.00960	-0.1368*	-0.0210	-0.0364*
8e	-0.00740	0.00470	-0.0107	-0.00190	-0.1017*	-0.0424*	-0.0726*
8f	0.0299*	-0.000200	-0.0153	0.0140	-0.0810*	-0.0447*	-0.0434*
8g	-0.00590	-0.0171	0.0127	-0.0192	-0.0501*	-0.0308*	-0.0265*
9a	-0.00590	-0.0171	0.0127	-0.0192	-0.0501*	-0.0308*	-0.0265*
9b	0.0120	0.00380	-0.0182	0.00690	-0.1339*	-0.0624*	-0.0869*
9c	-0.00250	0.00900	0.0292*	0.0160	-0.2104*	0.0277*	-0.0427*
9d	-0.00410	-0.00750	-0.0203	-0.0161	0.3127*	0.0209	0.1070*
10a	-0.00590	-0.0171	0.0127	-0.0192	-0.0501*	-0.0308*	-0.0265*
11a	0.00660	-0.00330	0.00800	-0.00730	-0.1958*	0.0361*	-0.1415*
12a	0.0247	-0.0237	-0.0281*	0.0220	0.1567*	0.0225	0.0792*
12b	-0.0242	-0.00350	0.0161	-0.0113	-0.0919*	-0.0145	-0.0312*
12c	-0.00280	0.0200	0.0266*	-0.0124	-0.0921*	0.0117	-0.0596*
12d	-0.00640	0.0331*	0.00180	-0.0101	-0.0715*	-0.0382*	-0.0415*
12e	-0.0127	-0.00830	-0.00640	-0.00930	0.00900	-0.00500	-0.00360

Table 21: *Correlations Matrix 2 (cont.)*

	4d	5a	5b	5c	6a	6b	6c
4d	1						
5a	-0.3312*	1					
5b	0.3467*	-0.9685*	1				
5c	-0.0686*	-0.1048*	-0.1462*	1			
6a	-0.1761*	0.2295*	-0.2214*	-0.0277*	1		
6b	0.0122	-0.0312*	0.0245	0.0263*	-0.0224	1	
6c	0.0273*	0.00910	-0.0134	0.0173	-0.0769*	-0.0194	1
6d	0.00470	-0.00530	-0.00380	0.0364*	-0.0323*	-0.00820	-0.0280*
6e	-0.0630*	0.0329*	-0.0332*	0.00190	-0.0885*	-0.0224	-0.0766*
6f	-0.0644*	0.0127	-0.00930	-0.0133	-0.1278*	-0.0323*	-0.1107*
6g	-0.0225	-0.0257*	0.0267*	-0.00480	-0.0973*	-0.0246	-0.0843*
6h	-0.0629*	0.0504*	-0.0486*	-0.00610	-0.0708*	-0.0179	-0.0614*
6i	-0.0339*	0.0920*	-0.0898*	-0.00690	-0.0632*	-0.0160	-0.0548*
6j	-0.0175	-0.0319*	0.0239	0.0314*	-0.0589*	-0.0149	-0.0510*
6k	0.0790*	-0.0270*	0.0248	0.00850	-0.1133*	-0.0286*	-0.0982*
6l	0.0393*	-0.0439*	0.0452*	-0.00610	-0.0391*	-0.00990	-0.0338*
6m	0.1451*	-0.1033*	0.0988*	0.0159	-0.0726*	-0.0183	-0.0629*
6n	0.1457*	-0.1475*	0.1504*	-0.0146	-0.0984*	-0.0249	-0.0853*
6o	0.0139	-0.0370*	0.0381*	-0.00480	-0.0842*	-0.0213	-0.0729*
7a	-0.1568*	0.2008*	-0.1983*	-0.00580	0.9000*	0.2274*	-0.0854*
7b	0.0273*	0.00910	-0.0134	0.0173	-0.0769*	-0.0194	1.0000*
7c	-0.0630*	0.0329*	-0.0332*	0.00190	-0.0885*	-0.0224	-0.0766*
7d	-0.0958*	0.0181	-0.0139	-0.0166	-0.1975*	-0.0499*	-0.1712*

7e	0.0438*	-0.0135	0.0100	0.0136	-0.1863*	-0.0471*	-0.1614*
7f	0.2172*	-0.1947*	0.1946*	-0.00390	-0.1355*	-0.0342*	-0.1174*
8a	-0.3011*	0.3163*	-0.3100*	-0.0187	0.4062*	-0.0115	-0.0706*
8b	-0.0999*	0.0821*	-0.0860*	0.0174	-0.0405*	0.0102	-0.00690
8c	0.0704*	-0.1012*	0.1001*	0.00210	-0.1479*	-0.00910	0.00830
8d	0.1470*	-0.1444*	0.1422*	0.00570	-0.1170*	0.0108	0.0284*
8e	0.1597*	-0.1367*	0.1392*	-0.0129	-0.0886*	0.0100	0.0160
8f	0.1263*	-0.1051*	0.1026*	0.00750	-0.0588*	-0.00450	0.0463*
8g	0.0804*	-0.0501*	0.0507*	-0.00350	-0.0302*	-0.00890	0.0336*
9a	0.0804*	-0.0501*	0.0507*	-0.00350	-0.0302*	-0.00890	0.0336*
9b	0.2097*	-0.1776*	0.1782*	-0.00620	-0.1094*	0.00570	0.0414*
9c	0.1711*	-0.1973*	0.1948*	0.00600	-0.2201*	-0.000500	0.0282*
9d	-0.3307*	0.3286*	-0.3266*	-0.00110	0.3016*	-0.00110	-0.0639*
10a	0.0804*	-0.0501*	0.0507*	-0.00350	-0.0302*	-0.00890	0.0336*
11a	0.2174*	-0.3259*	0.3176*	0.0262*	-0.2081*	0.0310*	-0.0143
12a	-0.1917*	0.1872*	-0.1894*	0.0127	0.1469*	0.0227	0.1303*
12b	0.1035*	-0.0896*	0.0935*	-0.0172	-0.0986*	-0.0259*	-0.0844*
12c	0.1018*	-0.1332*	0.1312*	0.00520	-0.0781*	-0.00170	-0.0677*
12d	0.1126*	-0.0773*	0.0814*	-0.0180	-0.0497*	-0.0149	-0.0513*
12e	-0.000800	-0.0246	0.0146	0.0393*	-0.0172	0.0342*	-0.0149

Table 21: *Correlations Matrix 2 (cont.)*

	6d	6e	6f	6g	6h	6i	6j
6d	1						
6e	-0.0322*	1					
6f	-0.0465*	-0.1274*	1				
6g	-0.0354*	-0.0970*	-0.1401*	1			
6h	-0.0258*	-0.0706*	-0.1020*	-0.0777*	1		
6i	-0.0230	-0.0630*	-0.0910*	-0.0693*	-0.0505*	1	
6j	-0.0214	-0.0587*	-0.0848*	-0.0646*	-0.0470*	-0.0419*	1
6k	-0.0412*	-0.1130*	-0.1632*	-0.1243*	-0.0905*	-0.0807*	-0.0752*
6l	-0.0142	-0.0389*	-0.0562*	-0.0428*	-0.0312*	-0.0278*	-0.0259*
6m	-0.0264*	-0.0723*	-0.1045*	-0.0796*	-0.0579*	-0.0517*	-0.0482*
6n	-0.0358*	-0.0981*	-0.1417*	-0.1079*	-0.0786*	-0.0701*	-0.0653*
6o	-0.0306*	-0.0839*	-0.1212*	-0.0923*	-0.0672*	-0.0599*	-0.0558*
7a	0.3273*	-0.0983*	-0.1420*	-0.1081*	-0.0787*	-0.0702*	-0.0654*
7b	-0.0280*	-0.0766*	-0.1107*	-0.0843*	-0.0614*	-0.0548*	-0.0510*
7c	-0.0322*	1.0000*	-0.1274*	-0.0970*	-0.0706*	-0.0630*	-0.0587*
7d	-0.0718*	-0.1969*	0.6470*	0.4927*	0.3586*	-0.1407*	-0.1311*
7e	-0.0677*	-0.1856*	-0.2682*	-0.2042*	-0.1487*	0.3394*	0.3162*
7f	-0.0493*	-0.1350*	-0.1951*	-0.1486*	-0.1081*	-0.0965*	-0.0899*
8a	0.00130	0.0337*	-0.0590*	-0.1226*	-0.0229	0.1415*	0.0909*
8b	-0.00260	0.0886*	0.0250	-0.0511*	0.0836*	0.0129	0.0522*
8c	0.00910	-0.0295*	0.0328*	0.0852*	-0.0208	-0.0513*	-0.0344*
8d	-0.00330	-0.0509*	-0.0106	0.0955*	-0.0198	-0.0498*	-0.0602*
8e	-0.0209	-0.0349*	-0.00190	0.0282*	-0.0303*	-0.0422*	-0.0492*
8f	0.000900	-0.0280*	0.0214	-0.0367*	0.00250	-0.0358*	-0.0323*
8g	0.0268*	-0.0249	-0.00800	-0.0244	-0.00310	-0.0252	-0.00860
9a	0.0268*	-0.0249	-0.00800	-0.0244	-0.00310	-0.0252	-0.00860
9b	-0.0169	-0.0461*	0.0114	0.00130	-0.0237	-0.0569*	-0.0606*
9c	0.00590	-0.0639*	0.0222	0.1473*	-0.0334*	-0.0830*	-0.0752*
9d	-0.00110	0.1009*	-0.0280*	-0.1433*	0.0501*	0.1274*	0.1180*
10a	0.0268*	-0.0249	-0.00800	-0.0244	-0.00310	-0.0252	-0.00860
11a	-0.00910	-0.1692*	0.1618*	0.0440*	-0.0531*	-0.0758*	0.0404*

12a	0.00300	0.1463*	0.1807*	0.1362*	0.0961*	0.0519*	0.0512*
12b	0.00800	-0.0982*	-0.1030*	-0.0759*	-0.0675*	-0.0173	-0.0114
12c	-0.00320	-0.0729*	-0.1124*	-0.0765*	-0.0533*	-0.0390*	-0.0483*
12d	-0.0215	-0.0558*	-0.0780*	-0.0649*	-0.0280*	-0.0293*	-0.0347*
12e	0.0207	-0.0171	0.00710	-0.0188	-0.000900	-0.0122	0.0189

Table 21: *Correlations Matrix 2 (cont.)*

	6k	6l	6m	6n	6o	7a	7b
6k	1						
6l	-0.0499*	1					
6m	-0.0927*	-0.0319*	1				
6n	-0.1257*	-0.0433*	-0.0805*	1			
6o	-0.1075*	-0.0370*	-0.0688*	-0.0933*	1		
7a	-0.1259*	-0.0434*	-0.0806*	-0.1094*	-0.0935*	1	
7b	-0.0982*	-0.0338*	-0.0629*	-0.0853*	-0.0729*	-0.0854*	1
7c	-0.1130*	-0.0389*	-0.0723*	-0.0981*	-0.0839*	-0.0983*	-0.0766*
7d	-0.2522*	-0.0869*	-0.1615*	-0.2191*	-0.1873*	-0.2195*	-0.1712*
7e	0.6085*	-0.0820*	-0.1523*	-0.2066*	0.4518*	-0.2070*	-0.1614*
7f	-0.1730*	0.2884*	0.5357*	0.7266*	-0.1284*	-0.1505*	-0.1174*
8a	-0.0476*	-0.0106	-0.1165*	-0.1304*	-0.0115	0.3701*	-0.0706*
8b	-0.0160	-0.00440	-0.0671*	-0.0678*	0.0162	-0.0355*	-0.00690
8c	0.0432*	-0.0329*	-0.0352*	0.0618*	0.0397*	-0.1347*	0.00830
8d	0.00630	-0.00610	0.1417*	0.0548*	-0.0380*	-0.1058*	0.0284*
8e	0.00560	0.0269*	0.0674*	0.0993*	-0.00740	-0.0862*	0.0160
8f	0.0163	0.0439*	0.0763*	0.0238	-0.0268*	-0.0547*	0.0463*
8g	-0.00690	0.0612*	0.0510*	0.00820	0.00970	-0.0204	0.0336*
9a	-0.00690	0.0612*	0.0510*	0.00820	0.00970	-0.0204	0.0336*
9b	0.0146	0.0491*	0.1025*	0.0972*	-0.0224	-0.1050*	0.0414*
9c	0.0441*	-0.0345*	0.0708*	0.0963*	0.00870	-0.1999*	0.0282*
9d	-0.0524*	-0.0124	-0.1514*	-0.1635*	0.00390	0.2759*	-0.0639*
10a	-0.00690	0.0612*	0.0510*	0.00820	0.00970	-0.0204	0.0336*
11a	0.0109	0.0721*	0.0808*	0.0908*	-0.0202	-0.1864*	-0.0143
12a	0.0517*	-0.2186*	-0.3522*	-0.3820*	-0.2120*	0.1415*	0.1303*
12b	-0.00780	-0.0117	0.0286*	0.3166*	0.2260*	-0.0941*	-0.0844*
12c	-0.0692*	0.1700*	0.4533*	0.0994*	0.0680*	-0.0732*	-0.0677*
12d	-0.00510	0.2498*	0.1289*	0.1848*	-0.0163	-0.0570*	-0.0513*
12e	-0.0133	0.0595*	-0.0140	-0.0191	0.0609*	0.000200	-0.0149

Table 21: *Correlations Matrix 2 (cont.)*

	7c	7d	7e	7f	8a	8b	8c
7c	1						
7d	-0.1969*	1					
7e	-0.1856*	-0.4145*	1				
7f	-0.1350*	-0.3015*	-0.2843*	1			
8a	0.0337*	-0.1362*	0.0605*	-0.1778*	1		
8b	0.0886*	0.0277*	0.0255*	-0.0960*	-0.2652*	1	
8c	-0.0295*	0.0703*	0.0173	0.0161	-0.3293*	-0.3297*	1
8d	-0.0509*	0.0432*	-0.0654*	0.1277*	-0.2196*	-0.2198*	-0.2729*
8e	-0.0349*	0.00180	-0.0401*	0.1289*	-0.1530*	-0.1532*	-0.1902*
8f	-0.0280*	-0.00550	-0.0333*	0.0803*	-0.1068*	-0.1069*	-0.1327*
8g	-0.0249	-0.0235	-0.0145	0.0586*	-0.0612*	-0.0612*	-0.0760*
9a	-0.0249	-0.0235	-0.0145	0.0586*	-0.0612*	-0.0612*	-0.0760*
9b	-0.0461*	-0.00180	-0.0536*	0.1561*	-0.1923*	-0.1925*	-0.2390*

9c	-0.0639*	0.0955*	-0.0317*	0.1075*	-0.4603*	-0.4608*	0.7154*
9d	0.1009*	-0.0894*	0.0710*	-0.2259*	0.6058*	0.6064*	-0.5436*
10a	-0.0249	-0.0235	-0.0145	0.0586*	-0.0612*	-0.0612*	-0.0760*
11a	-0.1692*	0.1295*	-0.0208	0.1457*	-0.2642*	-0.1156*	0.0483*
12a	0.1463*	0.2764*	-0.0401*	-0.5917*	0.1389*	0.0744*	-0.0361*
12b	-0.0982*	-0.1627*	0.1131*	0.2637*	-0.0593*	-0.0252	0.0657*
12c	-0.0729*	-0.1635*	-0.0497*	0.4133*	-0.1050*	-0.0571*	-0.0263*
12d	-0.0558*	-0.1166*	-0.0412*	0.3102*	-0.0660*	-0.0491*	0.00670
12e	-0.0171	-0.00690	0.0281*	-0.00330	-0.00130	0.0128	-0.00510

Table 21: *Correlations Matrix 2 (cont.)*

	8d	8e	8f	8g	9a	9b	9c
8d	1						
8e	-0.1268*	1					
8f	-0.0885*	-0.0617*	1				
8g	-0.0507*	-0.0353*	-0.0246	1			
9a	-0.0507*	-0.0353*	-0.0246	1.0000*	1		
9b	-0.1593*	0.7958*	0.5553*	-0.0444*	-0.0444*	1	
9c	0.4769*	-0.2659*	-0.1855*	-0.1063*	-0.1063*	-0.3341*	1
9d	-0.3624*	-0.2526*	-0.1762*	-0.1009*	-0.1009*	-0.3174*	-0.7599*
10a	-0.0507*	-0.0353*	-0.0246	1.0000*	1.0000*	-0.0444*	-0.1063*
11a	0.1590*	0.1694*	0.1199*	0.0438*	0.0438*	0.2139*	0.1596*
12a	-0.0861*	-0.0660*	-0.0660*	-0.0701*	-0.0701*	-0.0950*	-0.0955*
12b	0.00240	0.00420	0.00440	0.0143	0.0143	0.00620	0.0618*
12c	0.1222*	0.0705*	0.0611*	0.0208	0.0208	0.0958*	0.0647*
12d	0.0306*	0.0362*	0.0547*	0.1022*	0.1022*	0.0634*	0.0283*
12e	-0.0246	0.0251	0.00250	-0.00690	-0.00690	0.0224	-0.0226

Table 21: *Correlations Matrix 2 (cont.)*

	9d	10a	11a	12a	12b	12c	12d	12e
9d	1							
10a	-0.1009*	1						
11a	-0.3132*	0.0438*	1					
12a	0.1759*	-0.0701*	-0.1598*	1				
12b	-0.0697*	0.0143	0.0122	-0.6646*	1			
12c	-0.1337*	0.0208	0.1697*	-0.5062*	-0.0902*	1		
12d	-0.0949*	0.1022*	0.0994*	-0.3835*	-0.0683*	-0.0521*	1	
12e	0.00940	-0.00690	0.0150	-0.1114*	-0.0198	-0.0151	-0.0115	1

APPENDIX D: Logit Robustness Checks

Table 22: *Regression output for Series 1 Eq-12 Logit Model*

VARIABLES	(1) Marginal effects	(2) SE	(3) VIF	(4) 1/VIF
Base: Geographically accessible				
Geographically inaccessible	0.024*	(0.015)	1.15	0.87
Base: Do not train				
Train on-the-job only	0.128***	(0.022)	1.95	0.51
Train off-the-job only	0.146***	(0.024)	1.48	0.67
Train both on-and-off the job	0.194***	(0.020)	4.14	0.24
Base: No plan in place				
Plan in place	-0.003	(0.012)	3.14	0.32
Not sure	-0.048	(0.056)	1.05	0.95
Base: Primary sect. & utilities				
Manufacturing	0.076***	(0.025)	1.28	0.78
Construction	0.039	(0.024)	1.28	0.78
Trade, accom. & transport	0.051**	(0.020)	2.39	0.42
Business & other services	0.004	(0.022)	2.34	0.43
Non-market services	0.012	(0.024)	2.93	0.34
Base: Small & medium enterprises				
Established (250+)	0.121***	(0.029)	1.03	0.97
Base: Single site establishments				
Multi-site establishment	0.029**	(0.011)	2.35	0.43
Base: Mainly seeking to make profit				
Charity, voluntary, third sector	-0.024	(0.020)	1.43	0.70
Local government financed	-0.025	(0.022)	1.53	0.65
Central government financed	0.018	(0.026)	1.32	0.76
Other	0.148*	(0.084)	1.01	0.99
Observations	6,035	Mean VIF	1.87	
Wald chi2(17)	172.76			
Prob>chi2	0.000			
Pseudo R-squared	0.069			
Classification table (% correct)	79.62			
Hosmer-Lemeshow test	Satisfied			
LROC (under curve)	0.665			
Link test	Satisfied			

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 23: *Regression output for Series 1 Eq-6 Logit Model*

VARIABLES	(1) Marginal effects	(2) SE	(3) VIF	(4) 1/VIF
Base: Geographically accessible				
Geographically inaccessible	0.023	(0.015)	1.28	0.78
Base: Do not train				
Train on-the-job only	0.127***	(0.022)	2.13	0.47
Train off-the-job only	0.146***	(0.024)	1.67	0.60
Train both on-and-off the job	0.194***	(0.020)	4.63	0.22
Base: No plan in place				
Plan in place	-0.004	(0.012)	3.17	0.32
Not sure	-0.048	(0.056)	1.05	0.95
Base: Mining and quarrying				
Agric., hunt., forest., fish.	0.052	(0.035)	1.31	0.76
Manufacturing	0.133***	(0.038)	1.36	0.74
Elec., gas & water supply	0.085	(0.055)	1.07	0.93
Construction	0.090**	(0.036)	1.36	0.73
Wholesale & retail trade	0.089***	(0.033)	1.94	0.51
Hotels & restaurants	0.123***	(0.036)	1.59	0.63
Transport & storage	0.126***	(0.039)	1.24	0.81
Info. & communications	0.042	(0.036)	1.17	0.85
Financial service	0.077**	(0.037)	1.23	0.82
Real estate, renting & business activities	0.054	(0.034)	1.76	0.57
Public administration	0.104**	(0.047)	1.33	0.75
Education	0.055	(0.036)	1.98	0.50
Health & social work	0.061*	(0.035)	2.18	0.46
Community, social and personal service activities	0.059	(0.036)	1.63	0.61
Base: Small & medium enterprises				
Established (250+)	0.117***	(0.030)	1.04	0.96
Base: Single site establishments				
Multi-site establishment	0.031***	(0.012)	2.41	0.42
Base: Mainly seeking to make profit				
Charity, voluntary, third sector	-0.024	(0.021)	1.55	0.64
Local government financed	-0.031	(0.023)	1.77	0.57
Central government financed	0.009	(0.026)	1.38	0.72
Other	0.135	(0.084)	1.02	0.98
Observations	6,035	Mean VIF	1.70	
Wald $chi^2(26)$	190.41			
Prob>chi^2	0.000			
Pseudo R^2	0.071			
Classification table (% correct)	79.60			
Hosmer-Lemeshow test	Satisfied			
LROC (under curve)	0.671			
Link test	Satisfied			

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 24: *Regression output for Series 1 Eq-11 Logit Model*

VARIABLES	(1) Marginal effects	(2) SE	(3) VIF	(4) 1/VIF
Base: Large Urban Area				
Other Urban Area	-0.003	(0.013)	1.66	0.60
Acc. Small Town	-0.033	(0.024)	1.14	0.88
Remote Small Town	0.002	(0.035)	1.07	0.94
V. Remote Small Town	0.009	(0.030)	1.07	0.94
Accessible Rural	-0.020	(0.016)	1.21	0.83
Remote Rural	0.017	(0.024)	1.08	0.93
V. Remote Rural	0.027	(0.026)	1.09	0.92
Base: Do not train				
Train on-the-job only	0.127***	(0.022)	2.01	0.50
Train off-the-job only	0.145***	(0.024)	1.55	0.65
Train both on-and-off the job	0.194***	(0.020)	4.31	0.23
Base: No plan in place				
Plan in place	-0.002	(0.012)	3.15	0.32
Not sure	-0.049	(0.056)	1.05	0.95
Base: Primary sect. & utilities				
Manufacturing	0.073***	(0.026)	1.34	0.75
Construction	0.035	(0.025)	1.35	0.74
Trade, accom. & transport	0.046**	(0.021)	2.59	0.39
Business & other services	-0.002	(0.023)	2.50	0.40
Non-market services	0.006	(0.025)	3.05	0.33
Base: Small & medium enterprises				
Established (250+)	0.120***	(0.029)	1.03	0.97
Base: Single site establishments				
Multi-site establishment	0.027**	(0.011)	2.36	0.42
Base: Mainly seeking to make profit				
Charity, voluntary, third sector	-0.024	(0.020)	1.44	0.70
Local government financed	-0.023	(0.022)	1.54	0.65
Central government financed	0.018	(0.026)	1.32	0.76
Other	0.146*	(0.084)	1.01	0.99
Observations	6,035	VIF	1.73	
Wald chi2(23)	184.29			
Prob>chi2	0.000			
Pseudo R-squared	0.070			
Classification table (% correct)	79.60			
Hosmer-Lemeshow test	Satisfied			
LROC (under curve)	0.669			
Link test	Satisfied			

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 25: *Regression output for Series 1 Eq-5 Logit Model*

VARIABLES	(1) Marginal effects	(2) SE	(3) VIF	(4) 1/VIF
Base: Large Urban Area				
Other Urban Area	-0.003	(0.013)	1.77	0.56
Acc. Small Town	-0.032	(0.024)	1.16	0.86
Remote Small Town	0.002	(0.035)	1.08	0.92
V. Remote Small Town	0.005	(0.031)	1.08	0.92
Accessible Rural	-0.019	(0.016)	1.65	0.61
Remote Rural	0.017	(0.024)	1.35	0.74
V. Remote Rural	0.026	(0.026)	1.21	0.82
Base: Do not train				
Train on-the-job only	0.127***	(0.022)	2.13	0.47
Train off-the-job only	0.145***	(0.024)	1.67	0.60
Train both on-and-off the job	0.194***	(0.020)	4.64	0.22
Base: No plan in place				
Plan in place	-0.003	(0.012)	3.18	0.31
Not sure	-0.049	(0.056)	1.06	0.95
Base: Mining and quarrying				
Agric., hunt., forest., fish.	0.057	(0.036)	1.88	0.53
Manufacturing	0.136***	(0.038)	1.49	0.67
Elec., gas & water supply	0.087	(0.055)	1.10	0.91
Construction	0.091**	(0.036)	1.51	0.66
Wholesale & retail trade	0.090***	(0.033)	2.19	0.46
Hotels & restaurants	0.122***	(0.036)	1.70	0.59
Transport & storage	0.128***	(0.039)	1.35	0.74
Info. & communications	0.041	(0.036)	1.21	0.82
Financial service	0.077**	(0.037)	1.27	0.79
Real estate, renting & business activities	0.055	(0.034)	1.91	0.52
Public administration	0.104**	(0.047)	1.36	0.74
Education	0.054	(0.036)	2.05	0.49
Health & social work	0.061*	(0.035)	2.35	0.43
Community, social and personal service activities	0.060*	(0.036)	1.74	0.57
Base: Small & medium enterprises				
Established (250+)	0.116***	(0.033)	1.04	0.96
Base: Single site establishments				
Multi-site establishment	0.029**	(0.012)	2.43	0.41
Base: Mainly seeking to make profit				
Charity, voluntary, third sector	-0.024	(0.021)	1.56	0.64
Local government financed	-0.029	(0.023)	1.77	0.56
Central government financed	0.009	(0.027)	1.39	0.72
Other	0.133	(0.088)	1.02	0.98
Observations	6,035	Mean VIF	1.70	
Wald chi2(32)	202.19			
Prob>chi2	0.000			
Pseudo R-squared	0.072			
Classification table (% correct)	79.57			
Hosmer-Lemeshow test	Satisfied			
LROC (under curve)	0.715			
Link test	Satisfied			

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 26: *Regression output for Series 2 Eq-18 Logit Model*

VARIABLES	(1) Marginal effects	(2) SE	(3) VIF	(4) 1/VIF
Base: Glasgow City				
Clackmannanshire	-0.061**	(0.031)	1.04	0.96
East Ayrshire	-0.052**	(0.026)	1.07	0.93
Perth and Kinross	0.061*	(0.037)	1.15	0.87
Base: Do not train				
Train on-the-job only	0.129***	(0.022)	2.03	0.49
Train off-the-job only	0.146***	(0.024)	1.57	0.64
Train both on-and-off the job	0.196***	(0.019)	4.34	0.23
Base: No plan in place				
Plan in place	-0.004	(0.012)	3.16	0.32
Not sure	-0.045	(0.055)	1.05	0.95
Base: Primary sect. & utilities				
Manufacturing	0.066***	(0.025)	1.46	0.69
Construction	0.032	(0.024)	1.51	0.66
Trade, accom. & transport	0.044**	(0.020)	3.11	0.32
Business & other services	-0.005	(0.022)	2.96	0.34
Non-market services	0.002	(0.024)	3.30	0.30
Base: Small & medium enterprises				
Established (250+)	0.117***	(0.028)	1.04	0.96
Base: Single site establishment				
Multi-site establishment	0.026**	(0.011)	2.37	0.42
Base: Mainly seeking to make profit				
Charity, voluntary, third sector	-0.023	(0.020)	1.45	0.69
Local government financed	-0.020	(0.022)	1.54	0.65
Central government financed	0.018	(0.025)	1.33	0.75
Other	0.157*	(0.086)	1.02	0.98
Observations	6,035	Mean VIF	1.46	
Wald chi2(47)	252.77			
Prob>chi2	0.000			
Pseudo R-squared	0.077			
Classification table (% correct)	79.60			
Hosmer-Lemeshow test	Satisfied			
LROC (under curve)	0.673			
Link test	Satisfied			

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

APPENDIX E: Assumptions and Test Matrices

Table 27: *Assumptions and Tests Matrix for Series 1 Regressions*

Equation No.	Series	Regression	Probit/Logit	Wald chi2	P-value	P R-Squared	Class. Pct	H/L Test	LROC	Link Test	Mean VIF	Max VIF
1	S1	1	P	466.72	0.000	0.120	79.67	Good	0.716	Good	4.36	16.27
2	S1	1	L	423.34	0.000	0.119	79.70	Good	0.717	Good	4.36	16.27
3	S1	2	P	446.64	0.000	0.119	79.82	Good	0.714	Good	4.90	16.15
4	S1	2	L	410.52	0.000	0.118	79.82	Good	0.715	Good	4.90	16.15
5	S1	3	P	449.22	0.000	0.109	79.64	Good	0.710	Good	4.62	24.29
6	S1	3	L	413.68	0.000	0.109	79.70	Good	0.710	Good	4.62	24.29
7	S1	4	P	432.35	0.000	0.108	79.72	Good	0.708	Good	5.28	24.12
8	S1	4	L	401.52	0.000	0.108	79.78	Good	0.708	Good	5.28	24.12
9	S1	5	P	214.07	0.000	0.071	79.55	Good	0.673	Good	1.70	4.64
10	S1	5	L	202.19	0.000	0.072	79.57	Good	0.715	Good	1.70	4.64
11	S1	6	P	196.85	0.000	0.070	79.57	Good	0.670	Good	1.70	4.63
12	S1	6	L	190.41	0.000	0.071	79.60	Good	0.671	Good	1.70	4.63
13	S1	7	P	412.58	0.000	0.118	79.65	Good	0.715	Good	2.52	6.39
14	S1	7	L	374.38	0.000	0.118	79.72	Good	0.715	Good	2.52	6.39
15	S1	8	P	390.06	0.000	0.117	79.73	Good	0.713	Good	2.62	5.41
16	S1	8	L	359.76	0.000	0.117	79.85	Good	0.713	Good	2.62	5.41
17	S1	9	P	401.43	0.000	0.108	79.65	Good	0.708	Good	2.64	8.88
18	S1	9	L	368.36	0.000	0.108	79.64	Good	0.708	Good	2.64	8.88
19	S1	10	P	382.14	0.000	0.107	79.69	Good	0.706	Good	2.77	7.30
20	S1	10	L	354.76	0.000	0.107	79.64	Good	0.707	Good	2.77	7.30
21	S1	11	P	197.54	0.000	0.069	79.59	Good	0.668	Good	1.73	4.31
22	S1	11	L	184.29	0.000	0.070	79.60	Good	0.669	Good	1.73	4.31
23	S1	12	P	180.37	0.000	0.068	79.60	Good	0.665	Good	1.87	4.14
24	S1	12	L	172.76	0.000	0.069	79.62	Good	0.665	Good	1.87	4.14

Table 28: *Assumptions and Tests Matrix for Series 2 Regressions*

Equation No.	Series	Regression	Probit/Logit	Wald chi2	P-value	P R-Squared	Class. Pct	H/L Test	LROC	Link Test	Mean VIF	Max VIF
25	S2	13	P	632.12	0.000	0.128	79.98	Good	0.720	Fail	3.19	16.45
26	S2	13	L	552.59	0.000	0.126	80.05	Good	0.721	Fail	3.19	16.45
27	S2	14	P	595.77	0.000	0.117	79.80	Good	0.713	Good	3.28	24.56
28	S2	14	L	535.83	0.000	0.116	79.72	Good	0.714	Good	3.28	24.56
29	S2	15	P	298.11	0.000	0.079	79.60	Good	0.677	Good	1.59	4.65
30	S2	15	L	273.87	0.000	0.079	79.60	Good	0.678	Good	1.59	4.65
31	S2	16	P	582.88	0.000	0.126	79.88	Good	0.719	Fail	1.94	6.91
32	S2	16	L	506.72	0.000	0.125	79.88	Good	0.719	Fail	1.94	6.91
33	S2	17	P	556.40	0.000	0.116	79.69	Good	0.711	Good	1.96	9.65
34	S2	17	L	495.59	0.000	0.114	79.77	Good	0.712	Good	1.96	9.65
35	S2	18	P	277.30	0.000	0.077	79.59	Good	0.672	Good	1.46	4.34
36	S2	18	L	252.77	0.000	0.077	79.60	Good	0.673	Good	1.46	4.34

APPENDIX F: Participant Information Sheet and Consent Form

Name of department: Hunter Centre for Entrepreneurship
Title of the study: Skills, Productivity and Growth: Rebalancing Supply and Demand in the Scottish Innovation System

Introduction

My name is Ross Croall – I'm a Doctoral Researcher in the Hunter Centre for Entrepreneurship, Strathclyde Business School, University of Strathclyde. This doctoral research project is titled "Skills, productivity and growth: rebalancing supply and demand in the Scottish Innovation System" and is co-funded by the Scottish Government and the UK Economic and Social Research Council.

What is the purpose of this investigation?

In recent years, much has been made in both policy-making circles and the media of supposed skill gaps or skills shortages in the Scottish economy and the pervasive effects these have on company performance and aggregated economic growth. However, despite the availability of quality data sources, the evidence for this is often anecdotal, lacking in context and presented without a holistic discussion of the factors at play. The aim of this project is to investigate the causes, effects and potential solutions to the problem of skill gaps/skill shortages in Scotland. We would like to get a more detailed understanding of firms' experiences of these issues than has previously been the case, and in particular, we aim to understand how successful firms still manage to operate effectively in sectors where skill problems have previously been recorded. Moreover, given the marked variation in Scotland's economic geography, we aim to assess the regional dynamics at play.

Do you have to take part?

We greatly appreciate your involvement in this project, but please be aware that you are free to leave this project and withdraw your consent at any time.

What will you do in the project?

These interviews will be roughly 1 hour in length and will be conducted at the convenience of the interviewee with respect to time and location. I am looking to begin these interviews from September 2016. I am happy to forward you a rough interview guide/content schedule ahead of time if you wish.

Why have you been invited to take part?

I am inviting you to take part in short, semi-structured interviews. For commerical firms I have targeted, the participant will ideally hold a managerial or human resources position and will possess experience of both overseeing/managing existing employees and interviewing and hiring new employees. For participants who are employed at governmental organisations, you have been targeted explicitly because of the position/expertise you hold in this area. For both sets of participants, your knowledge, expertise and experience are essential for understanding the issues involved with the phenomena of skill gaps.

What happens to the information in the project?

Your data will be stored securely in accordance with the University of Strathclyde's data protection procedures (see below). No identifying information will be revealed in the write-up of this research, and your organisation will be referred to in general terms. The University of Strathclyde is registered with the Information Commissioner's Office who implements the Data Protection Act 1998. All personal data on participants will be processed in accordance with the provisions of the Data Protection Act 1998.
Thank you for reading this information – please ask any questions if you are unsure about what is written here.

What happens next?
If you are happy to proceed with this research project, then please sign the consent form below. If not, then I thank you for your time thus far. I am happy to share the results of this research with you if you would like, and will contact you in case these results will be published in future as well.

Researcher contact details:
If, at any point, you would like to contact the researcher post-interview please feel free to do so at the following address:
Ross Croall
The Hunter Centre for Entrepreneurship
Strathclyde Business School
University of Strathclyde
199 Cathedral Street
Glasgow, G4 0QU
E: ross.croall@strath.ac.uk
T: +44 141 548 3482

Chief Investigator details:
This doctoral research project is carried out under the primary supervision of:
Dr. Niall MacKenzie
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This investigation was granted ethical approval by the University of Strathclyde Ethics Committee. If you have any questions/concerns, during or after the investigation, or wish to contact an independent person to whom any questions may be directed or further information may be sought from, please contact:
Secretary to the University Ethics Committee
Research & Knowledge Exchange Services
University of Strathclyde
Graham Hills Building
50 George Street
Glasgow
G1 1QE

Telephone: 0141 548 3707
Email: ethics@strath.ac.uk

Consent Form

Name of department: The Hunter Centre for Entrepreneurship
Title of the study: Skills, Productivity and Growth: Rebalancing Supply and Demand in the Scottish Innovation System

- I confirm that I have read and understood the information sheet for the above project and the researcher has answered any queries to my satisfaction.
- I understand that my participation is voluntary and that I am free to withdraw from the project at any time, without having to give a reason and without any consequences.
- I understand that I can withdraw my data from the study at any time.
- I understand that any information recorded in the investigation will remain confidential and no information that identifies me will be made publicly available.
- I consent to being a participant in the project
- I consent to being audio recorded as part of the project Yes/ No

Please PRINT Name:	
Signature of Participant:	Date:

APPENDIX G: Letter to Potential Participants

Ross Croall
Doctoral Researcher/Teaching Assistant
Hunter Centre for Entrepreneurship
Strathclyde Business School
University of Strathclyde
Level 8, Duncan Wing
199 Cathedral Street
Glasgow G4 0QU

Email: ross.croall@strath.ac.uk

Request for interview

27/09/2016

To Whom It May Concern,

My name is Ross Croall – I am a Doctoral Researcher at the Hunter Centre for Entrepreneurship, University of Strathclyde. My research project is joint-funded by the Scottish Government and the UK Economic and Social Research Council, and we are seeking to investigate the causes, effects and potential solutions to the problem of skill gaps/skill shortages in Scotland. We would like to get a more detailed understanding of firms' experiences of these issues than has previously been the case, and in particular, we aim to understand how successful firms, such as your own, still manage to operate effectively in sectors where skill problems have previously been recorded.

I would be grateful if firm management or a member of Human Resources would be willing to meet for a short interview, lasting approximately 1 hour, to discuss their experiences of these issues. The outcomes of this research have the potential to impact government policy, and it is essential that the voices of fast growing companies like yours are heard. We would be happy to notify you of these outcomes if you wish.

If you would like to participate, please respond by mail to the above address or by email to ross.croall@strath.ac.uk, and we can arrange a time and date that suits.

Many thanks in advance,

Ross Croall
Hunter Centre for Entrepreneurship

APPENDIX H: Interview Guide 1

Interview Guide – August, 2016

Opener

Hello, my name is Ross Croall – I'm a PhD student at Strathclyde Business School researching the causes, effects and solutions to labour skill deficiencies in Scotland. This project is part-funded by the Scottish Government and the UK Economic and Social Research Council, and we would like to get a more detailed understanding of firms' experiences of these issues than has previously been the case. In particular, we are seeking to understand how some firms still manage to operate successfully in sectors where skill gaps or skill shortages have previously been recorded. Thanks very much for agreeing to meet with me.

1. Can you tell me a little bit about the organisation and your role within it? In what ways, for example, are you involved with the hiring and training of employees?

SECTION A: Understanding of skill gaps/shortages

2. Can you tell me what your understanding of the "skills gap problem" is?
3. Do you see this as an industry/sector-wide problem, is it a geographic one, or even both?
4. Has this problem changed over the last ten years? If so, in what way(s) has it changed?

SECTION B: Experience of (internal) skills gaps

5. Are your existing employees fully proficient in their roles or would you say there are skill gaps in the organisation?
6. Are these skill gaps technical in nature or are they confined to what we might term "core skills", "soft skills" or "people skills"?
7. To what extent, if any, do you find that these skill gaps are holding back company performance, growth or expansion?

SECTION C: Experience of (external) skills shortages

8. When you are hiring new employees, do you find that candidates often lack the requisite or necessary skills for the available position?
9. Are these skill shortages technical in nature or are they confined to what we might term "core skills", "soft skills" or "people skills"?
10. To what extent, if any, do you find that these skill shortages are holding back company performance, growth or expansion?

SECTION D: Combatting skill deficiencies

11. What do you see as the main cause of skill deficiencies? For instance, do you see it as an external problem (e.g. not enough apprentices or graduates in the market), an internal problem (e.g. the organisation not being willing or able to offer large enough salaries or provide enough training), or stemming from a different cause, or set of causes, altogether?
12. Despite your experiences of skill deficiencies, your organisation has performed very well over the last few years. How have you been able to overcome the

effects of these deficiencies and grow your business? Have you taken any of the following measures?

a. Increase salaries above market level
b. Offer other benefits, pecuniary or otherwise, to make the role more attractive
c. Increase investment in employee training
d. Use skills retention procedures, such as mentoring schemes or exit interviews
e. Outsource part of your production/service
f. OTHER
g. NO ACTION: Growth *in spite of* skill problems

13. Are you aware of any government schemes which could help you improve the skills base of your organisation? If so, do you use such schemes?
14. Do you think government and/or the education system should be doing more to combat skill deficiencies?

Thanks very much for your time. Would you like to be notified of the outcome of this research going forward?

APPENDIX I: Interview Guide 2

Thanks for agreeing to this X, I appreciate your time. I've given a very brief outline of my project below and have listed the main questions I'd like to ask. These interviews have been semi-structured in reality and I'm happy to take the conversation in any direction that you wish.

I'm looking at the problem of skill gaps and skill shortages in Scotland. There are roughly four strands to the PhD: (1) where and when the notion of skill problems in Scotland originated; (2) methodological issues related to skills research; (3) a quantitative analysis of skills problems in Scotland; (4) understanding what it is that successful employers/competitive firms do to combat skill issues and mitigate their effects.

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1. Can you tell me what your understanding of the skills gap/skill shortage problem is? So, for example, do you see it as an organisation-level problem (i.e. recruitment practices or inappropriate expectations/impatient employers), do you see it as a "genuine" sector or industry level problem, or even a geographic one? What do you see as the main cause(s) of these skill problems?

2. What impact, if any, do you see these problems having for Scottish employers and for the Scottish economy? To what extent do you think skill problems contribute to the so-called "productivity gap" in Scotland/the UK?

3. How do you see Scotland's skills problems as having changed over time? I'm thinking particularly from the 2008 crash, but take any time period you wish.

4. How do you think Scotland compares to other countries in terms of the workforce skills-base? I'd like to focus comparisons on UK constituent countries, EU or OECD countries.

5. Many Scottish organisations are still successful – even internationally competitive – in industries where skill problems have been self-reported by employer organisations and industry bodies. What do you think these firms do differently that means they can mitigate skill gaps and skill shortages?

6. Obviously employers throughout the UK have raised some concerns over access to international skilled labour post-Brexit. What do you think are some of the main challenges here in a Scottish-specific context?

7. What do you see as the main strengths and weaknesses of the Scottish education system? Do you think the education system does enough to take into account the needs of employers? Are there any changes or improvements you would like to see going forward?

8. What do you see as the main strengths and weaknesses of the way training is delivered in Scotland? Would you like to see any changes and improvements here, and how do you think training delivery in Scotland compares to training delivery in other countries?

APPENDIX J: Example interview transcript

[Audio commences 00:50].

[Introductions]

I: Aye, that's fine. So I'm just looking at skill shortages and skill gaps in Scotland specifically. But only looking at it from the point of view of employers. And then more specifically only successful employers. So in other words, like, how are some employers still able to operate successfully in industries, where these, sort of, shortages and skills gaps have been self-reported basically. So what are those companies doing right that other companies aren't doing right?

R: Aye, okay. What in particular do you …are you looking at particular skillset…any particular industrial sector, business sector, whatever or what…?

I: No, I'm trying to give as wider scope as possible. So I'm interviewing companies throughout Scotland. And then to be quite honest, these problems are reported across the board, regardless of industry or sector. Obviously some of worse than others and I'm thinking particularly, like, the computing software sector or the programming sector specifically. But…no, at the moment anyway, just, kind of, very broad basically. Very broad.

R: Okay. And what's the scope over? For instance, are you looking at particular implications of, like, the Brexit vote, things like that? Are these things…or take everything…separation on…is it historic, you know, kind of…

I: Say that again, sorry, [personal name]. I only head Brexit there.

R: Are you looking at potential…in terms of…what angle you're coming from. Are you looking at things like the Brexit vote, for instance, and how that's going to affect it or is it [voices overlap 03:45]?

I: Absolutely. I've got that down to speak to you about that, what sort of impact do you see that having. Aye. I would be looking at things like if we're doing temporal stuff, like, I'd be looking at the, sort of, impact since the recession ten years ago, to see how that's changed things. I think you're quite an interesting person to speak to though, because your company does training in the sector. So you'll have a, sort of, unique perspective on this problem.

R: We certainly have a perspective. Whether it's unique or not is open to question. But in particular…so you're looking at Scotland…just so I can keep that…my head focussed on it, just totally within Scotland, yeah.

I: Yes. But I wouldn't mind at all, like, if you want to start talking about comparisons between different parts of Britain, or even different parts of Europe.

R: Aye. The reason I'm saying that is because as we stand currently, and I don't know if this is something that you considered, but as we sit at the moment, to be honest, what's going to happen in the next couple of years, we are part of the same country as England and it means that travelling to the likes of London is pretty damn easy because going on, for instance, as an example, we are a Scottish based business which 90 per cent…more than 90 per cent of the business we do south of the border. Now what that perhaps tells…or why do we do that? Well one of the reasons why we do that is because you get paid a little bit more money for doing the same thing.

Now, I don't know if that's the same across the board, but you can imagine that that's going to have some kind of a…of an impact on particularly people who acquire skills and they have the ability to move to different parts of a country that speaks the same language as…I mean, I always look upon at that as one thing, that…it's a reason why we made a decision as a business to do more…it's not that we don't do anything in Scotland. We do. But it's why we made a decision to do more in England was because when I say you get paid a little bit more, you get paid a hell of a lot more for doing the same job in England.

I: Right. Is this just commercial rates you're talking about or is this different government subsidies or government revenue streams?

R: It's…both, a way in to each other. Why? Because what it does, is it creates a perceived market value of what you're doing. And the…one of the things…one of the…particularly within the skills sector that you find…and obviously looking…you know, part of your examination, is it going to be put…is it within the skill…obviously you're looking at the skills sector itself, yeah?

I: Yeah. Yeah.

R: Right. One of the things that…have you spoken to [organisation] in your conversations with them, for instance?

I: No. Yeah, I've got a meeting with the skills manager of [organisation] set up for this Friday though. So…

R: Right. What about [organisation]? Have you…I can get you links in to there if you want.

I: I think [personal name] has a contact there that he's going to get me in touch with, but…

R: Well if you're struggling or having challenges, let me know.

I: Aye, that would be great. I'll take a wee note of that just now actually.

R: My finance director is best mates with top guy in there.

I: Right. Great.

R: So if you're struggling there but also you can have some…

I: Aye, terrific.

R: Sometimes what you find is that…now you've got policy for the sake of policy's sake and because we have a Conservative administration in Westminster, we have a…obviously an SNP administration in Holyrood, there's something going on just now, I don't know if you've heard of it, called an apprenticeship levy…

I: Yes.

R: What about that? Okay. Well there's a whole host of reforms going on just now and it's an English based policy and in my opinion it's a very, very well thought out policy and does a lot of good things. But some…you know, sometimes you feel as if the administration up here are determined to…not to follow that policy, not because it's not the right thing to do, it's simply because it's a Tory policy. We're ain't doing anything the Tory…we ain't following a Tory idea. That…it's amazing how often that happens, Scotland or England, and it's sometimes…it's my belief we're making the wrong decisions. But you fire away. You start asking me questions.

I: No, that's absolutely fine. See if you wouldn't mind, like, later on when I'm talking about Brexit, feel free to talk about how you see independence…Scottish independence, I mean, impacting on this as well.

R: Right. Okay. Okay. We're being a wee bit political here then. Right. Okay.

I: No, that's completely fine…

R: No bother. No bother.

I: It's quite a, sort of, free flowing interview, so just take any of these questions in any sort of direction you want to head in.

R: No bother at all. No bother at all.

I: I'm just trying to get a few more things before I start. Obviously you've got a, sort of, eagle's eye of the sector. So the questions I'm asking you, feel free to speak about your own company specifically or the sector in general.

R: Yeah, will do.

I: Do you want me to run through the interview guide to start with? Like, the, sort of, different segments of it.

R: No, it's okay.

I: No. No problem.

R: No, I don't worry about it, just fire any questions if that's okay.

I: Could I just get you start then by telling me a wee bit more about the company and your role within it?

R: Our company is a…best way of describing it would be a private further education company delivering apprenticeship programmes in the main, really apprenticeship programmes both to new entrants in to the workplace and to existing people within the workforce looking to upskill and enhance their career prospects. The business is…operates across the UK. And mostly in England, given the population dynamics, that's easy to understand why there's more going on south of the border.

My role within the business is business…is director of business development, looking mainly at how we take advantage of changes in policy. One of the things that I notice, pay a lot of attention to, is the constant changing dynamics of policy, particularly in this area. If you look at both Scotland and England, skills policy is something that always seems to be a hot potato. Whenever a new administration comes in, it's something that they feel either rightly or wrongly that they…it's something that they want to get a hold of, tell you the previous administration wasn't doing it correctly and carry out some kind of consultation or study in to why it wasn't done correctly. It's amazing when you look back over the past 20/25 years how often both sides of the border have done exactly the same thing. Come in and said, oh no, policy's not working, we're going to change it. Unbelievable. Unbelievable how often that happens.

So it's my job to make sense of the constantly changing environment and to make recommendations to the business as to what's the best way for us to take advantage of the…this constantly changing environment that we see.

I: Right. Okey-doke. Just in terms of the number of employees you have and the number of sites in the UK, so I believe you've got a few down south as well.

R: Yes. We have…best way to describe number of candidates, we have in the region of just under a hundred employees and we have in the region of 2,000 active candidates.

I: Right. Okey-doke. Is that roughly about a thousand a year or 500 a year that you get in then?

R: No. We'll bring in…[we're actually starting quite significantly 12:07] at the present moment in time so you'll be looking at...over the next year we will train…we will recruit an…round about 1,300 to 2,000 new candidates. So we're going through a bit of a growth phase at the present moment in time.

I: Right. Ideal. Ideal. And the sites you run down south are in [city] I think and…I forget…

R: [city] and [city] although we do however operate throughout the UK, in employers' premises where…I'm going down to [city] next week to look at premises in [city] as well.

I: Right. No problem at all. Great. Could I just get you to start then by telling me what your understanding of this problem is then? If you see it as a company specific problem, like a recruitment problem, if you see it sector or industry wide or even if you see it geographically.

R: Right. Okay.

I: I know that's quite broad, but it's just to, sort of, open up and…

R: No, no. Where do I start? Okay. My perception of the problem with regards to the skills gap, you mean. You mean, why's there a skills issue in Scotland. I think…I see the reason as being the same in Scotland as it is in the rest of the UK, so it's fairly easy for me to talk about. And I see it as being…how do I best describe this? Okay. In terms of the way that companies operate, a lot of the policy as existed up 'til now has focussed upon bringing new entrants in to the workforce. Why? Because unemployment's been historically higher than we want it to be. So a lot of the funding has been towards getting people in to university, getting them graduating, putting them schemes, apprenticeship training schemes, college schemes, so on and so forth, to give them certain, you know, basic skills or skills that we get them on to the employment ladder.

Now what that does…obviously has dealt with people no longer being unemployed 'cause you can't be in college or university or anything else and be unemployed. So all being…and solves one challenge. What the funding has not necessarily been aimed at…and again even if you look at the policies, England starts change, Scotland doesn't. I'll give an example. The policy in Scotland is aimed at saving…I think an apprenticeship is for people between the ages of 16 to 24. Part of the challenge with that is…and I see this all the time, is people going in to a company, doing a job and hitting what I call a 'glass ceiling'. In other words they go in at whatever level they go in and there's no opportunity for them to push further in to the company. So what you do is you…I think looking at a bit of a [log 14:57] jam in the low levels of the business.

You can't actually get enough new people in to the company because there simply is no room. I'll give you an example, the example being the construction industry we operate in. There is a colossal shortage of quantity surveyors throughout the UK. This is…not just Scotland, in England and Scotland a shortage of quantity surveyors.

There's two ways of recruiting quantity surveyors. One way is you take people who are graduates from college or university and the other way is you train your own. Okay. The challenge being…is the colleges and universities cannot possibly produce enough people to fill the skills gap. They don't have the capacity to do that. The other challenge is the funding has not up 'til now and certainly…there might be some changes on the way, but the policy has not been towards helping companies to promote their growth within their businesses. And a lot…are the most capable people within the businesses and help them move up the ladder. Companies are now being left on their own to do this. And this is what we've found.

One or two changes are starting to happen in policies. There's something coming out just now called Graduate Apprenticeships in Scotland and degree apprenticeships in England where people can go through…where it's the employers can be funded towards putting existing employers through…existing employees rather, through degree level qualifications, preferably at a time and an environment where employers get the most benefit. And one of the challenges, I suppose, is that there's one thing getting somebody a qualification. So, I mean, you're doing a PhD just now. I would assume therefore that you've done undergraduate degrees, yeah.

I: Yeah.

R: Okay. I would be asking you a question. I'm not actually looking for an answer, but to think about from this perspective, how prepared for the world of work did you feel when you finished your first undergraduate degree…

I: I will answer it. I will answer it. Extremely unprepared.

R: Yeah. I mean, I graduated in law at the age of 20. And I was no use to man nor beast, the truth be known. I was useless. From a commercial perspective, I could not earn the company money. And that's a problem 'cause the results are a whole host of graduates, people going through universities, learning skills that are never going to be applied in the workplace, never going to be used, what's the point? Some days you have to ask yourself that question. Now one of the things I'm doing at the moment is I've started at looking at producing degree apprenticeships as I said and higher apprenticeships which will involve people who already are in employment as I explained, working and doing a degree or a higher level qualification at the same time.

Now the accountancy sector…again it's worth looking at that have grabbed the bulls by the horns and they're ahead of the marketplace on this. We've already started doing this before anybody else. And we speak to our accountants and our accountants will tell you that if we put someone through a…let's say a four year degree apprenticeship in accountancy, by the time they're finished, the person is fully equipped to do the job. Fully equipped.

If they take somebody who has done a four year degree in accountancy and recruiting them at that point, they're ready then start a four year traineeship. So they're already four years behind. And I see this as being one of the challenges with…there's…there have been a discord or a…between a…and a disassociation between the education system. What educators want, what training companies…training providers like us want and what employers actually need. Not enough good communication.

I: That's a…that requires a fundamental shift in the way education's delivered in Scotland then because even since the new universities got established in the 1990s, the numbers of full-time higher education students must have doubled in Scotland, or near enough doubled.

R: Yeah. But it looks good on paper, doesn't it. It looked very, very good on paper to say, yeah we put loads and loads of people through higher education, through degrees and so and so forth. Rather the…I had one of these moments, it was a bit of an epiphany

to be perfectly honest, but it…and it happened during my second master's and I was sitting… It was a class…it was a corporate law class and they mixed the master's students…I was doing a master's in [degree]. They mixed the master's class with the class…the honours class. And there were two or three of us doing the master's. And I felt like the most…by far and away the most business experience and I'm sitting there listening to the honour students and I'm sitting listening to questions that they're asking and I'm saying, this is ridiculous. These kids are in here and haven't…don't have a clue how to apply the knowledge they're gaining. No clue. No idea.

But this was…I found myself being able to do was deal with…be able to take the knowledge that I was learning during the class and apply it to a whole number of different situations. So instant [inaudible 20:27] knowledge became useful to me. Not just in this specific situation that the question might have been about or the seminar was about, but on a whole number of different scenarios, [be alive and well in our 20:41] business.

But for instance, one of the things that I know that you guys or…you guys, I'm saying you guys, us guys still…that the school for entrepreneurship does is they do a lot of placement work and so on and so forth. It's more useful perhaps than people actual realise. Let…get people understanding how the world of business actually works through the world of work, actually works in order that they can use and apply the knowledge that they're learning. Throw away the stuff you don't need, but keep a hold of the stuff that you do need. That's one of the things that I've learned.

So there's a discord between the type of education that we're delivering, that we're giving people and what the country actually needs in terms of…it might be sexy to do a law degree, it might be sexy to do a…an accountancy degree, it might be sexy to do certain engineering degrees or something like that, but if there's not an actual need for it, if somebody's not going to be applying that knowledge then…you know, you have to ask yourself that question a wee bit, don't you.

I: Uhm-hmm. God, I don't even know where to start. You've introduced a perspective there that I've not really head before. Do you think the education sector are aware of this then? Because one of the things I can see really getting pushed is…not even in our department, but throughout the business school there's, like, a push towards interdisciplinary learning and teaching. This is for our undergraduates as well, like, personal development and all that sort of…do you think that's them trying to combat…?

R: I think that's the question…I'm going to throw a question back at you. Why do you think in England they're introducing degree apprenticeships, whereby they're combining work and academic side of it? And why in Scotland again introducing graduate apprenticeships? Why do you think they're doing that?

I: Well it's more efficient. Like you were saying earlier, I would…if you can train…employ someone and train them over four years, that's better than having someone doing a four year degree and then coming in to the company.

R: Absolutely. The apprenticeship level will go towards it. And an interesting comment somebody very, very senior in [organisation]…[organisation] told me the other day, whether it's true or whether it's not remains to be seen is…he asked me a

question, he said, do you seriously think that the Scottish government can continue to fully fund higher education the way they're doing forever? And just, kind of, opened his eyes a little bit. It's…they pay a lot of money for a hell of a lot of degrees that don't necessarily result in people going on and using that knowledge in a productive manner. That's why I think degree apprenticeships have been introduced, 'cause they realise and in businesses employers are telling them that combining the academic side of…'cause the academic side of it is absolutely necessary. [Inaudible 23:41] people, teaching people to that…to high levels…for goodness sake, I've done a degree, two master's and I'm doing a PhD just now. I value higher education.

But trying to do it at the exclusion of teaching people how the world of work operates doesn't help. It delays the process. To think that somebody at 17 years of age, how does he know taking on the two things at the same time is wrong. If you're capable of learning the academic side of things and you're also capable of learning the business…the world of work side of things, the application of the knowledge side of things, we're more than capable at that age of doing that. Why do we not? Because we've got a culture of universities. And I loved my time at university, that's great. But sometimes I look back and say, well I could have been earning 20 grand a year for those four years. Would I rather have 80 grand in my pocket just now over and above that? Probably, yeah. Would I have been a better work candidate at the end of the four years? Damn right I would have been. Damn right I would have been…

I: Yeah. Absolutely.

R: And that's something that I look upon as being a reason for it. The…you know, you hear about these things…and again I heard [organisation] talking about their…they…see the talk…they only talk to employers. So unfortunately, you've got all these employers do…so and on so forth, that government talks to employers and government talks to employers groups. My experience of employers groups are usually people who have either maybe been successful, maybe not been but either have a hell of a lot of time on their hands…now, there's not any successful people building businesses that have got a lot of time on their hands at the time, you know, so you don't necessarily get a fair and balanced view.

You get the view that people want to give you and if you…and sometimes what they do…it's easy to put a consultation out there and wait for the answers to come in. Some days you need to do what you're doing just now and go and pest people for answers. Not just to people who volunteer to be part of the studies. Does that make sense to you?

I: Yeah.

R: But this is our experience. We see…I mean, I'm actually…I believe that the policy changes… It'll be worthwhile having a look at the policy documents on apprenticeship reforms in England…you would go to find them on UK government website, all the apprenticeship reforms, which gave a lot of detail on the…it was called the Richard Review. The Richard Review was a review and what they did was they based it upon…I think it is part of…it was part of the basis of the policy changes and the introduction of the Graduate Apprenticeships in Scotland as well. Well the Richard

Review looked at apprenticeship delivery in mainland Europe, some countries in Europe.

And they looked at the combination…just what I've been talking about, the combination of academic study and workplace activity. And how much better results they were getting in terms of productivity than we were. It's my opinion, I think we're years and years and years behind countries like, you know…why are Germany the biggest…second biggest export country on the planet, despite the fact they're roughly speaking, population wise, the same size as the UK? Why is that? I mean…

I: So you see that as being specifically a, sort of, skills competitive advantage that they've got then.

R: Oh a hundred per cent. They have for decades been training people to be able to do jobs, rather than giving people academic knowledge or basic knowledge and then relying on the individual themselves to go and learn how to apply that in the workplace. 'Cause that's…because that's what we do generally speaking in this country. Or what we have done. That's what…I…that's what I see, that's happened. It's the…there isn't enough discussion on the skills that employers want and…like…I'm going to give you an example. And it's maybe not on the level…well it might be the level you're looking at. There's a qualification…let's say somebody wanted to become a bricklayer, right.

Somebody to become a bricklayer. Now there are various organisations putting together qualifications and…somebody become a bricklayer. They all had to follow the same criteria, same standards, same units. And up until fairly recently…this was in Scotland and England, up until fairly recently, the qualification to become a bricklayer included a unit called slinger and signaller, okay. Now it's quite [voices overlap 28:41].

I: Say that again, sorry, called…

R: Slinger…slinging and signalling. Slinger signaller. Now basically what that means is teaching somebody how to sling a load…or a…it's the lifting chains on to a pallet or whatever to allow it to be lifted and to signal to the crane driver how to lift it. Yeah. Okay. Now for about the past 20/25 years, there haven't been cranes on housing sites. There have been forklift trucks on housing sites and yet that unit was still a core part of the qualification. Now that might not seem a big deal, but to me it is a big deal because what you've got is you've got a discord between the contents of the qualification and the requirements of what somebody needs in order to able to do the job.

I: Ah yeah, I assume that's quite indicative of wider problems, wider review problems.

R: Yes. That…I've just given you one example. It's…this is across the board, it's how often the qualification does not meet the requirements of the job. That's…and we see that time and time again. We can get…put people through an apprenticeship, hand them the qualification and they guy says the next day, oh that's very good, I'm glad I've got the qualification, but unfortunately they're bloody hopeless at their job, so we can't keep them on. Whereas the opposite should be the case. Does that make sense?

I: Yep. So is this is a trend throughout Europe? I know you mentioned Germany there, is this a trend throughout Europe that we are falling behind?

R: We've not been…we've had a more traditional view on what [inaudible 30:24] apprenticeships. And we've come at it from the wrong angle and we haven't really engaged with employers. We haven't spoken to employers in the development stage. And it's been others from the education field…and I'm not saying higher education, I'm saying across the board, and I need to take a bit of responsibility of this, 'cause that's the field I'm in, who have been responsible for putting these qualifications together and not really looking enough at…part of the challenge of qualification is qualifications sometimes take a long time to change, don't they. You know, the degrees, the way we teach them, all different qualifications and yet we're in a fast moving world. And sometimes we'll…I believe that the education sector has always lagged a little bit behind what employers are actually needing, hence we're not actually…we're not training people.

It's not…the skills gap is not lack of training. It's a lack of the correct training. So that's a lot of…hell of a long way about saying what the real crux is. It's not lack of training or lack of education, but a lack of the proper and applicable training and education.

I: Yeah. Certainly I see year after year, a number of students coming in to the business school that have no interest in being there. You know the next four years is going to be a waste of their time and a waste of their own time as well.

R: No it is. Let me ask you question. Let's just say that that was a key cursor to a job. Let's just say that we want to in an environment whereby every single student coming in the business school was, there was a job lined up at the end of that four years. So the prospective employer was stood there at the interview stage. They've weren't just being interviewed for the degree, but they've been interviewed for the job that they're going in to. And they showed a complete level of disinterest to the employer. What's the employer going to say?

I: Oh, I won't be rude but I think, you know…

R: Ah there's no job. [Redacted] off. That's what they're going to say. And I need to watch my language here, 'cause there is a tape running. But that's what the employer's going to say. Now that can't be right. You want people…would be better if they're enthusiastic, 'cause they're going in to something that they want to do and they want to learn about it, they want to apply their knowledge. Whereas from some reason we have a discord. It's not just… It's frustrating for somebody…for someone like me who believes there's one or two answers that could be fairly useful, you know.

I: Yeah. Do you see there being a fundamental shift in this, away from the higher education delivery then over the next ten/20 years?

R: I believe there's a need for a…yes and no. There's more of a need for a combination of the two. The ideal world…and I'm must admit, I'm not in an ideal world, but for a… I left my degree…my [degree]…finished my degree. At the end of it, as I say, no use to man nor beast and I leave wanting the world, and same for yourself.

What's all that about? [degree] school…Strathclyde [degree] School by the way…I'm not being…no attempt to engage with [sector] firms, with employers. And bring them in. Not…again maybe a wee tiny wee bit. You know, you maybe get a letter out six months before your graduation or something like that, when you…decide to be applying for any of these traineeships. No, no, no, no, no, no, no, no. Halfway through your first year, these companies should be coming in and saying, here's what we expect of you. Here's what we want you to be like by the time you finish.

Give students a target. When students understand…not just the theoretical, the academic knowledge that they learn, but all the different things they need to learn, what actually…what it's like out there. And that's what academia needs to do better. That's what I think the Graduate Apprenticeship scheme hopefully is about. Hopefully it's about bringing employers and universities together, not wait to two to three months before somebody graduates and then saying, oh here's what you're going to do for the business. So that's great. Do you know what it's like to go run a business? Well, no I don't really 'cause I've never been in one.

Or how about being in a real business. Because of the things that people don't learn, and it's a big…it's actually one of the main aspects of my study, to be honest, is…I'm going to be honest, there's a lot at risk and how that's dealt with from a variety of different perspectives, but the world of business hasn't…we've got theories on risk and all kinds of academic theories on why people won't make certain decisions and everything else. See when you're in it, see when you're in the world and you've got a decision to make, pressure comes in to play. And pressure changes the focus of decision making.

And students…the only pressure a student…this is a general statement, perhaps I shouldn't make general statements, but for a lot of the time, apart from deciding what pint they're going to have, students feel…pressure comes at exam times. Whereas in the world of work, the type of pressure is different. There's different types of pressure comes in different times and 'cause you need to make…what otherwise might be simple decisions, but under different degrees of pressure and I think what we…what people need to learn is there's an engineering equation. You know, an engineering equation for the purposes of an exam is one thing, but an engineering equation for the purposes advising [organisation] as to whether they should make a five billion dollar decision as to where to drill. It's a different type of pressure.

And introducing people to the different pressures that they're going to be subjected to in the real world, learn the real world…and I don't mean as a whole…that should be a class in my opinion or part of every single degree. Don't just…not just in the business school, the law school, but every single degree should have a real world class right from the word go. Right from the word go, here is what is involved in the world. And the reality is, if you don't want to do this as a job, what the bloody hell are you doing spending your time and everything…wasting everybody else's money doing this? Go and do the degree that's where you want to go with your life.

Sometimes…that's another thing that we do is we fund people to do courses and then they go and do something completely different. That's not right either. That…that's a political…that's…there's politics involved in that, you know. But…

I: Right. I'm trying to think where to go next. It's such a broad scope of where to take the interview. Could you tell me how the apprenticeship levy and the Graduate Apprentices are linked then?

R: From the funding perspective? Nothing. They are nothing alike. They're nothing alike and they're nothing alike for the reason that I told you in the start of the interview in that the Scottish government are determined not to follow the funding policy of the UK government, regardless of whether it's the right policy or not. And basically…

I: Are you talking specifically on the apprenticeship levy, sorry?

R: On the apprenticeship levy. Unfortunately what happened with the apprenticeship levy is George Osborne rightly introduced the apprenticeship levy, but George Osborne wrongly introduced the apprenticeship levy without consulting with the Scottish and Welsh administrations. He should have…but he should have done that before he did it. Because he didn't do that, the Scottish government have said, we ain't doing that because we weren't consulted, instead of looking behind the actual policy. It's a…it's the most socially democratic left wing apprenticeship funding policy that I've ever seen in my life. Far more left wing than…supposedly most left than the administration in Scotland are, are using and yet they're not doing it simply because George did it without consulting them. That's wrong in my opinion. And that's an opinion. That's only an opinion. It's not fact. But it's getting big business to fund apprenticeships for everybody else. Doesn't sound like a Tory policy, I'm sure you'll appreciate that. Yeah.

I: Are we speaking to a…sorry to interrupt you, [personal name], I was speaking to a, sort of, mid-sized employer in [town]. This is a company that's probably just went over 250 employees in the last few years, but they're up to about 600 employees now. So that's a massive bit of growth in the last few years. The HR manager there was really against this apprenticeship levy, but I'm assuming that's specifically because they went over that threshold, where they need to now fund it…

R: Okay. Part of the problem…there's a lot of disinformation about the levy. Part of the problem is, if England…the apprenticeship levy in England, what happens is…let's say IP, £100,000 worth of apprenticeship levy in England. Yeah. I get told…so I can use all of that money. That money's mine. And I can use that to pay for my apprenticeships in England. In Scotland, I can't. In Scotland, the government takes…are going to take a hold of it and are going to put it in to the big pot. So I would be annoyed if I was a Scottish company having to pay the apprenticeship levy, because I don't have the same access to it.

A lot of it is also borne by ignorance as well, because it's not been…because again, the two governments have decided not to enter a proper dialogue about this. The Scottish government's behind in terms of where they should be. So people start to get annoyed at things because, one, they're seeing it as a tax, correctly so, but they're also seeing it as a tax without getting any benefit. Again, that's where the problem actually lies.

And one of the challenges that I have…really have with the apprenticeship levy in Scotland is that unlike England…whereas England is going to…it looks as if it's going to increase the amount of apprenticeship delivery. It will only substitute in the current funding mechanism. In other words, there won't be an additional number of apprenticeships created because of the apprenticeship levy in Scotland. It was a substitute – the levy –for the funding mechanisms that they have. One…pound out, pound in, kind of thing.

So I can understand why the employer in Scotland is getting a wee bit annoyed. And rightly so, if the truth be known.

I: Right. But it's not really the problem of the policy itself, it's the way the government's implementing the policy up here or changed it.

R: It's…yeah, it's the discord between Westminster and Holyrood. And one of the challenges is that the taxation…particularly taxation at this is not devolved and education is a devolved power. And unfortunately what happens is when you have two policies, one devolved, one…two areas…policy areas, one which is devolved, the other not devolved, you get discord. And you get disassociation between the two governments. And that's another thing is that, you know, they don't…for instance, the meeting we had with [organisation], we were talking about Graduate Apprenticeships. They have degree apprenticeships in England. And they didn't want to call them degree apprenticeships. They want to call them Graduate Apprenticeships. Why? They're determined to make everything look different. Does that make sense?

I: Right. Uhm-hmm. You see it in a lot of different areas, it's not confined to this.

R: It's not confined to this. I mean, for instance, we have this discussion and for instance, I…one of my colleagues has a guiding role. He has…although it's in clear ink, we can't quite see it, he has SNP and Scottish independence tattooed on his forehead. And he cannot understand why we insist on having a different training…he's a joiner by trade and he can't understand why we have a different training mechanism for a joiner in England than we do in Scotland, because hanging a door in England is exactly the same skillset as hanging a door in Scotland. So why do we choose to run different policies and different ways of doing things, different training mechanisms, different funding mechanisms and…? Because surely there's going to be some wastage of money going on in there, I would think anyway.

I: Yeah. Definitely. Right. Can I…I'll come back to that and I'll come back to independence and Brexit just in ten minutes or so…

R: Feel free by the way at a later stage to talk to me again, 'cause I appreciate I am…I'm bouncing all over the place. So don't worry about that…

I: Aye. No problem at all. I appreciate it. Could I just ask a wee bit more specifics about the sort of problems, either internal skill gaps within the company or external shortages? You come across…so that can be technical skills, soft skills, people skills, even managerial skills. Could you just talk to me a wee bit more specifics about what you see as being prevalent in the industry?

R: Higher level skills…applicable higher level skills are in short supply. These are where I see…for instance…and again it's an interesting thing, you said, we'll keep Brexit to the next topic. I think it's difficult to divorce the two. And here's why I think that. It's because like we say, we always…we look at particularly the [specific] industry. So I can only really speak great…with confidence and authority from the perspective of the industry in which I operate. But let's just say I have a [industry] company. And I have skills shortages at various levels, both in professional level right down…away down through my management structure down to my workforce. Yeah.

What currently I can do is I can under the law, under immigration law, under European law and so and so forth, I can go to Poland or send somebody over to an agency in Poland and I can bring over 200 people, construction workers, to go and do the construction work that I need done. Just as adequately and just as well as the Scottish workers. Don't let anybody tell you any different, 'cause it's a fact. Do it just as well.

Yes, there may be language issues. You try and go in to a building site and speaking to some of the Scottish guys, there's language issues with them, believe you me. You'll know where I'm coming from.

However, you try and go abroad and recruit professionals, people with graduate level or applicable graduate level qualifications like quantity surveyors, like design engineers, so on and so forth. These are harder to find. Much, much harder to find. Because you can't just…because at these levels, language becomes a far, far bigger barrier. Non compatible education systems becomes a far bigger barrier. So these are where we see the…there being a bigger need. Because they're harder to address by just, you know, scouring the marketplace throughout Europe and going…picking somebody else up.

So whereas, you know, getting workers at the lower level can currently be solved by bringing in migrant workers, the reality is the…the challenge is…a lot of the challenges at higher level can't be similarly solved by bringing in migrant workers. Which brings us nicely on to Brexit, because to target area of Brexit in terms of who they're going to attack first of all are people at the lower level. Whereas they actually make up by far and away the biggest population of migrant workers in the UK.

So you're actually going to have their target removed, the people who are actually…they only want to solve all the problems [at the present 46:48] moment in time. So interesting to see how that goes.

I: Right. Well the next question I've got there is just unavoidable at this point, what role do you see wages as playing? Because one of the big arguments is that if you want to fill a shortage, then just raise the rate…the wage rate or the salary that you're offering. What do you think of that perspective?

R: Right. Okay. Are you doing any paid work at the present moment in time?

I: I'm teaching, yeah.

R: You're teaching. Right. Okay. See if I came along and gave you ten grand extra on your salary tomorrow, would it make you a better teach instantly?

I: No.

R: Well…no it wouldn't, would it. If somebody's got the skills then they've got the skills they've got…given them. So automatically giving more…paying more money doesn't automatically solve a problem.

I: Right. I'll put it a different way though. Whenever I've been speaking to employers, one of the things that's really, sort of, came in to my mind is the distinction between just a general labour shortage or a specific skill shortage. And I think so much of what they've talking about is just lack of numbers. It's not really a lack of skills. So if you…a good example is the finance industry in the UK, specifically in the lead up to the crash in 2008. They were stealing a lot of the good STEM graduates because they were paying them more. It doesn't mean…you know where I'm going anyway.

R: No, a hundred per cent. Absolutely. We're in good…yeah, there is an argument that that's the case, that people will…once people get professional level qualifications, they will go with the money. They'll chase the money. That's…there's an argument on that, without a shadow of a doubt. What you do about it is a different kettle of fish. I'm not sure how that would necessarily be tackled.

I: I'm very sympathetic to the point you're making and one of my friends, he's a director in the [specific] industry as well and he was…his point was…it was brilliant. I asked him the exact same question about wages and he said, well that's true but you'd also attract a lot of numpties as well, attracted by the higher wage…

R: Aye, 'numpties' a good word, not often enough used in academic literature. But it's a fact. You know, simply by paying somebody more money doesn't necessarily make them better. One of the other challenges that again…that, yeah…that we have…and again, perhaps in terms of applicable skills is there are some sectors…and again, I can only speak both from…from [industry] than I can perhaps some other areas. But some areas, particularly high end technology areas, very…IT, software development and so on and so forth, the people went through university doing that. I would imagine a fair number of them. Maybe all of them, I don't know. Probably mess about with computers in their spare time for fun.

I: I made the exact same point to a person I was interviewing last week.

R: Right. So they're learning applicable knowledge all the time.

I: From a young age as well.

R: From…absolutely from a young age. Whereas certain sectors, it's a different type of applicable knowledge. It takes longer. It's more difficult to acquire. And you can't just rely on somebody doing it themselves. Because somebody isn't in their spare time going to go and design a building. They might go and design a new computer game. But they ain't going to go and design a building. Unlikely, unless they're, you

know, [inaudible 50:43], if you know what I mean. And it'd be an unusual trait, let's just say.

So that's one of the things, it's…and again it comes back to the…I suppose the applicable…interesting…an interesting analogy because it can probably be suggested that some…occasionally there's some job areas that aren't more…more require applicable…you know, sharing in how to apply knowledge than others, because people won't naturally learn that as consequences of just…consequence of just growing up, the way that we grow up just now. I've got a 12 year old boy and he's…well, he's 12 years of age and he's got a part-time job and his part-time job is helping to programme a new sports version of Facebook.

I: Jeezo.

R: So that…so that…it's natural. He doesn't even need to think. Because that's the world we're brought up with now. So unfortunately, yes it is money but it's how quickly these kid can graduate from university, can use their knowledge and get themselves good jobs. Construction does take a little bit longer. Engineering takes a little bit longer, which makes it…it's a…how we solve that one, I don't know. I don't know.

I: That's fine. I'm quite wary of time, so I do want to touch on the, sort of, main point of my PhD, which is how are successful companies mitigating these problems. Could you just speak a wee bit about the specific effects that these have on the business? Now, that could be losing…sorry…

R: How companies do or how they should?

I: No, how they do it at the moment. What…like, if you're thinking of the most…

R: How they do…

I: …successful companies in your industry, how are they getting round these problems?

R: How the successful companies…it's what they do…successful companies, the companies who I believe will not complain about the apprenticeship levy for instance who will get value for money from education and who will in the long term have the best results are those who align their internal development policies and internal development improvement programmes with the people…with the education system we're working on. Now, what do I mean by that? What's the best way…? It's rather than just…it's to have a plan.

Those companies who have a plan…because what you…what I find is a lot of companies I speak…they make decisions on the hoof. You know, they'll make decisions with…they'll get a new project. Oh we've got a new project this week, what do I…we need to go and recruit another [specific job role]. Oh no, we've got a budget of 40 grand and this guy's going to cost us 80 grand.

Whereas those who think ahead, those who look three/four/five years ahead and start to plan just now. For instance, who'll look at the…their current resource, their current workers who are loyal to them and say…tell you, why don't I put....why don't I put Wee Jimmy there? Wee Jimmy's got a wee bit about him. Why not…why don't I put Wee Jimmy through a degree? Why don't I put him through an MBA? Why don't I do…those who actively look at developing…pushing forward their own workforce are those…why? Because you rightly said, graduates won't be the highest paid because there's no loyalty built in. Whereas if somebody's been working for somebody for a while, they're seeing their employer develop them, that's worth as much as a guy on a wage rise, if you know what I mean.

So that for me…the companies that I see progressing and with the best prospects are those who look at their own staff and say, how can I develop my own people? And give them the best opportunities, rather than constantly looking to recruit new people to…almost on an emergency basis to fill skill shortages because it always becomes reactive. And if you do something reactive, like, it cannot possibly be efficient. And what you're not doing is you're not building loyalty and what you're also not doing is you're not…you're not necessarily getting the best candidate because you're reacting to a situation and you're taking people on who are not necessarily the best candidates 'cause you don't have the time to get the best candidates. So that's…these are the companies that we see doing…

I: That's absolutely great. That's what I've heard most. A lot of training in house, a lot of professional development, a lot of succession planning, mentoring schemes, that's the sort of thing I've been hearing a lot about.

R: That for me is…companies without that attitude are going to struggle. Companies with that attitude are going to struggle a hell of a lot less.

I: Yeah. Great. Just before we go then, what specific challenges do you see Scottish independence posing? I don't know if that's more or less likely a scenario now than it was two years ago, but…

R: The specific challenges I see Scottish independence…interesting…interesting question…I think it's a…maybe a question to answer now, now we've had the Brexit vote because I see it posing exactly the same kinds of challenges that Brexit is currently posing. And that is that what happens when we go independent? Because the vote would be we go independent. And then we would need to start thinking about what that actually means. And that's the biggest challenge, is that we…it would be a whole host of additional uncertainties. Who knows, how's the rest of the world going to react? How's the rest of the world going to negotiate with? It's all kinds of assumptions, that people will, you know…and I appreciate…I think Nicola Sturgeon did the right thing by going to Brussels and trying to say, okay, here's the case that we want. Absolutely.

But I think you're already starting to see that…telling everybody that you're going to have a good negotiating position and actually having one are two entirely different things. Boris Johnson did a hell of a lot of shouting and bawling about what, he was going to be telling everybody what to do. It doesn't quite work that way now, would you…. They don't actually have the foggiest idea. And my concern is what would happen on the day after the independence vote if it was to go independent? What

would be…what would the next step be? That for me is another whole level of uncertainty whereby, yes, we're independent, but what does it actually mean?

It's like Brexit means Brexit. You have that phase with Theresa May. One…independence means independence. But...aye, okay, right, what does it actually mean? Do I need a passport to get to England? Is there going to be a border? Am I going to be able to trade with England? I've got a company that's based in [city], trades in England. Am I going to have to move everybody down south? All these kind of questions…are we going to have the same currency? What the hell's…all these different questions that we don't have answers to. And it's…too many questions without answers ain't a good thing for everybody. And that's…it's just…it would just be…for me, another set of questions without anybody really knowing what the answers are going to be. Everybody's speculating as to, ah this'll be great, or, this won't be. Oh right, okay. A lot…it's a little bit like somebody promising…give me the keys to your house and I'll give you a better house. Well show me the house you're going to give me before I give you the keys. Ah well, we can't quite do that yet. That's what happened with Brexit in my opinion.

It would do. But 'til such times as we know whether Britain's going to have free access to the…'cause if you think about this, I mean, ironically, here's the…the ironic possible outcome is that what could happen is Scotland could vote for independence in the next couple of years, let's just say that. And let's just say Britain…the UK government or the remainder of the UK are…agreed a free trade agreement with the rest of Europe, Scotland wouldn't be guaranteed to have a free trade agreement either with the rest of the UK or with Europe. You can end up with the worst of both worlds and 'til such times as we know what's actually going on. You know, it's the worst of both worlds. It's almost a…we give…one set of uncertainties…in my opinion, one set of uncertainties has never been assisted by adding another layer of uncertainty on top of it.

B: [Voices overlap 59:24].

I: Aye. No, that's totally fine. I'm really wary of time, so I think I'll let you go just now. Right. Great. I really appreciate your time today anyway.

R: No. No bother at all.

I: And if you're on the campus then, just give me an email and I'll meet you for a coffee or whatever.

R: Good man, Ross. Alright. If you need any other help, anything else, buddy, don't hesitate.

I: I will do. Thank you very much. Right, cheers, [personal name].

R: Okay. Cheers now. Bye for now. Bye.

I: Bye. Bye.

End of transcript