University of Strathclyde

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Assessing the effectiveness of government policies to stimulate the supply of early-stage risk capital: evidence from Scotland.

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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: 19-12-21

Abstract

Early-stage risk capital, in the form of business angel investments and public venture capital funds, have long been believed to be important sources of capital for the formation and expansion of small businesses, so much so that increased policy monies have been diverted towards encouragement of these sources of funds with the belief that they contribute to economic development. This belief however has remained an expression of faith as there has been little convincing research to substantiate that point of view as data challenges have left the area under-researched.

Having obtained primary data from Scottish business angel syndicates and their investee companies, this study argues that indeed these policy monies have contributed to economic development. By using a mixed methods approach and developing a novel analytical tool, this study argues that the policy monies invested in incentives to encourage business angel investment flows of capital and in public investment funds to enhance the investment volume of capital in the market do indeed create added economic value in the Scottish economy, both in term of economic growth as well as job creation. The work is conducted using an extended methodology of the approach recommended by the Scottish Government and the findings are placed in the context of the Scottish economy.

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Glossary

*	This symbol stands for ‘important’ in the survey discussion
ACF	Angel Co-Investment Fund
AIIF	Australian Innovation Investment Funds
AIM	Alternative Investment Market, London
ASE	Australian Stock Exchange
AVCAL	Australian Private Equity & Venture Capital Association
BA	Business angel or angel investor
BAN	Business Angel Network
BBB	British Business Bank
BES	Business Expansion Scheme
BIS	Department of Business, Innovation and Skills
BVCA	British Venture Capital Association
Counterfactual	also called the base case. It is defined as the number of positive outcomes that would have been observed amongst the eligible population if the programme was not in place. In most evaluations the counterfactual will be measured (with varying degrees of accuracy) using a control group who are not in receipt of the programme.
CVC	Captive Venture Capital Funds
DBIS	Department of Business Innovation and Skills
DAA GVAIA	Discrete Annual Approach Gross Value Add Impact Analysis
Deadweight	The extent to which policy interventions are not resulting in any additionality: for example, SE supports a company, but the company does exactly what it would have done without the support. In such a case deadweight is 100% as the outcomes and impacts would have been exactly the same if there had been no SE intervention.
Displacement	Negative effects on Scottish competitors
ECF	Enterprise Capital Funds
EIB	European Investment Bank
EIS	Enterprise Investment Scheme
EIS/SEIS	Enterprise Investment Scheme/ Seed Enterprise Investment Scheme
ERDF	European Regional Development Fund
EU	European Union
Exit	A liquidation event which enables investors to cash out
FAME	Database - Forecasting Analysis and Modelling Environment
Financial Instrument	A contract that creates a financial asset for one entity and a financial liability for another
FI	Financial Instrument – both policies considered in this thesis are FI policies
Formative evaluation	is evaluation undertaken to provide information that will be used to improve a programme

FTE	Full-time equivalent employee
GVAIA	Gross Value Add Impact Analysis – recommended policy evaluation methodology in Scotland
GBP	Pounds sterling
GFC	Global Financial Crisis
GLF	Guaranteed Loan Fund
GMM-SYS	System Generalized Method of Moment – an econometric technique
GOP	Gross Operating Profit
Gross	This is the calculated number pre additionality and policy costs adjustment
GVA	Gross Value Add
GVAIA	Gross Value Add Impact Analysis
Herfindahl Index	a measure of the size of firms in relation to the industry they are in and an indicator of the amount of competition among them.
HGF	High Growth Firm
HNWI	High Net Worth Individual
Hybrid Fund	An investment Fund which is funded from both public and private sector sources.
I	Investment
IOM	Input Output Model
IOT	Input Output Tables – a matrix created by the Office for National Statistics which likes all the sectors of the economy together which enables their contribution to GVA to be calculated
IP	Intellectual property
IPO	Initial Public Offering
IVC	Independent Venture Capital Funds
Leakage	Effect due to non-Scottish factors. An example would be supplies come from abroad which is a higher percentage than typical of the industry
LEC	Local Enterprise Company
LINC	The Scottish Angel Capital Association
LGF	Loans Guarantee Fund
Net	This is the policy result after having been adjusted for additionality but not the costs of providing the policy
OLS	Ordinary Leased Squares – an econometric technique of estimation
Pareto Optimality	The state at which resources in a given system are optimized in a way that one dimension cannot improve without a second worsening.
PRVC	Private Venture Capital Funds
PVC	Public Venture Capital Funds
RDA	Regional Development Agency
RGF	Regional Growth Fund
RVCF	Regional Venture Capital Fund

S	Syndicate
SBIR	Small Business Innovation Research Programme
SCF	Scottish Co-Investment Fund , a passive fund established in 2002 investing alongside private sector partners.
SDA	Scottish Development Agency
SDF	Scottish Development Finance
SE	Scottish Enterprise – one of Scotland Economic Development agencies
SEP	Sottish Equity Partners
SIB	Scottish Investment Bank – a subsidiary of SE that undertook investment activities during the research period.
SME	Small and Medium sized Enterprises
Substitution	The event when a company deliberately stops doing an activity to take advantage of public sector financial support.
Summative evaluation	An evaluation used to form a summary judgement about how a programme operated
trans	transactions
SVF	Scottish Venture Fund, another fund managed by SIB.
VC	Venture Capital
VCT	Venture Capital Trust
VICO	a database on young high-tech entrepreneurial companies operating in seven European countries (Belgium, Finland, France, Germany, Italy, Spain, and the United Kingdom).
YCF	Young Company Finance – a data gather on early-stage financing, funded by SE.

1 Chapter 1: Introduction

This chapter gives an overview of the of the two policy tools studied in this thesis and the market they are seeking to address. Some history as to the two providers of capital is presented as well as their profiles. It describes the profile of the typical BA and the type of capital they provide. The research questions of the thesis are presented as well as the structure of the study.

1.1 Background

The study of the effectiveness of financial instrument (FI) policy in stimulating the supply of early-stage risk capital remains under-developed. Business angels (BAs) are now one of the biggest providers of early-stage risk capital in the UK with early-stage risk capital being that capital provided to companies in the early years of their development alongside Private Venture Capital Funds (PVCs) (Pierrakis, 2011).

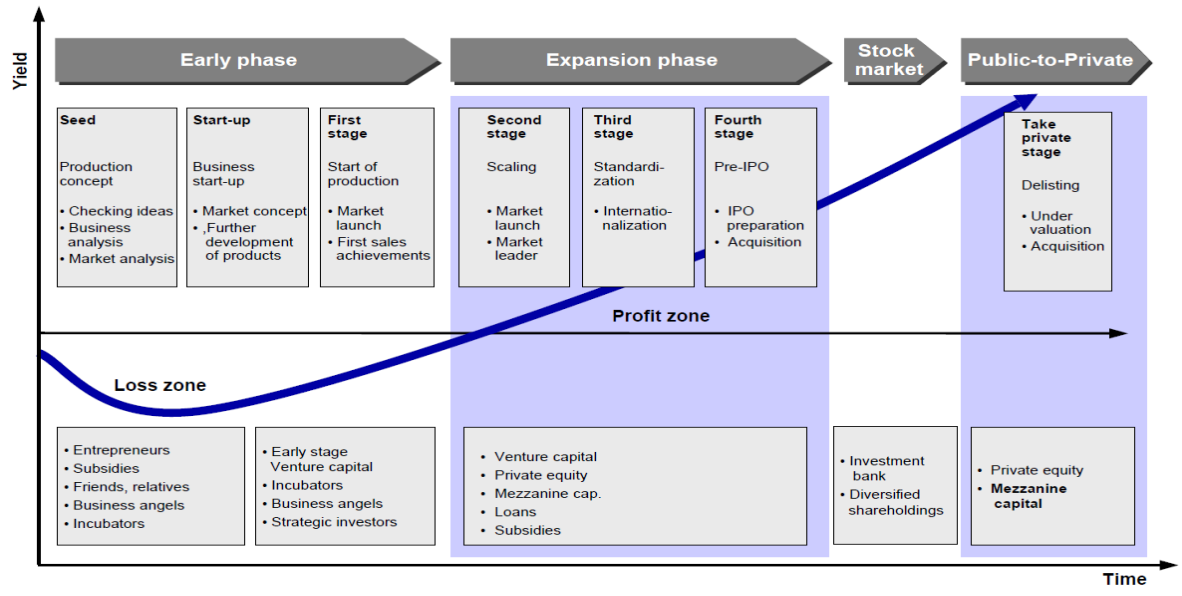

Figure 1-1: A company's financial life cycle

Source: Natusch (2003); OECD (2013); Wilson and Sylva (2013)

The diagram above splits a company's growth journey into seven phases. Seed, start-up and first stage are considered the early stage of the company's journey. The expansion phase also includes three stages those of scaling, standardisation or internationalisation and pre-IPO and the latter stage deals with the company becoming public and delisting again. It is the initial stage that this thesis addresses. This diagram shows that early-stage companies are not generally expected to make profit, and many may be pre-revenue.

BAs are individuals, who use their personal wealth to provide risk capital to third parties and, as such, are a private market for direct finance (Berger & Udell, 1998). Their investments can vary, from films, to businesses amongst other things, and their money is given most often for an equity stake, although debt finance and convertible loans can also occur. They may operate individually or in groups known as BA syndicates or Business Angel Networks (BANs). They exhibit different investee interests and investing patterns (Sørheim & Botelho, 2016) but together play a very important part in the financing of innovative new businesses as they are willing to put risk capital on the table long before the formal investors participate (Tenca et al., 2018) and this was even more so during the period of this thesis – 2003-2017 - as formal investors retreated, seeking less risky opportunities (Mason, 2009b). This appetite for risk taking is particularly beneficial for company formations, where often there is no revenue or assets to give comfort, so faith is required.

Opinions differ as to the profile of such investors, with Madill et al. (2005) and Aernoudt (2005a) seeing them as high net worth sophisticated investors with great business knowledge, who are willing to invest and get involved with unconnected investments, to a more common definition today, which includes professionals with similar interests and intent (Tenca et al., 2018). Regardless of who they are, their capital has been used to facilitate economic development despite there being little concrete evidence of that fact to date.

The difficulty for UK small companies to access finance had been a frequent topic of discussion and area of policy support for a long time so when BAs were introduced as the largest available pool of risk capital to support entrepreneurial activities and

deemed essential for funding the growth of high-tech ventures, despite the challenges of knowing who they were and the extent of their activities (Wetzel,1983), global interest was sparked. BA activities were not well known and there was a desire to know who BAs were, their criteria for investing and how to access this capital (Landström and Sørheim, 2019; Sohl et al., 2018; Mason and Harrison, 1999).

Much of the early BA academic research in the 80s and 90s was one of discovery with attempts to define the market, the attributes of BAs and types of investments they undertook of which Mason and Harrison were pioneers in the UK although research was being undertaken elsewhere (Mason & Harrison, 2000a; Mason and Harrison, 1999; Freear et al., 1995; Freear & Wetzel, 1990; Aram, 1989; Gaston, 1989). During that time their importance as capital providers was established with the belief, that in comparison to the institutional investors, they supplied between 2 to 5 times more capital to early-stage deals and financed as many as 30-40 times the number of ventures (Freear et al., 1997; Mason and Harrison, 1996, 1993; Wetzel, 1987).

Funds from BA investors have attractive features. Firstly, although sharing cyclical characteristics with other forms of financing, as will be discussed later, they tend to be resilient. During the Global Financial Crisis (GFC) in 2008, BAs continued providing capital to their investee companies, when bank lending, equity release re-mortgage opportunities and early-stage VC dried up as sources of funds for early-stage companies in the UK (OECD, 2011; Mason and Harrison, 2015; Botelho et al., 2018). Secondly, they tend to invest locally, which results in them financing a much broader and diverse set of economic development opportunities than formal investors and creating local spill over effects which are extremely beneficial for regional development in areas where VC local coverage is light as it creates more opportunities for a wider range of skill sets (OECD, 2011; Aernoudt, 2005a). Institutional investors tend to suck capital from the regions to the financial centres where their firms are located so this type of investment is very economically beneficial (Mason and Harrison, 2008; Mason and Harrison, 1991). Keeble (1989) shows the depressed areas of Northern England and the Midlands were net exporters of capital to Cambridge reflecting a similar phenomenon in the US where Florida and Kenney (1988) and

Leinbach and Amerheim (1987) show that the less developed central States are capital providers to the markets on the East and West coast. Such thinking supports Lerner's comment that a deep market and exits are needed for entrepreneurial things to thrive (1999).

Other attractive features of BA finance are a) its price or cheapness as there are less management structures and other interests to support b) quick decisions c) the outcome that BAs usually add value to their investments (Aernoudt et al., 2007) d) lower rejection rates, e) longer exit horizons and f) target lower returns (Harrison and Mason, 1993). It is precisely these advantages that supported the recommendations of Aernoudt (2005b, 1999) and OECD (2011) for policy measures to stimulate more angel investing to further economic development to shift the supply curve of such funds outwards. It has been the discovery of this large pool of capital and its attractiveness. which has resulted in indirect FI policy measures to stimulate its supply in the form of tax incentives The growth in digitalisation, the internet and the 'new economy' in the 90s. with its belief that competitive advantage was determined by knowledge and intangible assets, led policy makers to believe additional armoury was required in the form of government funded venture capital and so direct FI policy tools were also made available.

PVCs are a direct policy tool that invest in the early-stage risk capital market. They have been developed since the 1990s and are now well established in the Scottish eco-system. Governments believed steps were required to help fund the research and development early years of 'new economy' companies as little internal finance would be generated and such companies were required for the future growth of the economy. Scotland was a forerunner in such thinking established their first PVC in 1994. It was a hybrid fund run by Scottish Equity Partners (SEP), a government agency, with the first ever guarantee provided by the European Investment Bank (EIB) (Hood, 2000) The UK government followed later with the Competitiveness White Paper in 1998 and committed £270m to form an Enterprise Fund which was an array of sub-funds to work in partnership with the private sector to provide capital to the early-stage SMEs struggling to access to finance (Nightingale et al., 2009; UK Parliament, 1998).

1.2 The focus of this study

This study focuses on the two early-stage risk capital FI policy tools operating in Scotland during the period 2003-2017 - those of the indirect Enterprise Investment and Seed Enterprise Investment Schemes (EIS/SEIS), which provided tax incentives for private individuals, but are largely used by BAs (British Business Bank, 2017), and the direct PVCs run by the Scottish Investment Bank (SIB), the investment bank of Scottish Enterprise (SE), one of Scotland's economic development agencies. The Scottish Co-investment Fund (SCF) was launched at the beginning of the research period and was the flagship fund throughout and is thus the principal focus of this study regarding FIs.

Both policy tools were to facilitate funding for newly formed businesses and to offer help in their development journey. Entrepreneurial activity was being encouraged and local assets the focus of investment to encourage endogenous economic growth and comparative advantages of regional competitive structures (OECD, 2005; Audretsch and Thurik, 2001; Romer, 1994). It is that macroeconomic level that this thesis considers whether indeed this provision of early-stage capital resulted in the delivery of economic benefit.

It should be noted, however, that the early-stage eco-system in Scotland is a myriad of complex relationships with poor or non-existent data and any attempt at determining causality is sure to fail. It is difficult to identify all the variables which are affecting any defined relationships, never mind the relationships themselves. Considering that, this study is not attempting to address causality, but rather an attempt to lift the lid on a system underpinned by the assumption in the literature that there is an equity gap due to market failure in early-stage risk financing and government action is required for improvement. It does not seek to make causality or correlation claims but reflect historical facts using an enhanced public sector prescribed methodology and a consideration of the context in which they occurred.

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1.3 Research questions

This thesis provides a richer picture of the tools deployed regarding the use of early-stage risk capital in economic development than has been painted to date. Most research in this area has generally focused on one policy tool in isolation and its success in one economic stratum or at most two. In addition, the economic back drop, the policy implementation context, and the existence of other policies have rarely been discussed at length, although are often believed important (Pechard et al., 2017; Carpentier and Suret, 2016; National Audit Office, 2009; Coopey, 2005).

In contrast, this thesis has the objectives of considering outcomes at each level of the economy – macro, intermediate and micro – with real data over a long time period which provides a greater depth of understanding than most research conducted in this field. There are already published results from survey and the Scottish study showed that front-end tax and low capital gain tax incentives, such as the benefits of the EIS, were the most influential factors in enticing the flow of BA capital (Mason and Harrison, 2002a; 2000b). These studies considered one policy tool – the EIS. In contrast, to gain a richer perspective of investors' psychology and behaviour. this thesis also explores BAs attitudes to the SEIS, their thoughts on the provision of PVC money, on the form of the PVC and on its importance to their continued provision of capital. Other extensions of that previous research covered in this thesis explore the degree to which the BAs are motivated by the economic outcome of those policy tools such as creating jobs or economic growth and the creation of a policy additionality statistic to enable the macroeconomic analysis of the policy which links directly to the data it is referring to.

At the company level the research interest in this study was to explore disaggregated company turnover data to give insight into company's growth profile over time after receiving investment to extend existing research which typically considered short time periods and concluded these tools were ineffective. This complements for example the work of Boyns et al. (2003) and Cowling et al. (2008) who evaluated the effectiveness of EIS/SEIS policies at the company level.

At the macro-economic level this study hopes through its study of a 15-year time period, consideration of the context and use of real data to add different dimensions to the work of MWC (2016), Harrison (2018), Hayton et al. (2008), who found the SCF had been a large contributor to the success of early-stage investment in Scotland at the macroeconomic level and levering additional funds. The leverage of other funds has also been looked at for the EIS policies as well the creation of turnover growth and job creation Boyns et al. (2003), however this work takes that analysis one level up to the GVA being created and consider the context thereof. In so doing it hopes to respond to the work of Carpentier and Suret (2016) who raised the following points as challenges within this field of research – the superposition of policy, data access, short studies and little consideration of the economic backdrop and the work of Pechard et al (2017), National Audit Office (2009) and Coopey (2005) who emphasise the importance of context.

The study hopes to begin the debate within academia responding to the call for a requirement to consider the government's role in the provision of such policies and the effectiveness of the policies themselves. In the editorial to the then new journal *Venture Capital: An International Journal of Entrepreneurial Finance,* Mason and Harrison (1999) outlined the lack of debate, of examination of the advantages and disadvantages and of the impact of government intervention in the informal capital space and claimed back then

> The whole issue of government's role in the supply of venture capital therefore remains a high priority for further research
>
> Mason and Harrison (1999, p.19).

In 2009, a similar plea was made in respect to the policy support for BA investment

> 'Supporting the informal venture capital market has […] been largely an act of faith by governments'
>
> Mason (2009a, p 550)

Mason made a call to governments to create processes, methodologies and systems whereby data could be garnered to establish trends in the early-stage capital market, especially BA activities, so the need for government policy intervention could be demonstrated and any impact measured, so the faith exercised in the effectiveness of those policies could be substantiated or disproved.

Almost twenty-eight years later from Mason and Harrison's plea the request is restated with the voice of White and Dumay (2017)

> Future research must focus on the accuracy and efficacy of government policy in different economic contexts. Further, research should be longitudinal to determine contextual factors which may impact the effectiveness of policies and to identify where adjustments are necessary. We call for researchers to investigate the accuracy and efficacy, and compare both supply and demand side policies and attempt to determine if these types of policies address the problems associated with using public funding to finance entrepreneurial ventures, as outlined by Shane (Shane 2009).
>
> Of importance is the use of co-investment funds (CIFs) as a means of addressing the equity financing gap and to aid in the development and professionalisation of the angel financing market (OECD. 2011). To date, there is relatively little literature on CIFs and their impact and effectiveness (Owen and Mason 2016)
>
> White and Dumay (2017, p.203)

The study will take primary micro data from BAs and their investment transactions and will link that through to evaluate macro-economic outcomes in terms of cost per job and the value of GVA produced by one pound of policy money. The aim is to consider whether these tools achieve the governments' strategic goals of economic development. As these outcome numbers are created through the interaction of individual economic agents and their actions, the study will also consider the context

of this research period, which is believed to be as an important, if not a more important contributing factor, to the outcomes of the research than the numbers themselves.

The research questions are:

1. How effective have indirect FI policy tools, namely SEIS/EIS, been as economic development tools in Scotland during the period 2003-2017?

2. How effective have direct FI policy tools, namely PVCs, been as economic development tools in Scotland 2003-2017?

Effectiveness is judged by the descriptive numbers produced and a consideration of the context in which the early-stage risk policies operated, which is discussed in Chapter 3. Economic development in this context is measured as GVA created per one pound of policy money spent and the cost of each new job.

1.4 Methodology

To answer the research questions, this study deployed a mixed methods approach. The research focused on two elements – one was a consideration and determination of the context, in which the tools were deployed, and the other was the determination of macroeconomic variables to gauge the economic development success of the tools in numeric terms.

In the case of the former, data was collected through a series of interviews with people who had been involved with the launch of the SCF, some users of both policy tools, some policy makers, support professionals and academics. They were asked about both policy tools and what they believed were key to their design and implementation as well as their view on the experience of the each of the tools within Scotland at that time. In addition, a survey was taken of BAs to gather their views on the policies and update previous research. Lastly, data on the turnover and FTEs of investee companies was analysed to review the growth profile of such companies. Other contextual issues

were reviewed through desk research with a review of the literature and documentation analysis.

To get some numeric measure of policy effectiveness, the methodology to judge policy effectiveness recommended by SE was adapted and a novel Discrete Annual Approach Gross Value Add Impact Analysis (DAA GVAIA) approach developed. Like the SE methodology the output from the analysis is the £GVA per one pound of policy money spent however the discrete annual approach allowed each calendar year to be considered as a discrete entity and enabled a greater productivity of the data. The data used in this methodology is a mixture of primary data and secondary data sources. The primary data sources are as follows:

a) behavioural data through a survey of Scottish BAs. This was used to calculate the additionality statistic

b) financial and operational investee company data from the investee companies of four Scottish BA syndicates either from the records of the investing BA syndicate or directly from the companies themselves

c) primary investment transaction data from the four BA syndicates pertaining to these investee companies

All the secondary data was from either UK or Scottish government sources. The output from these macro analyses for both the tools was then contextualised within the Scottish economy through a relative analysis with national numbers of Scottish GVA and employment and an additional policy tool was included in the analysis, that of relevant SE expenditures in 2016.

1.5 Structure of the thesis

The thesis is organised as follows: Chapter Two considers the role and actions of government firstly generally and then with respect to the policies of the study – the EIS/SEIS and PVCs – and similar policies It begins with a conceptual introduction to policy – making, where the HM Treasury model is discussed, followed by a discussion on the role of government within the neo-classical and institutionalism economic

theories as these theories are very different, yet both are drawn on in this research. The emphasis of the chapter then moves on to the policy tools themselves, where the political context behind each of the tools is considered and they are introduced in terms of their objectives, their design, means of implementation and are appraised, to be followed by a consideration of how policies are evaluated. The rest of the chapter undertakes a literature review of extant research which has considered these policies specifically and other similar FI policies elsewhere. Research on PVCs is more developed that that on the EIS/SEIS and the focus of the research can largely be split into research which focuses on economic outcomes and that where the focus is financial. In the literature review section for the PVCs a few of the main themes in the literature are considered namely that PVCs are not successful policy tools; that hybrid funds are successful; the role and challenges of PVCs as economic development tools and then consideration is given to each of the economic and financial streams of analysis. This section concludes with an overall critique and outline of the necessary considerations for successful research in this area as well as the rationale for the methodology chosen for this study.

Context is a very important aspect of this work, and this is discussed in Chapter Three. The subject matter involves the demand and supply of risk capital for early-stage businesses and economic development, which occur within economic cycles and are subject to underlying trends. Risk appetite varies over the economic cycle both in terms of the those investing and those undertaking entrepreneurial activity and trends result in a repositioning of important competitive landscapes and influences. A lack of contextual consideration has been highlighted as one of the failings in this area of research (Carpentier and Suret, 2016) and yet is one of the main determinants of policy results, good and bad, as can be seen by the success of the Yozma programme and the lack of success of the DBIS Venture Capital Fun (National Audit Office, 2009; Avnimelech et al., 2007, Ehrlich, 2004). Important topics are presented to provide context for the Scottish risk capital market during the research period, those of the growth of institutionalism, SME Capital risk policies, the supply of VC capital and the importance of economic cycles which includes a data comparison section. It also considers the deepening and widening of BA investing, the retreat of PRVCs from

early stage investing, some pertinent macroeconomic trends, differences between PRVC and BA investment and PRVC and PVC parameters.

Chapter Four presents the research philosophy and methodology of this work. It outlines the rationale for the choice of a social constructionist approach to the work and includes a detailed discussion of the mixed methods approach deployed, referencing conventional mixed method styles presented in academic literature as well as their advantages and disadvantages. The methodology section is split into two parts and the methods of analysis described in turn for the determination of the context and that of the macroeconomic output. A mix of qualitative and quantitative methodologies are used in the context determination such as documentary analysis, a review of literature, a survey, and semi-structured interviews. The macroeconomic analysis employs a series of quantitative methodologies in the analyses undertaken. These likewise fall into two parts - the first to ascertain an effectiveness measure for each of the policy tools, and then with them working together. The novel DAA GVAIA and jobs analysis which connects the micro data to the macroeconomic outcomes is described in detail and is considered a contribution to knowledge due to the resultant increased data productivity. The second part of the macroanalysis seeks to contextualise the results within the national Scottish economy and with the consideration of superposition of policy.

Chapter Five describes the data used in the analyses. It covers the four distinct data sources used in this work – individuals, BA syndicates, companies, and government. Primary data for this study comes from individuals, BA syndicates and corporates, and secondary data is comprised of government datasets. The semi-structured interviews were the only qualitative data source in this work; all other sources are of a descriptive quantitative nature.

The data from individuals involved opinions, facts and historical information and was collected via semi-structured interviews and a survey. Four Scottish BA syndicates helped with this work. They provided data on the investments they made or had made over the study period and these investee companies was the complete sample of

investee companies included in the analysis. Turnover and FTE data was collected for those investee companies. As discussed in the last chapter these data points were paired with the investments undertaken by the BAs to create input data for the DAA GVAI and jobs analysis for the research question regarding the economic development effectiveness of the EIS policy tool. To answer the research questions pertaining to the economic development effectiveness of the PVC policy tool, the PVC policy money could be determined from the BA investment data and that was then paired with the companies that received that money for the DAA GVAIA and jobs analysis for the PVC policy tool. That analysis is discussed in Chapter Seven. For each of the primary data series the chapter includes a discussion of its representativeness of the population as a whole. In addition, for the investment data a comparison is drawn with another study within the PVC literature so explore the importance of size in explaining the effectiveness of PVCs (Grilli and Murtinu, 2014a).

The secondary government data used in this study is the annual EIS and SEIS data for Scotland, national statistics on employment and GVA, industry GVA and macro-economic multiplier data from the IOTs and financial data from SE. The government data fulfilled one of two purposes. Firstly, the EIS/SEIS, GVA, Employment and SE Accounts data was used to evaluate the representativeness of the samples and results and, in some cases, provide context. The IOT data provided input variables for the DAA GVAIA and Jobs analysis in the form of economic multipliers and industry GVA statistics. Information on these data sets is presented. The final part of Chapter Five reviews the input into the DAA GVAIA and jobs analysis for each of the policy tools. This analysis had four separate samples which are explained in detail.

Chapters Six and Seven are the data analysis chapters. Chapter six is in two sections. The first section considers the responses to the BA survey and the second considers the nature and growth of the sample investee companies. The BA survey analyses consider five subjects. Firstly, the survey data is considered to explore the degree to which BAs were motivated to increase their supply of capital by the FIs. Secondly, their responses in relation to the larger strategic policy outcomes of job creation and economic growth are considered. Thirdly, the policy instrument questions are

considered, and the results are used to ascertain an appropriate additionality adjustment for the DAA GVAIA and Jobs analysis for the EIS/SEIS and PVC data sets. Penultimately, the results are compared with conclusions drawn by Mason and Harrison (2002a) on the behaviour of angel investors and how that might have changed after sixteen years. Lastly, the results are considered in light of the research questions. New policy areas explored in this section of the research are BAs attitudes to SEIS, their thoughts on the importance of PVCs and their form and how these factors may influence their continued provision of capital.

In the second section of the sixth chapter the growth of the investee companies being the engine of connection between the investment by the BAs and the creation of economic and job growth at the macro level is considered and the intent of the EIS to enable a sufficient supply of finance for small firms into sustainable profitable businesses (HM Treasury, 2008). How sustainable are these businesses and how long does it take? This section of the chapter considers the length of time it took for turnover and job growth to happen for the sample companies. In Chapter Two the literature reviewed concluded that EIS and PVC were ineffective policy tools and provided no benefit to the recipient companies, some of the time periods of the studies were short, however. The intention in this section is two-fold, one is to consider a longer time period and the level of turnover and jobs created in more detail, to gain insight into the growth trajectory of early-stage businesses. This analysis hopes to build on both EIS and PVC research, which considered short time periods such the work of Cowling et al. (2008), which did comment that the short time period could be an explanation for the negligible company benefits they found in their evaluation of EIS policy and in the PVC area; MWC (2016) and Hayton et al. (2008), whose studies were less than five years; Nightingale et al. (2009) findings of negative results with the use of a small concentrated data set. The second intention is to explore the data set skew, which is cited as rendering OLS econometric modelling ineffective with data sets such as these. With this analysis, it is hoped to build on the work of Nightingale and Coad (2013), who challenged the use of averages as being representative of the entrepreneurial firm particularly in econometric modelling due to data set skew.

Before the conclusion to the chapter, which summarises the findings of the analyses, the chapter ends by considering both sets of analysis in light of the research questions.

Chapter Seven answers the research questions outlined in section 1.3 above and pulls many of the previous chapters together. It applies the DAA GVAIA and Jobs analysis methodology, outlined in Chapter Four, to the primary and secondary data inputs, outlined in Chapter Five, and deploys the EIS/SEIS policy additionality figure of 80% and PVC additionality of 68.5% derived from the chapter six survey results. This chapter looks at the value of GVA created per £1 of policy money spent and the cost of each new job created for each of the policy tools over the research period 2003-2017, to respond to the research questions and undertakes other analyses to expand on these results. As discussed in the methodology section in Chapter Four, the results are presented as averages which, as was seen in Chapter Six, is a useful summary statistic but can camouflage a wide dispersion of data. In this case though, the interest is not in the 'average entrepreneurial firm, and each turnover and FTE number is linked back to the investment data that created it.

The series of DAA GVAIA and jobs analyses conducted in this chapter are as follows: the two metrics for each of the policy tools individually, then, for them combined and then, after a discussion on VC cyclicality and its effects, the combined results are considered in the context of superposition of policy, as discussed in Chapter Three and lastly within the context oof the Scottish national economy.

The first analysis looks at the cost per job and value of GVA created per one pound of policy money spent in SEIS/EIS tax incentives. This is followed by the same two metrics calculated for the money invested by the PVCs in the sample companies. The third DAA GVAIA and Job analysis considers both policy tools together. This dual analysis presents a truer picture for Scotland as both these policies do operate together and are heavily interconnected due to the BA being partners of the PVC funds (Interviewee B, 2015, Interviewee D, 2015).

The next analyses consider contextual issues and includes a discussion of the effect of VC cyclicality, an analysis of policy superposition by considering addition monies dispersed by SE following the methodology outlined in Chapter four, followed by a contextualisation of the results within the Scottish economy, as a whole. Finally, the degree to which the tools lever other funds is then considered.

Chapter eight is the concluding chapter. It provides an overview of the research context and aims, methodological approach, key findings, contributions of knowledge as well as implications of this work for policy rationale and design, recommendations for future research and the limitations of the study.

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2 Chapter 2: The role and actions of Government

2.1 Introduction

The chapter considers the role and actions of government generally, then with respect to the policies of the study – the EIS/SEIS and PVCs – and similar policies. It begins with a conceptual introduction to policymaking where the HM Treasury model is discussed, followed by a discussion on the role of government within the neo-classical and institutionalism economic theories as these theories are very different, yet both are drawn on in this research. The emphasis of the chapter then moves on to the policy tools themselves, where the political context behind each of the tools is considered and they are introduced in terms of their objectives, their design, means of implementation and are appraised, to be followed by a consideration of how policies are evaluated. The rest of the chapter undertakes a literature review of extant research which has considered these policies specifically and other similar FI policies elsewhere. Research on PVCs is more developed that that on the EIS/SEIS and the focus of the research can largely be split into research which focuses on economic outcomes and that where the focus is financial. In the literature review section for the PVCs a few of the main themes in the literature are considered namely that PVCs are not successful policy tools; that hybrid funds are successful; the role and challenges of PVCs as economic development tools and then consideration is given to each of the economic and financial streams of analysis. This section concludes with an overall critique and outline of the necessary considerations for successful research in this area as well as the rationale for the methodology chosen for this study.

2.2 Conceptual discussion of government intervention/action

Governments can take many forms and have varying priorities, which influence their actions within their environment. Policies are the tools used by governments to attain their strategic ambitions as outlined below in the quote from the Scottish Government.

> A policy is a statement of what government is trying to achieve and how it will do it. Policies describe the work the Scottish Government is doing to achieve its strategic objectives.
>
> Scottish Government, n.d.

. Policies originate from varying sources such as those listed below:

1) Electoral promises
2) In response to events or situations e.g. the Paris agreement on climate change
3) As a result of legislation
4) The government's engagement with external parties and formal consultations
5) The lobbying of ministers
6) Research which can be used to inform policy formation

(British Ecological Society, 2019)

It is hoped that policy outcomes deliver some social benefit and the value of that benefit to society is greater than the cost of providing it. Overleaf is a diagram from the Green Book issued by HM Treasury, the government agency behind the EIS/SEIS policies, which gives a broad outline of how policies work conceptually (HM, Treasury, 2020). The diagram shows that once the rationale for a policy has been determined, the expected outcomes and their net benefit to society are considered for each policy option as well as the process by which they will be delivered. During this process the policy is designed whereby the beneficial agents of the policy, its enabling entities and its means of implementation are identified. Once the policy has been designed it is then implemented.

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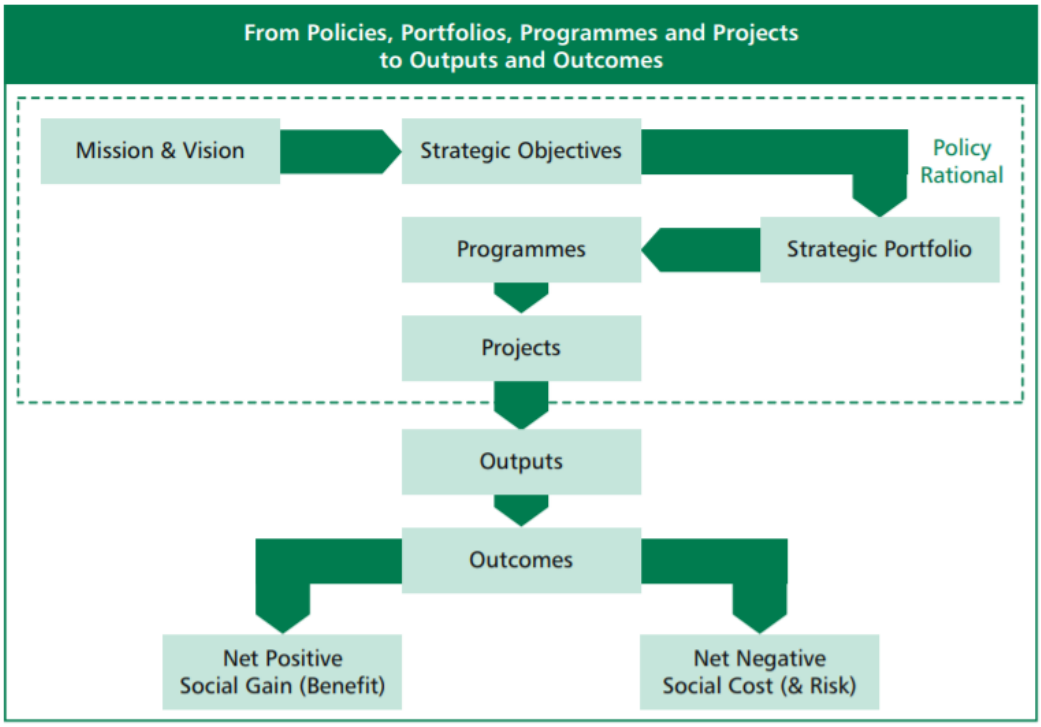

Figure 2-1: From Policy to Outcomes

Source: HM Treasury, 2020, p.14

From this diagram it can be noted that for the UK Treasury, there are strategic objectives relating to the UK Government's overall mission and vision.

This mission and vision are then broken down into a strategic portfolio of programmes which comprise of various projects which may encompass one or a group of policies. The interest then is a consideration of the outcomes of the policies and a consideration of their benefits and costs.

2.3 The developing role of government

Nations' governments vary as to their role and size resulting from a combination of ideological, political and economic influences, preferences for which, in democratic countries, are usually expressed by the electorate through the ballot box. Over the years thinking around the role of government has changed, but there is general understanding they add value to society by treading the narrow path exercising self-interest for two

purposes – that of the common good along with the well-functioning of government - whatever the electorate's political preference (Medena, 2004). President Theodore Roosevelt, one of the Presidents during the Progressive Era in the US, when the focus was on eradicating corruption in government emphasised this

> …the object of government is the welfare of the people. The material progress and prosperity of a nation are desirable chiefly so long they lead to the moral and material welfare of all good citizens.
>
> Roosevelt (1910, p.10)

Material progress, prosperity and economic growth are commonly measured financially by growth in in a nation's Gross Domestic Product which, despite its drawbacks, remains the main gauge for material well-being (The Economist, 2016). Sustainable economic growth is viewed as the main driver of higher welfare and the Scottish Government say their purpose is

> …to focus government and public services on creating a more successful country, with opportunities for all of Scotland to flourish, through increasing sustainable economic growth.
>
> Scottish Government (2016, p.1)

A theoretical consideration of government policy and entrepreneurship draws on two main bodies of government literature – Public Finance, which considers the implementation of policy focusing on efficiency and equality (Rosen and Gayer, 2010) and Institutional and Evolutionary Economics which looks at the operating environment of policy design and implementation where

> institutions are the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction (i.e. the environment in which organisations are the players).
>
> Donelly (2005, p.1)

The theories are very different in nature – Public Finance draws on the science side of Economics' place as a discipline in the Social Sciences and has its roots in the assumption-heavy mathematically derived Neo-Classical tradition of General Equilibrium, Pareto Optimality and Welfare Economic theories of the late nineteenth century. In this world perfectly rational, omniscient, self-satisfying consumers and profit-seeking producers exercise choice to maximise their options and interact in a seamless manner both responding to and setting market prices, which are the market clearing mechanism, and adjust all things to match supply and demand in an environment of scare resources. These prices determine the intermediate market outcomes, which, according to Walras (1874), results in one atemporal pareto-optimal general equilibrium for the whole economy. Market failure occurs when a market does not clear in this manner and in their world government intervention is justified.

On the other hand, and coming much later, Institutional or Evolutionary Economics draws on the human or 'social' side of Economics' Social Science status and focuses on human interaction, its nature, governance, and permissions (North, 1991). In such a theory, economic growth is endogenous to the system and heterogenous firms exercise judgement in the face of uncertainty and carve out a growth trajectory (Hodgson, 2007; Penrose, 1959). Individuals' preferences are endogenous in this theory too, situationally dependent and filtered through mental models with a bounded rationality which are shaped by the institutions of the cultural setting (Hodgson, 2007; Akerlof and Kranton, 2005; Bowles, 2004; 1998). Such considerations result in interactions by economic agents being based on locally embedded knowledge, social and cultural characteristics.

Governments are hence viewed quite differently in each of the theories, either as agents who intervene to correct non-performing markets or as integrated actors in the economic eco-system who help define the institutions. This thesis draws on both considerations of the role of the government. The Cost Benefit Analysis approach of the UK Government aligns with the Public Finance approach whereas the Scottish approach aligns more with institutionalism. This will be discussed further in the next section.

The DAA GVAI evaluation model is based on a neo-classical view, whereas the social constructionist philosophical stance of the thesis embraces an institutional or evolutionary stance, whereby although precise numbers are one set of results of this research, their embeddedness in local institutions with its particular psychology and common understandings means the context of their production is just as necessary consideration, hence the Context chapter which follows. In addition, the nature of the variables chosen to represent the data required and the imprecision of the models themselves mean the research results are at best indicators of the policies' successes, and those best indicators will be then subject to the reader's value judgements. Institutions create order and reduce uncertainty, so the government's role in that institutional framework is governance rather than governing (Rhodes, 1996). It's a role which exercises the choice as to what governance structure will be best and then adding and deleting networks to accommodate their view and influence, and to co-ordinate and manage the institutional framework. Relatedly, the World Bank (1992) considers an efficient public sector to be evidence of good governance in developing countries.

2.4 Differing policy contexts within the UK

Within this policy area Scotland and the UK have quite different approaches to policy making. The contexts align with the pareto optimality and institutionalism discussed earlier. For UK policy. HM Treasury attempts to undertake objective appraisals, monitoring and evaluation analysis before, during and after its implementation. For these purposes HM Treasury has published the 'Green Book' which presents a five stage model to deliver an optimal social/public value proposition (HM Treasury, 2020). The book offers guidance on the creation of policy options, generating a short list using social cost benefit and cost effectiveness approaches, evaluating these approaches and then suggestions on how to monitor and evaluate them. For HM Treasury it is very important that a rationale is provided as to how the policy outcome will be an improvement in society's welfare or efficiency of existing private sector markets and that alternative policy options are designed and identified to achieve these stated options. They advise costs of provision and governance should be included in

the evaluation and provisions made to collect data for governance and evaluation purposes.

In contrast, Scotland's government has gained a reputation for a distinctive consultative and cooperative decentralised style of making and implementing policy. In this process it works with stakeholders to gather information and garner support for its national strategic policy priorities within its National Performance Framework. Policy is then implemented via 'Community Planning Partnerships' often orchestrated by local authorities to agree and work on shared outcomes locally (Cairney et al, 2015). The process in Scotland is the same as the UK as outlined in Figure 2-1 to Strategic Portfolio and thereafter Programmes, Projects and Outputs will be determined at a local level with the 'Single Community Outcome' initiative. There is no net positive or negative social gain or loss as data gathering and evidence to support the outcomes is not a major component of the Scottish policy making process and is a severe lack (Coutts and Brotchie, 2017). Although the Scottish government acts very much as the governing agent influencing and managing the institutional framework and active evaluation is considered a failing, SE believe policy appraisal is important. For them

> Appraisal, monitoring and evaluation are key steps in the policy cycle. They provide:
>
> - The economic justification for policies, programmes or projects;
> - Evidence that these interventions are meeting their defined targets and objectives;
> - The evidence that they have achieved the desired impacts; and
>
> Learning that can be fed into ongoing policy, programme or project delivery (formative evaluation) or which can influence the development of new interventions.
>
> Scottish Enterprise, (2014a; p.4)

Their assessment of policy impact focuses on the net impact of two factors – GVA, employment, the deliverables of the funds deployed are their ultimate interest and so the focus for jobs is the cost per job and £GVA per one pound of policy money spent.

2.5 Policies in this Thesis

2.5.1 The Enterprise and Seed Enterprise Investment Schemes

The EIS was introduced in the UK Budget in November 1993, a budget which focused on job creation and economic recovery. It particularly emphasised the formation of new businesses and economic growth was deemed to be one of the greatest contributors to reducing unemployment. The EIS was deemed to be a solution to the acknowledged UK capital market failure for higher risk small and growing companies and their difficulties in obtaining finance to grow their businesses into sustainable profitable enterprises. The scheme offers generous fiscal incentives (tax reliefs) to private individual investors and facilitates the companies having access to their expertise by permitting paid directorships for unconnected persons (UK Parliament, 2015, HM Treasury, 2008; Hansard, 1993; 1992; John Major Archives, 1993).

Although the policy operates at the micro level of the economy, seeking to increase the supply of informal capital, the ambitions of the policy are greater and aligned to the strategic intent of the UK government as can be seen from the quote below from the EIS consultation document (HM Treasury, 2008):

> The Government's central economic objectives are to achieve high, stable and sustainable rates of economic growth and employment. A key determinant of long-run growth is productivity growth that, together with employment growth, leads to greater prosperity
>
> Measures to address the equity gap aim to make the market operate more efficiently, in turn stimulating growth, productivity, innovation and expansion. These are all objectives of common interest and key features of the Lisbon Agenda [6] and the Government's own enterprise agenda.
>
> The Lisbon Agenda is an action and development plan for the European Union. Its aim is to make the EU "the most dynamic and competitive

> knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion, and respect for the environment by 2010."
>
> HM Treasury (2008) p.3; p5.

The result of these incentives is to lower the cost of investment for the investor, hence enhancing the ultimate financial return. Investing in early stage SME's is considered amongst the highest risk investments by the Financial Conduct Authority and the Financial Ombudsman Service (Intelligent Partnership, 2017), which is not surprising as it is expected that 50% of the companies will fail (MacKenzie and Coughtrie, 2015, Wiltbank, 2009) with all invested capital lost and only 4% of the invested capital is expected make over 50% of the returns (HM Treasury, 2017) with 9% expected to get a 10.0x multiple on exit and producing 80% of the investor's cash flow (Wiltbank, 2009).

Unfortunately, as a policy the EIS lacks clears measurable objectives in common with many policy initiatives which presents evaluation challenges in determining its effectiveness (Carpentier and Suret, 2016, Storey, 2000). Through the documentation analysis, however statements can be found that link the micro based policy to its macro objectives.

There are good aspects to the design of this policy. Firstly, it targets individuals who are sophisticated investors and are wealthy enough to lose what they invest and hence take risks which other members of society or institutions would not. Investing in early-stage companies is very risky and although the schemes are often described as being too generous, generosity is required when capital is applied to uncertainty. Often institutional money is serving smaller retail investors and so their risk-taking needs to be well managed and hence institutions are not likely to allocate a large part of their balance sheet to such high risk activity. Secondly, having the HMRC as the administrators of policy is positive as it fits easily into the annual tax collection process for both individuals and companies. Thirdly, enabling non-executives to be able to

participate in the scheme and excluding executives are also good aspects. Experienced people are encouraged to share their knowledge and entrepreneurs to work harder to get their income and not abuse government money for projects which ultimately may not be beneficial to the economy. A negative aspect of the scheme, yet one that contains its cost, is the requirement that tax must be paid by the individual in order to claim the rebate. Greater capital may be supplied if the incentive could be claimed whether tax was paid or not.

There are signs over time that the government sought to refine aspects of the policy seeking greater effectiveness and a greater supply of capital. Table 3-6 overleaf outlines the history of changes from an investors point of view during the research period. It is noticeable that the annual maximum investment amount per person increased during the period from £200,000 to £2m and the tax rebate increased from 20% to 30%. Other changes were the introduction of the SEIS in 2013 to provide capital for nascent companies with a 50% tax rebate and annual maximum investment of £100,000 as can be seen in Table 2-1 overleaf (HMRC, 2018a).

Tax yr. ending April	Scheme	Holding period tax-free capital gains	Capital gains tax rate deferral	Qualifying capital	Tax rebate	Annual max. investment	Comments
1994	EIS	3yrs	40%	Ordinary shares	20%	£100K	
2000	EIS	3yrs	40%	Ordinary shares	20%	£200k	
2006	EIS	3yrs	40%	Ordinary shares	20%	£400k	
2009	EIS	3yrs	40%	Ordinary shares	20%	£500k	
2011	EIS	3yrs	40%	Ordinary shares	30%	£1.0m	
2013	SEIS	3 yrs.	40%	Ordinary shares	50%	£100k	

2015	EIS	3yrs	40%	Ordinary shares	30%	£1.0m	renewable energy cos. excluded. Knowledge intensive cos - 10-year investment window, other companies 7 yrs.

Table 2-1: History of EIS/SEIS Policy amendments

Source: HMRC 2015, 2011, 2009, 2008, 2005, 2003

Companies have also received greater generosity from the policy over time. The maximum permitted assets and staff to qualify for the scheme have increased from £7m and 50 employees pre-funding in 2008 (HM Treasury, 2008) to £15m or £20m (if it deemed as a knowledge-intensive company) and 250 or 500 employees in 2016 (HMRC, 2017; HM Treasury, 2008).

A company can qualify for EIS investment on undertaking a qualifying activity, if it is unquoted, UK-based and uses the money for growth purposes. It must use the funds for growth and development, meet the asset and employee criteria and have generated turnover for less than 7 years or 10 years if it is deemed as a knowledge intensive company. The company must deploy the funds within 3 years, on which it gets a certificate from HMRC to give to each of its investors to make the tax claim and should there be losses on Scheme-qualifying investments, the investors can also write the losses off against their taxes. Companies can raise a maximum of £12m from the scheme. In the case of the SEIS a company can raise a maximum of £150,000 in the first two years of trading and must have less than 25 employees and assets of less than £200,000 (UK State Aid Law Association, 2014).

Through the EIS more than £20bn has been raised for almost 30,000 UK companies between 1994 to 2018 and in the fiscal year 2017-2018, £1.9bn from 33,605 investors claiming the tax relief, which was estimated to rise to 37,350 at the end of the 3-year claim period. in which companies can claim the relief (HMRC, 2019). The actual

policy money paid out is not, of course, the money invested, but the rebate itself, so if the scheme had had a consistent 30% pay-out, this would represent £570m for that fiscal year and less than 0.1% of the UK's £789bn Total Managed Expenditure for the relevant period and yet for the 'vital 6%', particularly the small ones seeking deals less than £2m, it is very important deployment of public funds (HM Treasury, 2018b; Intelligent Partnership, 2017; BDRC, 2017; Anyadike-Danes et al., 2015; Pierrakis, 2011).

Table 2-2 below reports the annual amounts raised by businesses in Scotland in millions through the EIS and SEIS for the period under consideration, Years highlighted in yellow are years when some changes were implemented.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
EIS/SEIS	44	45	46	44	51	38	31	30	34	48	48	75	68	83	80

Table 2-2: Annual EIS/SEIS in Scotland 2003-2017

Source: HMRC 2019, 2018b, 2015, 2011, 2009, 2008, 2005, 2003

In total £688m has been raised. Figure 2-2 below depicts the amounts invested mapped to the EIS/SEIS policy changes. The cyclical nature of the capital provision should be noted with the GFC in 2008 clearly visible, with little recovery until four years later.

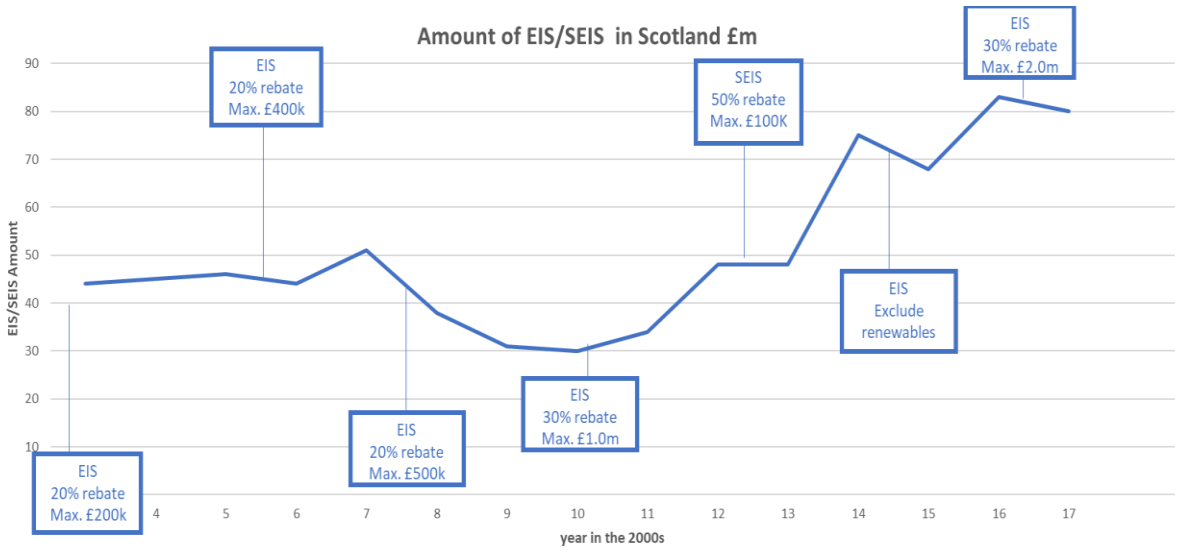

Figure 2-2: Details of EIS/SEIS investing in Scotland

Source: HMRC 2019, 2018b, 2015, 2011, 2009, 2008, 2005, 2003

2.5.2 The Scottish Co-investment Fund

In practice PVCs have one of four main structures, the funds are either

1. managed by an investment team employed by the government, who make the investment decisions and are accountable for the outcomes.

Alternatively, the government has private sector partners in that their pot of money is either

2. managed by a private firm with a structure, which permits a levered upside to the private partner, with the government taking a nominal return.

3. managed by a private firm with total discretion with annual reporting, for a fee.

or

4. supported by a team who co-invest with the private sector in a passive manner.

The SCF is structured like the fourth type. Its remit was to invests through-out Scotland (Mason and Pierrakis, 2013: Harrison, 2009); it was launched at the end of 2002 and undertook its first investment in 2003. It is a passive fund matching the private sector funding of its financial partners, when required, and was set up to increase the supply of capital to high growth businesses, increase high tech investment knowledge amongst investors and latterly to encourage the supply of capital from out with Scotland. Aside from the sustainable growth priority of the Scottish government, the Fund also had an economic development focus which concurs largely with the goals of the European Regional Development Fund (ERDF) – who was a part sponsor of the Fund - those of job, economic and productivity growth, and increased competitiveness (European Commission, 2018).

The Fund consisted of three rounds of funding, SCFI, SCFII, SCFIII, which roughly coincide with the last three rounds of EU Cohesion funding prior to UK's exit from the EU in 2021. These periods were 2000-2006, 2007-2013, 2013-2020 Hayton et al. (2008) and MWC (2016) evaluated the Fund for the periods SCFI and SCFII respectively, although in both cases, there was a delay in investing the money, so the times considered in their reports are shorter. Both the ERDF and Scottish Government invested each time and total invested capital of SCFI and SCFII as of March 2015 was £107m. The Scottish government had committed another £75m for SCFIII (Glasgow Herald, 2015), an announcement that was later revised to say it would be a joint investment between SCF and the Scottish Venture Fund (SVF) (SIB, 2015). The Fund is primarily an equity fund and can invest between £100,000 and £1.5m on a 'pari passu' [equal footing] basis with their partners, up to a total value of £2.0m or 50% of the equity of a company (MWC, 2016). As with the EIS parameters, the SCF's parameters changed slightly during the period. Its minimum investment was lowered to £100,000 cf. to the initial £500,000 and the maximum investment per deal was raised by 50% from £1.0m to £1.5m.

The Fund was structured like a Limited Liability Partnership (Interviewee A, 2015) where accredited private sector investors, such as banks, venture capitalists, corporate investors and BA syndicates undertook the due diligence on investment opportunities,

negotiated and executed the deals and the Fund followed on at their request as a passive investor. SIB conducts due diligence partners and when deals are presented by their approved partners, they verify the proposed investee company's compliance with their investment criteria, which is a list aligned with their policy objectives (Hayton et al. 2008). In their due diligence on partners, SIB considers the investment capacity within the potential private partner, their potential to conduct follow-on investment, the quality of the personnel and their due diligence process for investment selection. Once approved as a partner, an annual amount of money is allocated for automatic draw-down as a supplement to their invested capital.

Intent

There was hope that the Fund would be an instrument of regional redevelopment both in terms of improved skill sets within the Scottish investment community and provide a restructuring the industrial base (Hayton et al., 2008). At the micro level there was hope to not only cause a one-off shift in the supply curve of capital, but for that shift to increase over time as capacity increased (Interviewee A, 2015) along the lines of creating a creative response within the market as discussed by Arndt (1988) and as outlined in the Scottish Government's 2004 Economic Development Plan which was seeking

> The promotion of dynamic competitiveness within the Scottish economy…[as] one of the most critical elements of the devolved Scottish government's strategic approach to economic development.
>
> Scottish Government (2004, p66).

The intent was to use the public funds to lever funding from the private sector in order to accomplish their economic development goals. In return, it helped diversify the partners' investments with more deals and hence lowered their risk and provided longevity capacity. It also enabled them to undertake deals, otherwise impossible, due to insufficient capital, which in some cases may prevent firms from going into liquidation. Synergies from a larger portfolio for the partners was alco enabled and the greater opportunity for and benefits of knowledge sharing between companies, which

has been discussed for companies in the private equity sphere (Humphery-Jenner, 2011).

More specifically in a later evaluation by MWC (2016) the following is mentioned of the Fund:

> The original rationale for intervention through the SCF, again as re-stated in the 2008 evaluation, was to address a perceived gap in the provision of equity finance in the range of £500,000 to £1m. This gap existed because of a number of market imperfections:
>
> - The perception of high risks associated with these types of investments?
> - A lack of capacity in Scotland to fund the numbers of investable propositions that were available. In part this was a consequence of the withdrawal of some venture capitalists from Scotland following market turmoil in the early 2000s;
> - The fact that the transaction costs, for example the costs involved in undertaking due diligence, tend to be relatively fixed, regardless of the scale of investment. As such, ceteris paribus, there was a tendency to look for larger investments; and
> - A lack of capability in the Scottish market for undertaking due diligence for technology-based enterprises.
>
> In summary, therefore, the original rationale for the SCF was based on risk aversion, transaction costs and lack of investor capacity and capability in the Scottish equity funding sector.
>
> Scottish Government (2004, p.5)

There are some significant benefits of the design of this policy. Having pre-agreed terms with private sector financial partners and then responding passively to their active decisions of the private sector are no transaction delay for the investors, a varied investment exposure for the SCF, access to the human and social capital of the investors and mentoring for the invested companies (Hayton et al. 2008)

With the Fund being the marginal capital supplier, on the same terms as the private sector, concerns of the SCF crowding out private investment (Leleux & Surlement 2003) or providing subsidies are eliminated. In terms of additionality (Gillenwater 2012), or exercising poor judgement due to an inferior skill set (National Audit Office, 2009; Lerner, 2002), the structure of the Fund is extremely beneficial, as the supply of additional capital is only triggered when the private sector partner lacks and it is the private partners who are exercising the judgement, so the Fund automatically creates an additional impact and aligns fully with the government's objectives and acting as a facilitator of markets:

> 'Promoting sustainability of the Scottish economy means supporting the ongoing transition to sectors that create wealth and jobs in the long term. While the Executive recognises that market forces are the ultimate arbiters for the economic viability of businesses, it has a role in supplying the framework that gives firms either the incentive to establish themselves in Scotland or to remain and grow here.
>
> This does not mean that the Executive is trying to choose winners. The Executive is making sure that enterprises have the wherewithal to grow by promoting the flexibility, adaptability and responsiveness to compete in an increasingly aggressive global economic environment. Expenditure on education and skills formation raises the adaptability of the labour force. Forging an enterprise culture enhances the responsiveness of the Scottish economy to new challenges. The Executive's strong support of more private R&D spending aims at safeguarding further productivity improvements and product innovations in order to build and retain viable industries in Scotland.'
>
> Scottish Government (2004, 90-91)

Negatives with respect to design of the policy are again a lack of clear measurable policy objectives, the lack of any clarity of responsibilities, accountabilities and monitoring processes. This is apparent by the dearth of public information on its

activities, an unwillingness to allow access to the data as was encountered in this research project and inconsistent data provision when it does occur (MWC, 2016,; Hayton et al, 2008),

2.6 Methods of evaluating policy impact

Evidence based policies have become an increasing requirement, requiring more use of policy evaluations. In the case of the ERDF monies, the funding recipient needs to produce an evaluation report of the funded programme and make it publicly available as a condition of funding (European Commission 2014b, Sanderson, 2002). In the UK, with the Green Book, evaluations are required by HM Treasury at each stage of the policy- making process – as policy options are being formulated and business cases prepared; after implementation, formative evaluations need to occur to monitor or evaluate the design and operating processes of the policy and ultimately summative evaluations need to occur once a clear policy impact can be judged (OECD, 2008).

Policies can be evaluated in many ways and the design of the chosen evaluation method depends crucially on the questions of interest and the nature of the policy or programme to be evaluated. The evaluation of the policy could focus on the policy's process of implementation or the intended impact of the policy or both (Tosun and Treib, 2018; OECD 2008; Purdon et al, 2001; Barnow, 1986).

In most cases it is extremely difficult to make an accurate estimate of a programme's impact as the relevant outcomes need to be measured as if the policy were not in place and that result compared to the outcomes post the policy implementation. Before policy implementation such testing can occur will pilot groups, however there is no guarantee that when the policy is implemented at large the outcome will mirror that of the pilot group. Once policies are in place measurement can be near impossible as the counterfactual, or situation without the policy, needs to be determined and then the pre- and post - policy outcomes compared. Estimation techniques need to be deployed to establish that counterfactual such as surveys to determine additionality as used in

this work. In addition, the determination of all the possible effects of the policy can be a challenge as well as finding variables to represent them.

Approaches to measuring economic impacts have been developed largely by three key groups on people – academics, consultants, and governments. In academia, Storey (2000) outlines three approaches to evaluating the impact of policies focusing on small businesses. Each approach requires a comparator group as the counterfactual. In the first approach he recommends the establishment of a control group, although he admits differences may exist between the groups which would limit the control group's effectiveness. The second approach he discusses implements more rigour in the control group by applying factors, which are believed to influence outcomes, such as age or geography and highlights the importance of the timing of establishing the two datasets to limit the effects of other factors. The third approach includes a process to overcome sample selection bias, should the sample result from some process, whereby a prior decision was taken for a member of the sample's inclusion e.g. they are involved in the sampled programme as a result of an application process.

Other academic work has highlighted the need for a broader approach, incorporating other elements, such as effects on the wider society and competitors and have developed logit models to reflect that such as cause and effect models. An example of one of those is shown in Figure 2-3 below.

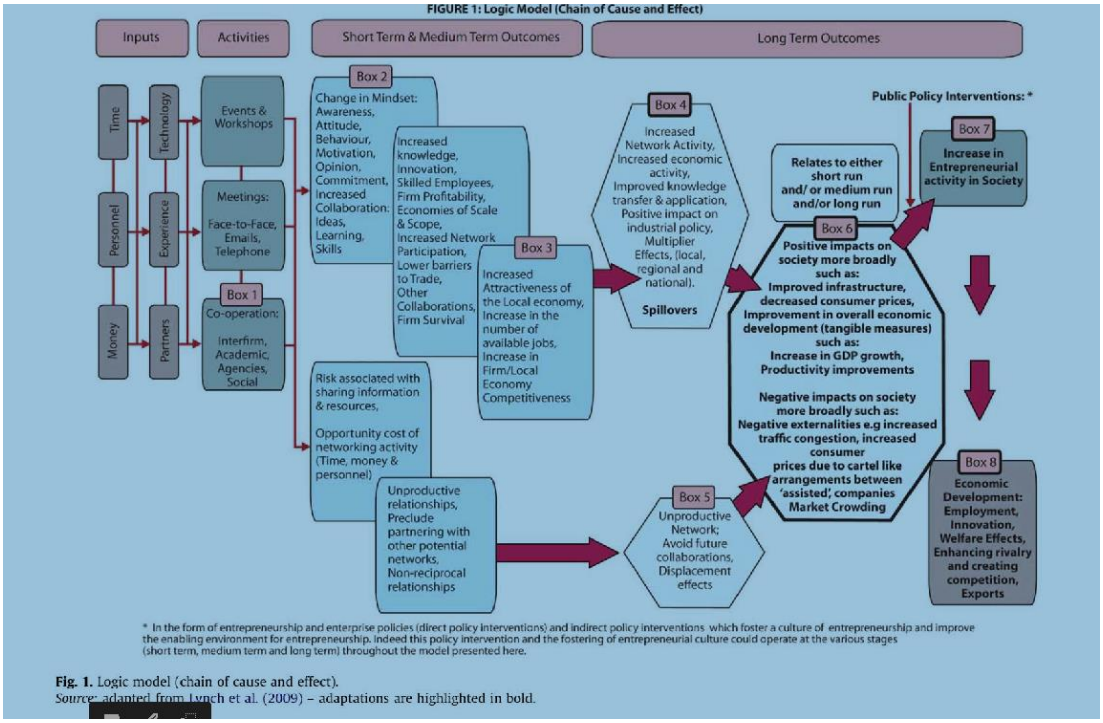

Fig. 1. Logic model (chain of cause and effect).
Source: adapted from Lynch et al. (2009) – adaptations are highlighted in bold.

Figure 2-3: Logic chain (of cause and effect)

Lenihan, 2011, p.329

Consultants also develop economic impact methodologies. They are often hired to undertake the evaluation of policies by the government. They have no standard approaches, but approaches will be agreed with clients in advance. For instance, the two studies on the SCF were conducted by consultancies and another consultancy has conducted work on other funds that SIB manage (MWC, 2016; PACEC, 2012; Hayton et al., 2008).

Governments and their departments are the third group who determine policy impact estimation approaches and they will incorporate different metrics depending on what is of interest. HM Treasury, as outlined previously, take a cost benefit approach and are keen to try and capture these elements at the level of society as a whole (Treasury, 2018). SE are interested in the impact of policies on the economy in terms of growth and job creation. They do not need a counterfactual for comparison but rather adjust for certain situation for key influences as outlined below in Table 2-3.

Effect	Explanation
Deadweight	The extent to which policy interventions are not resulting in any additionality: for example, SE supports a company, but the company does exactly what it would have done without the support. In such a case deadweight is 100% as the outcomes and impacts would have been exactly the same if there had been no SE intervention.
Leakage	Effect due to non-Scottish factors. An example would be supplies come from abroad which is a higher percentage than typical of the industry
Displacement	Negative effects on Scottish competitors
Substitution	The event when a company deliberately stops doing an activity to take advantage of public sector financial support.

Table 2-3: Adjustments required for SE policy evaluation methodology

Source: Scottish Enterprise (2014b)

Some government departments follow a counterfactual approach and there are various ways of doing those. Three were already mentioned above in the discussion of Storey (2000), other methods are randomised trials, before and after studies and difference-in-differences. The choice of evaluation technique, nevertheless, depends on the subject of interest, resources available to design and monitor the programme, manage the data collection and the stage that the policy is at – whether it has already existed sometime, or is only being explored as a possibility with some pilots (Purdon et al., 2001). Often so-called evaluations of policy are not evaluations but rather attempts at capturing activity or opinions of the programmes. Examples of those would be work which considers the take up of schemes or beneficiaries' opinions. Such work could rather be considered as monitoring studies of the policy (Storey, 2000).

Regardless of the origins of the methodology or the methodology itself there is a general understanding that each stage of the evaluation process has problems with data definition and collection and a correct specification of the model. Some areas of academia, sophisticated methodologies are preferred as they often show policy as

being less effective, which is claimed to be due to a better attribution of contributing factors rather than be attributed to the effect of the policy (Storey, 2000). This view can, however, be challenged as often the statistics relating to the explanatory power of the model, as is discussed later, is low and identifying causation in the area of Social Sciences is near impossible, due to the interlinkages of many variables which result in correlations being mistaken as causalities (Brady, 2011). As a result, the addition of another variable in the model is likely to pick up some of the correlations which were previously attributed all the variables prior to its inclusion so it is not surprising the policy effect diminishes.

2.7 The effectiveness of the EIS/SEIS and similar policies

2.7.1 The findings of the EIS/SEIS studies

Outcome focused studies of the EIS have analysed three levels of outcomes and have been largely government financed, no doubt to address HM Treasury's requirement for policy evaluation.

One area of focus is the micro level as to how the Scheme relates to those individuals or companies participating in the schemes. Mason and Harrison (2002a, 2000b) surveyed the degree to which individual investors were motivated by the tax incentives and how they ranked amongst other influences on their investment behaviour priorities. They found that front-end tax incentives and low capital gain tax were by far the most influential factors in affecting the flow of BA capital Scotland (Mason and Harrison, 2000b). In their broader national survey of 84 respondents, they found that tax breaks were amongst secondary considerations, after a very strong first consideration of making money (Mason and Harrison, 2002a).

Two studies have considered how the scheme affected the investee companies. Boyns et al. (2003), in a report sponsored by HM Treasury that used extensive surveys, found

that nearly half of the EIS investee companies surveyed had been empowered by the EIS to get practical help from their investors (using investments made over a five-year period). Cowling et al. (2008) looked at the degree to which the scheme helped the companies' trading performance, capital structure, factor utilisation, and survival. This study also found that for every £1.0m of policy money spent £3.3m of company sales were produced. Using data from HM Revenue and comparing a funded sample to a control group, Cowling et al. (2008) undertook an econometric study that found little significant differences in the sample data versus the control group, other than the recipient companies of EIS experienced small positive increased effects on fixed assets, employment and labour productivity (defined as sales per employee), although the small companies within the sample did not. The most refreshing aspect of this study is its degree of realism in outlining that company development takes time.

Like Nightingale et al. (2009) and Guerini and Quas (2016), other papers exploring the effectiveness of policies for early-stage companies, Cowling et al. (2008) worked with data series of less than 5 years. The average length the data set for the sample and control group was 3.3 and 4.4 years respectively. Their research concluded small or nascent companies attracted low levels of investment capital and, in such a short time period were likely to have low profitability, as their focus was to invest in capacity building and market growth and hence no significant evidence of profitability or productivity growth was unsurprising. They, in fact, concluded that the evidence of capacity growth (real assets and employment), albeit small materially, was a laudable outcome given the intent of the policy was to

> strengthen the future capability of the economy. It is the growth of capacity that is likely to be of more importance than the factors of profitability or productivity for young and growing businesses in the short term.
>
> Cowling et al. (2008, p. xi-xii)

Evidence that the tax schemes increase the supply of capital in the UK is found in Boyns et al. (2003). Their work estimated the scheme increased investment flows by between 100% and 650% and that the front-end tax relief was a very strong influencer

of the flows. The additionality, however, they determined was low – of the order of between 4% and 18% after costs. Overall £2193m was invested during the period of their consideration 1994 - 2001 and the scheme had administration costs of £750m. They determined of that £2193m between £1140m and £1360 was additional. Boyns et al. (2003) estimated one macro effect of the EIS scheme – that of job creation and they concluded 65 jobs were created, which represents a cost of £15, 385 per job.

When a control group has not be part of the evaluation methodology, the benefit of any policy is largely determined by its additionality as that number has a large impact on the believed success of the policy. Finding that number is, however, a large challenge which Boyns et al. (2003) and Wiltbank (2009) sought to address through their surveys. The Boyns et al. study reckoned that between 52% and 62% of the EIS qualifying investment amount would not have been invested without EIS relief. Wiltbank (2009) reckoned 43% of the investments undertaken in the two years prior to his study would not have happened without EIS relief and using the same data Pierrakis (2011) concluded between 34% and 52% of the amount invested would not have happened without the EIS.

The costs of administering the programme are another consideration. There are two aspects - the opportunity costs of foregone tax, which is government revenue in this case, and the cost of administering the programme. Pierrakis (2011) and Boyns et al. (2003) undertook analyses of additional investment to revenue foregone and found the ratio of the amount of additional funds to tax foregone to be 1.46 to 1 and between 1.52 - 1.81 to 1 respectively. Although presenting evidence of policy additionality in the supply of capital, these metrics lack a qualitative dimension addressing whether the economy benefited from those deployment of funds. The Treasury Report estimated the cost of the scheme was between 52-66p for every additional £1.00 invested, although it caveats that by saying the benefit that the companies may have garnered from the scheme in raising additional finance were excluded (HM Treasury, 2017). Other numbers have suggested the costs of the schemes may be between 57p to 73p for EIS and 87p to 1.11p for SEIS for every pound invested in each of the schemes (HM Treasury, 2017).

2.7.2 Discussion of the EIS/SEIS studies

Considering the results on the companies' operations, the lack of evidence of no gross profit or investment growth may be explained by several factors. One might be the short data set – on average 3.3 years, which they identified as an issue of their work

> …the time-series element of our dataset is too short to permit robust analysis of the nature of causality in the relationships found using appropriate dynamic models.
>
> Cowling et al. (2008, p. ix)

Another explanation might be the stage in the macro-economic cycle when this analysis was done. The data was collected between 1994-2005 which more or less reflected an economic cycle but given the average data time series is only for 3.3 years it is unlikely the effects of the cycle were captured and some data may have caught the up cycle to 1999, some the recession after 1999 and yet others the slow growth period of the early 2000s. Another reason may be the inflow of money is an automatic part of the investment cycle for these early-stage companies, which begins with poor metrics as they build out capacity. Once innovative companies get funded, the number of their employees and R&D spending increase, new to market products are developed, which then follow through to sales, so it is no surprise that productivity declines as costs go up initially with no commensurate output (Coad et al., 2016). Such a view is supported by Cowling and his co-authors in the paper and then shown in Baldock (2016) where sales and employment growth in the companies funded later registered 64% and 138% respectively, whereas those funded earlier recorded sales growth of 170% and employment growth of 85%. These numbers show the switch to sales growth exceeding that of employment as the company matures and moves into its expansion phase. Companies in the initial years after funding are still building out their staff, resources and capabilities, whereas more mature companies are more likely to be at a stage where sales growth is outstripping employments growth and thereby no doubt

registering productivity gains. Another consideration is the challenge of truly identifying causation within Social Sciences due to the interlinkages of many variables and correlations being mistaken as causalities (Brady, 2011).

2.7.3 General overview of other indirect FI studies

Much of the early UK literature addressing indirect FIs addresses the Business Expansion Scheme (BES), the EIS' forerunner and was descriptive in nature. It addresses the development of the scheme's invested capital flows away from the initial intended beneficiaries – small unquoted companies – to larger entities and ultimately rental property (Harrison and Mason, 1989) or the differential geographic demand (Mason and Harrison, 1989). Utilising the incentives to invest in the lowest risk assets permitted under the scheme is not surprising as portfolio theory, with its efficient frontier (Markovitz, 1952), had already established that investors seek the highest return for the lowest risk and in the investment risk hierarchy, property is less risky than quoted equities (which are generally larger companies) and unlisted equity in early stage small companies, is one of the most riskiest asset classes. The Financial Conduct Authority (FCA), the regulator of investment firms, considered EIS based products to be amongst the riskiest even although they do not mention the companies are unquoted or early stage which to many would mean they are even riskier.

> The view of the FCA and Financial Ombudsman Service is that EIS are amongst the very highest risk of all retail investment products as they involve investing in small companies.
>
> Intelligent Partnership (2017, p.13)

Elsewhere, research validates the tax incentives increase the supply of capital. In Canada, Hellmann et al. (2010) reported for British Columbia (BC) that 11.9% of the surveyed investors would not have invested at all if there were no tax incentives and 63.1% would reduce their investment by 30% or more if there were no tax credits - 30% was the value of the tax credit. Loritz (2008) mentions in the first year of Hawaii's tax incentive scheme, when rebates were 10% the scheme had 23 claimants for

$162,000 and in the year of increased rebates to 100%, $26m was invested. A study in the US confirmed the tax credits stimulated capital supply and increased BA activity, but found no evidence of a measurable positive impact on entrepreneurial activity or company development as much of the investment activity centred around tax arbitrage. They found 33% of the tax beneficiaries were executives of their investee company, which suggests a poorly designed policy, and it should be noted participation in the tax incentive schemes by company executives is not permitted in the EIS/SEIS policy in the UK (Howell and Mezzanotti, 2019).

Increased tax revenue is an additional benefit from these programmes, as the newly formed companies create revenue for the government, through increased income taxes from the newly employed, taxes on the product sales achieved and corporation tax from profits in time. A study of income tax from VC funded start-up businesses was done in British Columbia (Hellmann and Shure, 2010) where they found, given their federal and provincial tax collecting authorities, at the Canadian level the VC programme had a tax multiplier of 2.92 and at the provincial level 1.92, such that every C$ spent on the scheme generated extra C$ in government revenue.

Addressing more general issues, Carpentier and Suret (2016) provide an international overview of BA tax incentive programmes and conclude the objectives of these programmes are generally related to the creation of economic growth, but such an objective is so broad and imprecise that the measurement of the effectiveness of such programmes is difficult. They highlight the lack of data and consensus in definitions and methods in research that had sought to evaluate such programmes, which likewise leads to inconclusive findings. Even the common objective of increasing the supply of capital, they believe tells us little, even when it has occurred, as the capital may well have been allocated to poor economic opportunities. MacKenzie and Coughtrie argue that it must be remembered that a failed company is not a failed policy in an economic development sense, as jobs and income were created by that investment, which had multiplier effects elsewhere (2015). They cite negative aspects of such indirect FI policies as the possible encouragement of inexperienced investors and overvaluation of investment opportunities resulting from insufficient supply. This is counterbalanced

by considerations that BAs do not only invest to get a financial return, but often also to give something back (MacKenzie and Coughtrie, 2015; OECD, 2011; Boyns et al. 2003). Such comments are very helpful in summarising the challenges of ascertaining the effectiveness of such programmes and a good reminder of many of the issues already highlighted by others (Pierrakis, 2011; Loritz, 2008; Aernoudt, 1999) such as

- generally, the investment or investor data cannot be accessed
- difficulty in measuring the effects
- the lack of clear policy objectives
- a focus on the short term
- policy superposition
- the use of classic growth indicators for nascent businesses which generally record a value of zero

Overall, they are disparaging about the success of these programmes and highlight their perceived deficiencies in the analyses undertaken, namely:

- the extensive use of surveys at the company level which will suffer from survivorship bias,
- the often-cited claim that the company would not have existed without the investment
- the lack of a consideration of a displacement effect
- the lack of a consideration of varying effects through the cycle.

All these issues are real challenges to evaluations of indirect FIs and matters which this paper seeks to address, to contribute to that knowledge gap. In this study mixed methods and real data are used for the company and investment data rather than surveys which eradicates the reliance on the companies' statements and future projections. Failed companies are included so survivorship bias is addressed, and the results considered in the context of the economic cycle. The idea that economic growth is too vague a concept to be measured may well be the case philosophically, given how macro data is gathered (Pilling, 2018), but there is a global consensus (TED Summit,

2019) that the change in what we understand as GDP is the means by which economic growth is measured and a derivative of that measure in the form of GVA is what is measured in this study. The literature's general view that policies are ineffective as the tax revenue they expect to generate does not exceed the taxes foregone, is a simplistic view of the policy effects, which have many other beneficial effects such as creating employment, spillovers and networks, triggering innovation, increased supplies and increasing competitiveness, to name but a few. It is worth noting here that when the EIS was introduced as a policy the tax revenue it would collect was not a consideration (John Major Archives, 1993).

With the exception of the Carpentier and Suret study, research to date has produced findings that conclude that the supply of informal capital to early-stage companies has been increased as a result of the EIS, that companies have benefited from the received advice, that turnover growth in the investee companies was achieved on the back of the policy money and that such levels of investment would not have occurred without the scheme. However, there is a distinct lack of research examining macroeconomic outcomes, considering the context of the policies over a meaningful time period, and linking these two issues together. This study addresses that lacuna accordingly.

2.8 Performance of the SCF and other PVCs

2.8.1 Findings of the studies on the SCF

MWC (2016), Harrison (2018), Hayton et al. (2008) and Harrison (2009) are the most comprehensive reports available on the SCF. As with seeking general evidence of FIs use and success, carrying out independent analyses of the SCF is challenging as publicly available data lacks Europe (European Commission 2014a, Wishlade and Michie, 2014; Wilson and Silva, 2013), The first and third of the reports mentioned above are respectively specific EU Cohesion Policy programming evaluation reports for the monies received under the periods 2000-2006, and 2007-2013. Due to the delays in SCF receiving the funds from the EU, the reports cover shorter periods than

the seven-year programming cycle so Hayton et al. (2008) covers 2003 to 2007 and the other almost four years from April 2009 to December 2013.

The formal objectives of the Fund are to increase the supply of capital to high growth enterprises, increase the investment capability to invest in high technology companies in Scotland and in the second phase to increase capital flows from out with Scotland (MWC, 2016). The leverage numbers shown in Table 2-4 confirm the first objective was achieved but no evidence has been presented as to the accomplishment of the second or third objectives. Indeed, the measurement of the second factor of success may be one of those processes described by Ebrahim (2013) as so difficult or impractical but any proof would require further research and the third never received further mention.

With respect to the EU economic objectives – jobs, economic and productivity growth – both these reports conclude that, despite the young age of both those tranches of money, the SCF is effective in delivering jobs and economic growth, the latter defined as additional GVA. There is however no evidence of productivity growth but rather evidence that the average productivity change of the sample companies is lower than the average Scottish company, possibly supporting Alperovych et al. (2015) findings that investment by PVCs produces lower productivity growth. Coad et al. (2016) and Taymaz (2005) offer an alternative interpretation of this where lower productivity is an automatic part of the investment and learning cycle. Their research shows after funding, innovative companies increase their employees and their R&D spending, enabling the development and commercialisation of new to market products, so it is no surprise that productivity declines as costs go up initially with no commensurate output or sales and is the most likely explanation for the findings in Cowling et al. (2008) of gross margins falling before they rise again. Indeed, this may support the view that PRVCs produce greater productivity as they often time their investment just before the company enters a period of accelerated growth.

No doubt due to the challenges of ascertaining causation in the real world and reflecting the eyes through which reality is seen, there is a debate as to whether the

Scottish BA community was responsible for the success of the SCF or the SCF the success of the BA community. In addition to the Fund's structure of seamless decision-making once a deal is proposed, one angel considers the depth, growth and relative maturity of the Scottish angel investor market as key factors contributing to the Fund's success (Gray, 2014), whereas Harrison (2018), having had access to SCF information at SIB, believes the presence and structure of the SCF strengthened the BA infrastructure and its transformation into one dominated by syndicates and groups as well as encouraging more BAs into the market. The Fund was deemed to be represented in over 40% of all the identifiable risk capital deals (35% of those with BAs) and indispensable for its funding partners and many of the investee companies (MWC, 2016). A deep and developed private funding market is deemed a requirement by Mason (2016) for any successful PVC in a peripheral region and the market development and deepening in Scotland is discussed in detail in Mason et al. (2013). The PVC literature supports the view that a deep mature private sector is a requirement for any PVC success as this was also one of Lerner's findings with the SBIR programme and the strong employment and sales growth he found in areas where a developed PRVC market existed (Lerner, 2009).

2.8.2 Discussion of the SCF results

Table 2-4 outlines important metrics of the three SCF evaluation studies with the second period covered by MWC (2016) including the GFC of 2008. The methodologies of the two evaluation studies are different as SE has a policy of process improvement and in his public talk, Hayton, an appraisal and evaluation manager at SE, outlined SE have had a greater understanding of policy effects as time has progressed and hence a greater ability to allocate costs more effectively which resulted in more costs being identified and included in evaluation exercises as time has gone on to try and give a truer picture of the policy value add, although such evaluation exercises are more of an art than a science and the results should be judged in that light. He also highlighted the superposition of policy as recipients of investment from the SCF were often recipients of other sorts of policy support such as the Regional Selective Assistance scheme (Hayton, 2017).

No doubt resulting from this greater understanding, the second study of the SCF portrays the FI as less effective and indeed the authors needed to include all the partner effects to record a positive contribution (MWC, 2016). Harrison (2018) does present new data for the first tranche of the Fund but republishes the findings of MWC (2016) for the second tranche. MWC (2016) also noted disappointment by some of the Fund's partners at SIB exercising a degree of discretion, when undertaking follow-on funding, contrary to the original intent of the Fund of them being a passive investor, and perhaps this is adversely affecting results, as to date only the SBIR programme is a successful government - managed programme and those results were apparent after a long time.

For the financial returns of SCF, seen in Table 2-4, MWC (2016) outline for the second tranche of money (2008-2013) a cumulative 3.5% return on invested capital was achieved during the first three and three quarter years, which compares to a negative 1.8% on the first tranche of money at the time of the Hayton et al. (2008) report, which was around four years.

	Hayton et al. (2008)	MWC (2016)	Harrison (2018) T1	Harrison (2018) T2
Time period yrs.	4	3.75	6	
No of companies	121	139	118	139
Amount invested	£30.7m (to Jan 08)	£45.5m	£33.3m	45.5m
Leverage ratio	2.43	1.64	4.02	1.64
Net[1] No of jobs	(2007) 449-664 (2010) 176-505	(2015) 238		
Cost per annual job £	13,791 12,888	50,980	35,387	
Job per £1m	17.8	9.1	28.3	
GVA per £	3.71	1.5		1.5
Cumulative return	-1.8%	3.5%		

Table 2-4: Summary of the SCF Evaluation reports

Sources: Hayton et al. (2008), MWC (2016); Harrison (2018)

The table shows the tension between the financial and economic outcomes. For SCFI the investment return was negative or £18,000 was lost for every £1m invested, yet almost 18 jobs and £3.31m of GVA were created with the number of jobs per £1m invested increasing to just over 28 with Harrison (2018) This shows in times of negative financial returns, a positive economic return can, nevertheless, be generated, which suggests that should the private sector alone price these investments, they might never happen as they would not invest as they might see no positive investment return and yet the potential positive economic return would be foregone. The report on SCFII does not present the Fund as having a positive outcome especially as the financial partners are included in the numbers rather than the Fund receiving a pro rata amount

of the effects, hence inflating the numbers. This block of money produced lower leverage and higher cost per job numbers despite the partners' inclusion (MWC, 2016).

The cost per job numbers are interesting reading in the SCFI study. They are presented as a range of net jobs created (net meaning new jobs created minus those lost but before the government's policy costs) and then an estimate for 2010 (Hayton et al, 2008). Interestingly the number of net jobs decline in the future period, which the report explains by the possible application of a too severe optimism correction discount in the analysis or that the companies were focusing on turnover growth in their predictions of the future rather than jobs, when they answered the survey. This is an example of how fickle surveyed predictions can be and does confirm questions over the usefulness.

2.8.3 Other PVC studies

Studies of PVC funds use various measures of success, some related to the intent of the policy, others not. The studies reviewed are presented in Table 2-5 overleaf with a summary of the articles, their datasets and conclusions. Generally, the success metrics fall into two main categories:

I. Economic
II. Financial

with one study of the Belgian BAN incorporating both approaches (Collewaert et al., 2010). The focus on economic success metrics aims to ascertain the degree to which the economy benefitted from the PVCs' investment in early-stage companies and often the sales of the investee companies and the number of their employees are the focus of the analysis (Daunfeldt et al., 2014; Delmar, 1997). Occasionally the estimation of the additional GVA created, the recommended process for effective policy measurement in Scotland is considered (Scottish Enterprise, 2014a, 2014b), but this is largely confined to independent evaluations of policy sponsored by the government, which results in a large gap in the academic literature dealing with policy effectiveness. Those

that focus on the financial element are interested in measuring the breadth and depth of the investment activity, often captured by exits or syndication events and not actually financial investment returns themselves. Much of this thinking is building on Lerner (1999) where a deep VC sector was highlighted as a pre-requisite for successful economic development through the financing of early-stage companies.

This body of literature deals with policy and as such is very influential. Grilli and Murtinu (2013) is an example of this. This study was work done for the EU when they were considering the structure and focus of the next programming round of the EU Cohesion Funds in 2013. This work later came out in a journal as Grilli and Murtinu (2014b) and is discussed later. Not only are these conclusions influencing policy, but other authors are citing them as legitimate (Mason, 2016).

Authors & sample	Dataset	Methodology	Evidence of success	Outcome
Harrison (2018) SCF	The SCF Annual Report 2008 and MWC (2016)	Descriptive quantitative	Leverage Reliance on by the eco-system	Overall leverage
Owen (Baldock) and Mason (2017) ACF	15 funded representative businesses, interviews with unsuccessfully funded businesses and lead investors	Surveys and secondary data provided by the British Business Bank (BBB).		fund meeting the funding gap For interviewed companies receiving funding in last 18 months sales had gone up by 2/3 and employment doubled
Standaert and Manigart (2017) 108 companies backed by VC hybrid Fund of Funds 10/05-12/09 in Flanders	Individual companies invested in by independent (IVC), government (PVC) and captive VC (CVC) funds	Econometric - Random co-efficient modelling	Employment growth	IVCs saw most employment growth, even though not a target for them, unlike the government fund. Cost per job over 5 years \ or p.a. for each of the VC types: IVC - £121,940/ £24,388 CVC - £624,961/ £125,000 PVC - £2,578,571 / £51,5714

Authors & sample	Dataset	Methodology	Evidence of success	Outcome
Cumming et al. (2017) European private and government VC investments, 1990–2010. 607 VC backed firms & 7591 non-backed	VICO & Amadeus Datasets	Econometric - Multinomial logit approach	Successful exits	PRVCs better exit performances than private. PVC deals with private syndicated VCs do better in terms of exit outcomes, but not statistically significant.
Baldock (2016) ECF	75 investee SMEs, case studies, fund data and industry data	Surveys - Interviews – quantitative cross-sectional survey, longitudinal survey and qualitative case studies.	Successful business impacts on the investee companies	• the equity gap at the small end of the market is being addressed • delivering business revenue, employment and innovation impacts. Sales increased 170% or 64% depending if pre or post GFC and employment by 85% or 138% respectively

Authors & sample	Dataset	Methodology	Evidence of success	• Outcome
Guerini and Quas (2016) 8277 European high-tech VICO dataset; 183 received PVC funding - first round during the period 94-2010.	183 firms who received 1st round funding from 81 PVC s in 7 countries	Econometric Semi-parametric event history model, Endogenous switching regression	2nd round of funding from a PRVC	• PVC backed firms in the first round 3.0x more likely to get PRVC in 2nd round • Result interpreted as evidence of the screening ability and certification effect of PVC in Europe.
MWC (2016) 49 of the 139 invested companies of the period 04/09 to 12/13	Scottish Co Investment Fund	Surveys and interviews	• Increased supply of capital • GVA • Employment	• The funds capital was levered 1.64 times • Return was 3.0% • 186 jobs created • £31.4m cumulative GVA
Cumming and Johan (2016) Investees of the Australian Venture	AVCAL and Morningstar, Thomson Reuters SDC, AVCAL, Lexis–Nexis,	Econometrics-Cross-sectional regressions for 2011 for employment data	• employment, R&D, patents, time to IPO, market capitalization	• VC & AIIF firms contribute disproportionately to money spent on R&D and patent citations. IIF firms have a

Capital, Private Equity and Government backed Australian Innovation Investment Funds (AIIF) from '98-2012	Hoovers, Bloomberg, Patents IP Australia, ASE webpage, Google Finance, Business Week and many company webpages from Internet searches	across quartiles to account for data differences, controlled for age and a dummy variable if listed, for its region and industry		greater number of IPOs and greater market cap thereafter. No evidence of lower levels of employment
Authors & sample	**Dataset**	**Methodology**	**Evidence of success**	**Outcome**
Baldock and Mason (2015) Role of ECFs and ACF as escalators	Investee companies, fund managers, angels, stakeholders	Demand and supply side interviews	• Meeting the equity gap • Providing assistance to the companies	Evidence equity gap being met, quantitative exit measurement not sufficient as overlooks other effects; contract employment, sales and employment growth achieved.
Munari and Toschi (2015) UK PVCs (split regional and	Thomson Reuters Venture Economics	Econometrics-Regressions to control for various factors -	• successful exit for an investee company through an IPO or trade sale	Regional characteristics matter as to the successful creation of a VC market.

national) VC 1998-2007 investing in 628 cos, 135 by public VCs and looking for exits by 2010		time period, size etc. Poisson regression for the skewed staging model		Analysis suggests regional PVCs might be less effective due to their tight geographic constraints and in technologically lagging areas specially to attract further funding.
Authors & sample	**Dataset**	**Methodology**	**Evidence of success**	**Outcome**
Brander et al., (2014) a sample of 20,446 enterprises in 25 countries that received VC funding 2000–2008 and tracked exits to 2012.	data from Thomson One (previously called VentureXpert) and the Asian Venture Capital Journal	Econometrics-Log regressions	• Ability of companies to get follow on funding • Trade sale or IPO	Jointly funded companies (PVC & PRVC) more funding than either source individually The more PVC funding received, the more VC funding per enterprise - so PVC funding augments rather than displaces. Positive exits – IPOs and acquisitions - from hybrids largely attributable to the extra investment.

Authors & sample	Dataset	Methodology	Evidence of success	Outcome
Grilli and Murtinu (2014a) 8270 firms of which 759 are VC financed firms 1984-2004	VICO & Amadeus Datasets high tech in Belgium, France, Germany, UK, Italy and Spain.	Econometrics-Augmented Gibrat law panel data models	Impact on growth in sales Impact on growth in employees	PRVCs impact sales & employee growth (though latter not significant), PVCs no impact on either. Syndicated private/PVC impact on sales if led by PRVC. No impact on jobs
Grilli and Murtinu (2013) also (2014b) 6513 New Technology Based firms 1992-2009	VICO dataset	Econometrics-OLS, Fixed Effects to remove endogeneity, GMM -SYS as robustness check	Impact on growth in sales due to timing and origin of investment	PRVCs successful; only impact by PVCs if invest early with PRVCs

Authors & sample	Dataset	Methodology	Evidence of success	Outcome
Alperovych et al. (2015) Belgian VC data '98-2007. 515 firms. Investigation spans 1 year before the investment and 3 years after	Venture Economics and Zephyr	Econometrics-Dynamic Envelopment Analysis to determine efficiency. Global efficiency score between 1 and 4	Considers • Fixed assets • Headcount • Equity • Value Add= GOP • Age • Leverage • Herfindahl Index	PVCs presence reduces companies' growth rates and relative performance to PRVCs
National Audit Office (2012) The Regional Growth Fund (RGF)	The bidder applications: project appraisals and recipient companies	Interviews and on-desk reviews	• Evidence the bids selected will fulfil the funds' criteria: • Support projects with substantial economic growth and employment potential • Fund in areas where there is a dependence on public sector jobs	• Selected investments did provide better returns than those not selected • Could have provided jobs more cheaply

Launched 2010, £1.4b allocated to projects 2011				
Brander et al. (2010) All VC funded firms in Canada firms 1996-2004	Built up from fund information	Econmetrics-Regressions-OLS, multi notional logit, negative binomial	• likelihood and size of a successful exit event, • innovation • competition • employment	PVCs have • Less successful exits • Less IPOs • invest less in high technology industries, • generate fewer patents • no evidence of increased employment or competition.
Authors & sample	**Dataset**	**Methodology**	**Evidence of success**	**Outcome**
Nightingale et al. (2009) 7741 firms of which 782 were	Library House dataset for VC investments FAME for accounts	Data Analysis and Econometric -a quantitative variation study –	Effects of • Age • Size • Sector • Funding type	Found hybrid funding • created jobs and greater capitalisation, • had no significant impact on profitability

firms backed by hybrid capital funds. Data 1995 to 2008 but most data is concentrated between 2003-08.		fixed and random effects	on • Profitability and sales • Fixed assets and capital formation • Factor utilisation • Survival and qualitative input as to why	• gave signs of gross margin falling and then rising again • Other effects – 1) size negatively correlated to capital accumulation 2) manuf./construction companies. greater employment; university spin-outs lower capitalisation coefficient & employment
Authors & sample	**Dataset**	**Methodology**	**Evidence of success**	**Outcome**
National Audit Office (2009)	The DBIS venture capital funds – UK High Technology Fund, Regional Venture Capital Funds (RVCF)s,	Interviews & surveys – On desk analysis, semi-structured interviews, telephone	• highly innovative companies stimulate economic growth and productivity. • Performance of funds against varied benchmarks • Encourage new private investors	• Lack of clear objectives to assess if good value for money achieved for the taxpayers • Confirmation of an equity gap – 83% found it easier to get funding afterwards, 32%

Companies funded by 28 funds with varying objectives	Community Development Venture (Bridges) Fund, ECFs, the Aspire Fund, Capital for Enterprise Fund.	survey, case studies	• Increased supply of capital • Prove commercial returns possible • Provide VC to disadvantaged areas of England • Encourage new managers into early-stage financing • Be self-financing • Increase the no. of successful women entrepreneurs • Improve linkages between providers of funds and investment readiness support • Help overleveraged businesses • Support viable businesses and enable them to get long term finance.	would have been nothing if not for the funds, 23% would have gone ahead anyway. • Poor performance but VCs generally reap rewards after 8 years, also poor time for VCs • RVCFs poor design- lack of good flow, timing, broad geographic coverage, larger funds, lacked ability to follow on.

Authors & sample	Dataset	Methodology	Evidence of success	Outcome
Hayton et al. (2008) 48 of the 121 invested companies of the period 2003 to 2008	Scottish Co Investment Fund	Surveys and interviews	• Increased supply of capital • Fund double the number of companies with potential - an additional 132 • Aim for a 20% p.a. return - to be evergreen • GVA • Employment • Turnover	• The Fund's capital was levered 2.43 times • Return was -1.8% after 1 exit, 4 AIM listings and 12 failures. • 546 jobs created • £28.5m additional GVA p.a. • Additional turnover £46.8m
Cumming and Johan (2008) Canadian VC Data, 1990–2004 –518 exited companies	Canadian Venture Capital Association	Econometrics-Multi-notional logit regressions	Mitigation of information asymmetries and agency costs, better exits	Government subsidised labour sponsored VC funds in Canada 1) more often have inefficient exits 2) more likely to have write-offs.

Authors & sample	**Dataset**	**Methodology**	**Evidence of success**	**Outcome**
Cumming (2007) 280 Australian VC and private equity funds and their investments in 845 entrepreneurial firms over the period 1982–2005	AIIFs 1998-2005	Econometrics-Multivariate Analysis – OLS and logit regressions	No. of rounds of financing No. of syndicates No. of exits	The data strongly consistent with the view that the AIIF program is fostering the development of the Australian VC industry
Lerner (1999) 1135 awardees of the Small Business Innovation Research programme (SBIR) between 1983 and 1995	Thomson SDC US Government awardees database	Data Analysis-Comparison of funded dataset with a matched unfunded group of companies	Employment and sales growth	SBIR awards certify quality of early-stage ventures and facilitate growth. The awardees grew much faster over a 10- year period but only in areas that attracted substantial flows

Table 2-5: Overview of PVC studies

Authors & sample	**Dataset**	**Methodology**	**Evidence of success**	• **Outcome**
Murray, G.C. (1998) 22 funds in 10 countries 1988-91	Pilot European seed funds which by 1995 – 23 pilot funds set up with a budget of €8.7bn	Interviews	Attract private capital Create jobs Create enterprises Interaction with local regional goals. Long term viability	• Did attract private capital • Long term viability questioned due to the large need for capital to keep them going. Only 2 of the 12 funds would have raised private capital without the government • created 2,085 jobs – cost per job £872/£1674

2.8.3.1 **PVCs are a failure?**

In general, academic research of this century consider PVCs a failure (Standaert and Manigart, 2017; Mason, 2016; Grilli and Murtinu, 2014a; 2014b; Munari and Toshi, 2015; Alperovych et al., 2015; Brander et al., 2010; Nightingale et al., 2009; Lerner, 2009; Cumming and Johan, 2008; Brander et al., 2002) and the only models highlighted as successes are those mentioned below, with the ECF positive outcome superceding earlier negative outcomes.

- SBIR programme (Lerner, 1999) which started in 1977, is run by the US Federal Government and invests in companies which undertake and commercialise R&D and innovation (United States Government, n.d.). The period considered in Lerner (1999) began in 1983 and covered 12 years.

- AIIFs (Cumming and Johan, 2016; Cumming, 2007), which began in 1998 as co-investment vehicles and experienced three rounds of funding in 1998, 2000 and 2006. They are funds managed by private sector partners on behalf of the government to encourage new technology companies to commercialise R&D, in the hope of developing a self-sustaining early-stage VC industry, medium term self-revolving programme and experienced personnel (Cumming 2007). (Although found successful by the authors, others disagreed, as discussed later)

- SCF (Mason and Pierrakis, 2013: Harrison, 2009) covered here.

- ECFs (Baldock, 2016), UK-wide funds with two main objectives - a) provide seed and early-stage growth capital of amounts between £250,000 and £2m to potential high growth SMEs and b) establish an eco-system of early stage PRVC with new managers entering the market. They required one third private investment for which there were preferential terms. The UK government provided £280m in 2006 for an initial eight funds, £200m in 2010 for a further eight and then a further £400m for the period q3-2014-2017. Their management was transferred to the BBB on its creation.

Independent evaluations of PVCs in the UK have produced a mixed picture, with the National Audit Office (2009) painting a negative picture of the RVCFs, set up in England in the early 2000s (which includes the ECF covered in the Baldock (2016) study above), National Audit Office (2012) a positive, although could be better, picture of the RGF set up in 2010 and MWC (2016) and Hayton et al. (2008) a positive picture of the SCF. Although the SCF has had a longer life than the RVCFs and all examples of success mentioned overleaf are programmes which have lasted more than 10 years, the SCF evaluations were nevertheless covering short time periods of less than five years. This validates that it takes time and effort to build an eco-system of which the funds are part and without that depth success will be nothing other than aspirational (Lerner, 1999).

In contrast, most of the academic literature supports the argument that PRVCs add value to their invested companies, that they grow faster, create more jobs (Standaert and Manigart, 2017; Grilli and Murtinu, 2014a), have better financial and operating performance and are more likely to get a public listing for their investee companies than their non-PRVC-backed peers (Gompers and Lerner, 1999). Bygrave and Timmon (1992) highlight that it is not the price of the VC that is important for any growing business, but rather whose capital it is, due to the extras that individual people or organisations connected to the concerned PRVC bring after investment. The relevance of literature pre-2000, however, is now questionable as VC trends have changed - returns are lower and companies overall are less likely to list (Mason, 2009b).

The case for the success of PRVC money largely rests on the superior skills of PRVC professionals and how that expertise is attracted to large financial centres as they are attracted to deal flow and their income usually reflects a percentage of the profits made. As a result, they want to operate in environments where making profits seems possible and often in regional areas this is not the case due to the lack of opportunities (Jääskeläinen et al., 2007). Superior skills highlighted are the screening and monitoring expertise added to operating efficiencies delivered by highly reputed VC firms who

tend to invest in firms with lower efficiency levels but improve them to a par with other VC firms (Chammanur et al., 2011).

National Audit Office (2009) and Lerner (2002) also highlight the importance of the investment personnel having a relevant skill set and concluded this lacked amongst government employees. Mason and Pierrakis (2013) gives an insight into the required skills:

> …both, in terms of, their ability to make good investments (quality of deal flow, domain knowledge, effectiveness of their due diligence) and to add value to their investee companies (e.g. mentoring skills, strategic insights, networks).
>
> Mason and Pierrakis (2013, p.27)

Other writers talk about the importance of successful exit skills such as previous experience in exiting a company or specialist industry (Zarutskie, 2010). Dimov and Shepherd (2005) find that VCs where the top management have a general education in the science and humanities experience greater bankruptcies than management with a specialist education like an MBA, law, or a consultancy background. Schäfer and Schilder (2009) highlight German institutional investors have offered varied input to their investee companies and conclude skills are an important factor in the provision of smart capital, which they define as two-way explicit and tacit information flows between the VC professional and the company. Lerner (1998) mentions the specialist knowledge PRVCs have in managing IP and dealing with legal challenges.

MacKenzie & Coughtrie (2015) show BAs too add value. Their study covers one of SCF's long standing private sector partners, Archangels, a BA syndicate and considers their portfolio since the group's inception in 1992 to 2015 and its co-investments not only with the SCF but other co-investment vehicles run by SIB. They found the value add delivered by Archangels (measured by GVA, jobs and turnover) is above the average value add delivered by the SCF's partners, which does suggest skills vary across firms. The study also showed that for every £1.0m invested by Archangels

around £8m GVA, 33 jobs and £14.34 of sales were created, which translate to each job costing £30,303 of BA capital.

In addition, the study paints hope for the success of PVCs over time as on average Archangels have invested 65% of their portfolio with SIB as a partner, which has mainly been with the SCF, although this has increased from 40% of their investments in the early 2000s to around 90% in the period 2012 to 2014. Had they been an investment fund, Archangels would be a sustainable entity today as their initial capital has been paid back. Of the £90m invested between 1992 and 2015 they had already liquidated £100.4m and still had a portfolio with a book value of £37.9m at the end of the report period of 23 years. which suggests sustainability takes time but is possible for FIs. This highlights the requirement for patience and the importance of time to evidence such policy tools as self-sustaining. Had Archangels' investments been a portfolio it would have delivered a 12.6% annual return since inception until 2014 and a higher return of 20.6% p.a. in the 10-year period to end 2014. These numbers, of course, camouflage varied returns on individual projects and losses of £17.8m on failed businesses, which represented 44% of all Archangels investee companies until the end of 2014. These returns do however compare favourably with typical returns within the VC industry (BVCA 2015) and of course are well in excess of cash and global equity returns (EMMI 2016, Investing.com, 2020), which are 13.8%, around 2% and 6% respectively for the since inception time period and the BVCA's 13.8% return is most likely a levered return which is not the case for Archangels.

In contrast a couple of studies have challenged this view and concluded PVCs do add value. Guerini and Quas (2016), based on 8827 high tech companies in seven European countries of which 183 were funded by 81 PVCs during the period 1994-2010, draw out the points that

- if a PVC managed by the government participated in a company's first round of funding, the company is three times more likely to get PRVC money in the second round of financing.

- if a PRVC has followed a PVC investment, the company is just as likely to receive another round of PRVC investment or have a successful exit as companies which were solely PRVC funded.

They conclude their study evidences government personnel do have screening and selection abilities to select promising companies and act as certifiers to future investors. In addition, National Audit Office (2012) claims PVC success in selected projects, which created substantially more growth and job creation than the non-selected projects. The study did think more jobs could have been created had there been a greater focus on value for money which they estimated as cost per job.

Another aspect to superior PRVC investing is them securing preferential terms to the firm's existing shareholders, such as they get their money back before other investors can participate in any upside as happened in a £2.0m PRVC investment in Cognitive Geology in 2017 (Companies House, 2017a) or Vascular Flow technologies where they get a preferential coupon attached to their investment (Companies House, 2013). Such behaviour is the main reason why some renowned BAs, such as Barry Sealey, are sceptical of VC firms (Informatic Ventures, 2013) and why Archangels have preferred to invest in companies where they can control the share capital (Interviewee D, 2015)

If preferential terms are secured over other investors and PVCs are not undertaking similar behaviour, PRVCs will have relatively higher returns. These preferential demands, of course, are detrimental to other investors in the company such as BAs, who most likely will just have ordinary shares alongside the founders and then end up with a secondary claim on assets, when the business is sold and the PRVC will automatically get higher returns. Elsewhere writers focus on innovation and claim PRVC firms' investments are more innovative (Gompers and Lerner,1999; Hellmann and Puri, 2002), whereas for other writers the main benefits PRVCs bring are valuable business contacts (Hsu, 2004; Hochberg et al., 2007; Lindsey, 2008).

Later work claims PRVCs have no real skill in achieving successful exits, but rather their reputation results from the timing of their investments which, they then exploit to de-risk their portfolio by investing in less early-stage businesses as time goes on (Nanda et al., 2017). Block (2008) and Mazzucato (2013) consider the timing of their investments and suggest PRVCs wait until there are commercial prototypes or services developed which are about to embark on a momentous trajectory before investing. Such a view does have credibility as surprising some of these PRVC funds only have lives of 3 or 4 years (Intelligent Partnership, 2017) so the investment returns need to be made quickly. Rosenbusch et al. (2013) suggest their apparent success comes from investing in high growth sectors and not from any value add. Work by Grenier and Lee (2017) suggest that PRVC actually detract from investee companies' value by exerting too much control that they stifle the entrepreneurial capability of the managers of the companies they invest in.

Another focus of the literature are comparisons of outcomes of companies whoese investors are PRVCs to those funded by PVCs, with the PRVC investee companies fairing better. Often sales and employments changes are considered. Some work has concluded that PVCs, unlike PRVCs, have no significant impact on the sales or employment growth of their invested companies (Grilli and Murtinu, 2014a), diminish productivity (Alperovych, et al., 2015) and are ineffective in building PRVC industries (Munari and Toshi, 2015).

Grilli and Murtinu (2014a) undertook an EU-funded econometric study with the European VICO Dataset data of 6513 high tech companies from seven European countries (Belgium, Finland, France, Germany, Italy, Spain and the United Kingdom) during the period 1992 to 2010 and defined PVCs as those making the decisions. They ran 4 different models for each variable and compared the sales growth of PRVC, PVC and syndicated PRVC/PVC funded companies compared to companies which had not received VC funding at all. The same dataset was used for Grilli and Murtinu (2014b) with slightly different parameters as outlined below:

Average	PRVC	PVC	Co-syndicated	Non-VC
Ave. Sales €m	6.0	3.2	3.5	6.5
Standard Deviation (SD)	25.2	7.4	8.5	67.5
Ave. FTEs	35	27	29	40
SD	60	44	41	305
Average Age	5.8	6.2	5.9	6.9
SD	4.2	4.5	4.2	5.1
No of years included in data sales (employment)	6.59 (6.94)	7.74 (7.84)	6.73 (8.09)	
Median Investment €m	1.4	0.2	1.5	

Table 2-6: Descriptive Data – Grilli and Murtinu (2014b)

Source: Grilli and Murtinu (2014b, 1527-1528)

Their models are an Ordinary Least Squares (OLS) model, a fixed effects (FE) estimation, which removes any concern of endogeneity of the independent variables due to unobservable firm specific factors, then a two-step system generalised method of moments (GMM -SYS) model, which they consider to be a robustness check but would not have been valid. Their study concludes that PRVCs did impact the growth of sales and employment in their invested companies with the result for sales growth being significant in a couple of the models at the 1.0% level which is a very strong result but the estimator of their impact on employment growth is not statistically significant. Their results show that PVC finance neither helped grow or create jobs in their investee firms when compared to firms that did not seek money. They commented it may well be that greater amounts of money are required to get noteworthy results, with the median investment in the PVC investee company being €211,400 whereas it was around €1.43m in the PVC group of companies. Sadly, these comments are in a footnote, despite them being an important aspect of the study and their work did not give it due consideration. The average results for the OLS and FE estimated parameters are shown below in Table 2-7 and shows that 30% of the growth in sales is explained

by PRVC funding whereas in the case of PVC money only 4% of the sales growth is explained. The PVC numbers, although not significant, suggest that the PVC funding reduces employment in their investee companies, which is a contradictory outcome to the intent of many of the PVC funds whose role is one of economic development and job creation. The R^2 of this study is very low, which means although the statistically significant results are valid, the predictive power of the model is low and it should be considered more as a case study, rather than offering any generic conclusions (The Minitab Blog, 2014). To have described their work as a case study, rather than making the bold claim that it explains the impact of PRVC and PVC funding on investee companies is supported by Brady (2011), who explains that within social sciences there are many requirements to explain impacts and often the observed relationships between variables are rather correlations where the variables have a relationship but not the required characteristics to determine them as casual.

As mentioned before this was a very influential study as it was conducted for the EU as they were reviewing their ERDF policy for the next programming round in 2013 and that is the version Grilli and Murtinu (2013). Credibility however is a much greater problem with this paper as it would appear the authors have been victims of the lack of transparency in the PVC sector with respect to the varying structures and objectives pursued by the different funds. On page 4 of their study they define SE's role in the Scottish PVC included in their calculations as:

> In the UK, is a public agency… which is almost fully financed by the Scottish government and selects equity investments in promising start-ups.
>
> Grilli and Murtinu (2014a, p. 1113)

As Scottish Enterprise (2018) shows, this is incorrect as SIB undertakes most of SE's investments and these are made passively and hence undertakes limited discretionary investment activities. As such they would not qualify as a PVC fund as defined by their work, as their definition requires the PVC to make the decisions.

> PVCs are defined as funds that that are managed by a company that is entirely possessed by government bodies.
>
> Grilli and Murtinu (2014a, p.1524)

The fact that this error occurs in this paper is interesting, as they specifically make the statement that the VICO database circumvents the lack of knowledge of the source of the funds, which is a common problem with the databases in this area of research such as Thomson One, as the precise source of funds is unknown. Yet the VICO database also cuts the sources as PVC providers and IVC providers without adding the information, whether the source of funds for those IVCs is government money as was commonly the model in the UK outside of Scotland.

Note should also be taken that in their sample the average sales of the PVC sponsored firms, are around half of that of the PRVC sponsored firms and even less when compared to the non-VC sponsored firms. The PVCs are also less productive with an average Sales/Employee ratio of 0.7 compared to 0.17 for PRVCs, 0.12 for co-financed companies and 0.2 for non-VC. Reasons for these results may be explained by the R&D intensity being different for the different cohorts and maybe many of the non-VC businesses are lifestyle businesses; maybe these numbers are biased due to the effect of survivorship due to the government supporting struggling companies for economic development purposes and hence on average they have half the sales for companies with roughly the same life span whereas in the private sector those companies would be forced into liquidation or perhaps they reflect less attractive investment opportunities as is required by PRVCs; maybe these numbers reflect earlier comments that when companies are at an early stage of their growth journey the focus is on building capacity and it is not surprising that productivity and growth numbers are low. It is interesting to note that the PRVC cohort have the highest sales/employee ratio which does suggest economics and productivity is a consideration on their investment agenda.

There are a few other dissatisfying aspects of this work. One is its focus on hypothesised relationships rather than actual real metrics. There is no discussion of

what the sales growth is but rather PRVC money will influence that growth by 30% and PVCs by 4% on average. One explanation may be that the smaller PVC investee companies are not experiencing sales growth yet. Another consideration is this is a relative measure, and it could well be that the value of the growth of the companies in the PVC cohort are significantly larger than those of the PRVC and hence PVCs are more economically impactful – it will depend on the value of the sales base. It is unlikely on review of the other metrics but might have been possible had we not known those other metrics. As the data-matched non-VC financed comparators are quite different, it is questionable what function they serve and the use of OLS can lead to erroneous results (Nightingale and Coad, 2013)

The results they found in Grilli et Murtinu (2014a) are outlined below

Study	Variable	Sales % p. a growth	Employment % p. a growth
	PRVC	30	9.7
Grilli and Murtinu, 2014a	PVC	4.0	-3.6
	R^{2-} PRVC/PVC	15.4 /14.1	8.1 / 6.9

Table 2-7: Data from the Grilli and Murtinu study

Source: Grilli and Murtinu (2014a).

The work of Alperovych et al. (2015) considered the effect of the VC partner on the Belgian invested firm's efficiency between 1998 and 2007, one year prior to investment and three years after. They found the growth and productivity rates of companies funded by PVCs were lower relative to those of PRVC funded companies.

2.8.3.2 **The success of hybrid models**

In contrast to the general understanding of PVCs being a failure, academic literature supports the view that hybrid VC models, where the PRVCs and PVCs operate together, are successful. Studies consider funds which have additional desired

outcomes to financial returns, such as, non-market distortion, the creation of an early-stage VC market and/or increasing the supply of capital for early-stage companies.

Brander et al. (2014) looked at over 20,000 firms in 25 countries, which were jointly funded by the government and private sector, and found they ultimately secured more funding than if the funding came from only one source. They also concluded that the positive exits, experienced by joint-funded companies, were largely attributable to that extra funding. Work in Europe, covering the period 1990 to 2010, discussed in the article Cumming et al. (2017) showed PVC and PRVC syndicated deals do better in terms of exit outcomes; whilst with regard to sales growth, Grilli & Murtinu (2014a), in their study of roughly the same period, conclude PVC investments have an impact on sales growth only if the investment is done jointly and led by a private sector partner. These conclusions are not surprising. Many authors have alluded to the limited funding in the public sector and how greater funding is required for the successful development of firms (HM Treasury, 2017; Mason, 2016; Nightingale et al., 2009; Murray, 1998). Generally, PRVCs have greater financial resources than PVCs and are interested in larger deals and hence for both to be involved in a company's growth trajectory makes sense.

2.8.3.3 **Consideration of the finance stream**

Studies emanating from the finance stream, such as Cumming et al. (2017), Cumming & Johan (2016), Brander et al. (2014), Munari & Toshi (2015), focus on investment exits, time to IPO, syndication and follow-on funding. One of their main foci is financial returns as Brander et al. (2014) confirm:

> Ideally, we would like to measure the success of VC investments with returns data. Short of that, it is sometimes possible to use exit values or exit multiples as a measure of success (as in Brander, Egan, and Hellmann 2010)... We note, however, that using IPOs and third-party acquisitions as a measure of success is standard in the VC literature (as in Brander, Amit, and Antweiler 2002). Importantly, Phalippou and Gottschalg (2009) demonstrate a high positive

> correlation between successful exits (IPOs and acquisitions) and returns to venture capitalists, suggesting that such exits are a good measure of success.
>
> Brander et al. (2014 p.11)

Some of the studies (Munari and Toshi, 2015; Cumming, 2007) consider these variables in attempts to measure the success of these funds in creating a VC industry, which of course has benefits for economic development. Although this was one of the aims of the AIIFs, it was not for the RVCFs in England, which is the subject matter of Munari and Toshi (2015)'s study. Measuring the development of a VC market by IPOs and syndication and using that to represent a measure of economic success supports the view of Levine (2004) that financial development is not only a result of economic growth, but is also its cause, and hence signs of a healthy financial market are indicative of a healthy economy. He claims both theory and evidence show that better developed financial systems ease financial constraints for companies and support economic growth.

Levine's view has been questioned and subsequent work either brands such thinking as part of the financialisation stream of literature, which is claimed by some critics as being oblivious to this increasing financialisation and its detriments within the economy (Christophers, 2017) and others who argue deepening of capital markets helps GDP grow more quickly initially but that over time if they deepen too much they create a drag on economic growth (OECD, 2015). The influence of this financialisation trend reflects one of the developments in PVC literature where financiers are evaluating policy focused tools like direct FIs or PVCs as if their sole purpose is to generate financial returns rather than considering the economic development principles underpinning their creation and rationale for operation. Cumming's work (Cumming et al., 2017; Cumming and Johan, 2016; Cumming, 2007) focuses on syndication hypotheses that companies who raise capital often and from syndicated partners have less resources to manage, more scrutiny, are subject to better governance and are more aligned with shareholders' objectives, which results in them

> …generating economic value as proxied by the propensity to go public and market capitalization after being public.
>
> Cumming and Johan (2016, p.31)

Their work, however, lacks the rational of why that is the case and it is also hard to believe given the myriad of economic benefits that do occur. These authors' backgrounds are in corporate finance and they are modelling corporate finance metrics, hence their categorisation in the finance stream of contributors in this thesis. It does seem an unconvincing twist of events that the proxy of going public and market capitalisation after being public is considered by the authors to be a measure of economic value. This, of course, is the mistake made by the financialisation stream of literature already alluded to. These measures of success are based on work done by Gompers and Lerner in the 1990s (Gompers and Lerner, 1999; Gompers, 1995) which, within an agency framework, found frequent funding and extended syndication contributed to successful exits. They explained this by suggesting that from the information gathered at each financing round, the venture capitalist continues to fund if they see IPO potential whereas they will quickly seek a trade buyer or liquidate if the potential is less. Following this methodology, Cumming and Johan (2016) also claim their model shows a VC development like the AIIFs produce economic growth but there is no rationale in their work to substantiate that claim. Munari and Toschi (2015)'s measures of success were the number of new partners in each syndicated round of financing, number of rounds of financing and the number of exits. Their work focused on UK companies over the period 1998-2005 with most of the data in the latter five years. They followed Cumming's (Cumming & Johan, 2016; Cumming, 2007) hypothesis of better governance leading to better and more exits.

The finance stream, with the exception of Brander et al. (2002), focuses on the success of the finance raising process rather than the financial outcome. Using econometric techniques, they examine relationships which they believe will generate good values at exit rather than measure those exit values themselves. Data challenges also partly explain why some of the finance stream researchers went down this route – Brander et al. (2010) admit they struggled to identify the amount invested in the companies – and

as mentioned earlier much economic benefit is ignored such as jobs created and indirect economic effects.

Aside from the AIIF work (Cumming & Johan, 2016: Cumming, 2007) and work of Guerini and Quas (2016), the finance stream of writers has overwhelmingly concluded PVCs are not successful, although their work, with the exception of Brander et al. (2002) (when they had positive financial returns to measure during the tech boom of the late 90s), do not actually measure true value and impacts but rather hypothesised relationships of those impacts, due to their reliance on quantitative and secondary data and little if any attention has been paid to the economic value of these policies. Considering that, it is surprising that such a body of literature has developed, particularly as the model on which most of the work is based was established in the 1990s when the dynamics of the VC market were much more robust than in subsequent times (Mason, 2009a) and, indeed, further research to establish its continued validity would be a good addition to this body of research.

2.8.3.4 **Consideration of the economic stream**

The economics stream of research produces mixed results as to the success of PVCs, with the negative outcomes of Grilli and Murtinu (2014a; 2014b) contrasting with the positive outcomes of Owen (Baldock) and Mason (2017), Baldock (2016), Baldock and Mason (2015), MWC (2016), Hayton et al. (2008) and Lerner (1999). There were also reports with mixed results, with National Audit Office (2009) taking cognisance that the evaluation period was an economically difficult one, that the fund objectives were unclear, its design poor although they did validate the existence of an equity gap. Baldock (2016) argued they would have added more value had they related the company data to the sums invested. Percentages are better than nothing but knowing the base numbers on which they are based, is always much more illuminating. They did say that the median value of the three-fifths growth in the companies' sales was £80,000 and the median growth when employment doubled was three new staff. It is known, however that means and medians can be very different in this area of research, so the mean might have been quite different, but the median is certainly the more

information rich average in work like this. Except for the SBIR (Lerner, 1999), the funds, which have been deemed as successful have been managed or led by private partners, although that has not been the necessary pre-condition of success for a PVC, as was evident with the private management of the failed RVCFs (National Audit Office, 2009) who received £70m and ended up with a pot worth £5.8m (HM Treasury, 2017). It should be noted Lerner (1999) showed positive results after a 10-year period, so another consideration is that many of the time periods considered in these failed studies are too short to draw valid conclusions. He also showed the success was in geographical areas where a PRVC industry was already established, so there was some depth of capital and knowledge stock in the eco-system already.

The studies which cite PVCs as largely ineffective in promoting the growth of firms are Nightingale et al. (2009) and Grilli and Murtinu (2014b). Nightingale et al. (2009) believe there is a place for PVCs, but some amendments are required to the models they reviewed, which they considered too parochial and small, despite the fact that jobs had been created. This theme is picked up in Mason (2016), who attributes the failure of execution of some funds to several factors. Factors cited are an inappropriate investment focus and mandate parameters (size of investments too small; technology orientation), the funds' inability to provide larger follow-on investments, lack of competence to provide hands-on support amongst the managers and he advocates complimentary support is required for success and the encouragement of BAs as a source of capital.

Since the discussion on funding restraints, there have been calls for a redesign of PVCs and for other supportive schemes to be considered, like improving financial literacy amongst firms, helping firms with high growth potential realise their potential (BBDBIS, 2015). Many aspects have been called out by various writers such support in assembling finance options for the businesses (Smallbone et al., 2002), stimulating the demand for external finance in firms to increase their entrepreneurial ambition, as research has shown that entrepreneurs with higher levels of human capital and more extensive networks have a greater knowledge of financial options and are able to benefit from them (Seghers et al., 2012). Improving the 'debt readiness' of growth-

oriented firms (Rostamkalaei and Freel, 2016) and promoting newer forms of alternative finance such as crowdfunding (Brown et al., 2016).

Mason (2016) advocated a broader adoption of the Scottish model of publicly funded but privately managed funds and the development of networks and deal sourcing – or pipelines –to bring in out-of-region equity investors to address the 'thin' market issue of peripheral regions (Nightingale et al. 2009). Aside from Scotland, other innovative high growth programmes seek or have sought external funding such as the NIY programme operated by Tekes in Finalnd and the highly regarded Yozma programme in Israel (Autio and Rannikko 2016; Avnimelech et al., 2007, Ehrlich, 2004).

2.8.3.5 **The role and challenges of PVCs within regional development**

The intent of most of the UK's PVCs has been economic development where they have sought to increase productivity, competitiveness, and long-term economic transformation (HM Treasury, 2017; European Commission, 2005). Jones-Evans (2014) reviews the activities in Wales and gives some pointers as to his definition of a successful model

> The Welsh Government needs to consider an approach where public funding for SMEs is affordable, focused on economic development, is supplemented by business support and is oriented towards the needs of the business customer. It is also critical that the public sector does not displace the private sector but works alongside the banks and other stakeholders to address a market failure in the provision of finance to SMEs.
>
> Jones-Evans (2014, p.2)

A few have been mentioned already such as the SCF in Scotland, the RVCFs & ECFs in England, some others are the London Co-Investment Fund and ACF in Manchester.

The need for PVCs in a regional development role often results from the lack of a PRVC presence in that region, which, suggests the investment opportunity set and flow is scant, otherwise it would be there (Mason 2016; Nightingale et al., 2009). Often regional PVCs have geographic limitations, as they are funded by regional entities, who only wish to develop their area and usually the funds are small, which compounds the problem of scarcity, especially when it comes to their capacity to participate in follow-on funding rounds to help companies grow (Innovation Australia, 2014; Mason and Pierrakis, 2013; Nightingale et al., 2009; National Audit Office, 2009). Weak human capital in regional PRVC firms, if they exist, is another issue (Mason and Harrison, 2003), which compounds the problem even further as regional challenges and the prospect of lower earnings prevent highly skilled venture capitalists being attracted to peripheral areas (Jääskeläinen et al., 2007) and often these skills are needed even more in these challenging areas to help grow companies and get good financial returns, which is the prime focus of PRVC firms (Brander et al., 2014). Other points raised in the National Audit Office (2009) and HM Treasury (2017) reports are the importance of the PVC's costs of operation and the timing when raising money, especially if the funds have a fixed term, both of which can have a detrimental effect on the returns

2.8.4 A critique of the studies

This body of literature on PVCs – both academic and independent - does not adhere to a consistent definition for PVCs – Munari and Toshi (2015) argue a PVC deal is one where the PVC took more than 50% of the first round of financing, for others it is when they pass the responsibility of management to the private sector (Cumming, 2007; National Audit Office, 2009), for Grilli and Murtinu (2014a, 2014b) it is when the government makes all the decisions. Differing definitions make comparisons difficult so a recommendation to the researchers in this area is that all papers cite a precise definition and list all the funds included so some scrutiny and correction can be undertaken if required. It is also important the conclusions drawn in the research relate to the PVC structure and logical comparisons are made so if funds with different

structures are compared those differences are a subject of discussion in the analysis. As PVCs are direct FI policy tools, the key considerations in evaluating their success are their delivered outcomes with respect to the policy objectives, when they were formed and whether this was a good use of public money.

Unfortunately, the analysis of PVCs outcomes is another area which lacks clarity and feeds confusion, as some papers draw conclusions on effectiveness of funds based on outcomes that are totally, or at best, partially unrelated to the fund's primary objectives or the context in which they were operating (Munari and Toshi, 2015; Cumming & Johan, 2016: Cumming 2007). Murani and Toshi (2015) measured the effectiveness of the RVCFs, UK public money subcontracted to PRVCs. Their econometric model contained hypotheses relating to the success of their syndication and exits, their success in developing a local VC market and whether regional characteristics were important to their success, yet the goals of the funds were to bridge the gap in finance available to small businesses and show potential investors commercial returns could be made (National Audit Office, 2009). In measuring an outcome other than that intended by the policy tool, Munari and Toshi (2015) offers little value to the extant literature and, in fact, misleads as it is quoted by others as evidence that PVCs don't work (Mason, 2016). As these PVCs were run by PRVCs, a more interesting discussion may be related to the competence of the PRVCs and indeed there has been a discussion of regional VC markets and their lack of depth, which renders PVC success challenging (Mason, 2016; Mason & Pierrakis, 2013; Nightingale et al., 2009).

In the area of PVC research, like BA research, the availability of relevant data is a challenge, and the requirement for publications in high impact journals for academic success has often meant topics for which data is available becomes the focus of attention, even in this case, if it does not appear relevant (Landström and Sørheim, 2019; Wilson and Silva, 2013). The data challenges and use of surveys or public databases result in erroneous research as the samples are unrepresentative and biased due to their tiny minority of successful companies and often future data are entrepreneurs' estimates (MWC, 2016: Hayton et al., 2008). If the interest is really to ascertain whether the policy measures are creating economic growth, the focus on the

average firm common in quantitative techniques such as Ordinary Least Squares, when the distribution of successful companies is very skewed with only a few winners, is an error of process most data is poorly performing firms (Nightingale and Coad, 2013).

Colombo et al., (2016), Cumming and Johan (2016) and Cumming (2007) conclude the AIIFs were a success because the investee companies undertook more R&D and filed more patents than Australian firms in general and even more than firms funded by PRVCs. In addition, the companies experienced a greater number of IPOs and higher public market valuations than their comparators and no worse employment statistics. Commercialising R&D was one goal of the programme, IPOs and a consideration of IPO valuations were not a programme objective and in fact the other two goals related to the development of a vibrant PRVC sector to meet the needs of the economy in terms of volume and capability. Although poorly explained in the articles often the volume of IPOs is used as a success proxy for the development of a PRVC industry. These works, with its lack of clear signposting as to what was being tested and for what purposes, are other examples of misleading policy research as their conclusions are selective and indeed in accomplishing the omitted policy objectives the programme was deemed a failure by others as no thriving VC market was built (Clune, 2014).

There are, however, other opinions on this programme; Mr. Cheaver, the CEO of the Australian Institute of Technology at the time, highlights only 85 VC personnel were employed in the 16-year programme with a maximum of 15 at any one time and of the AUD600m invested, AUD130m went in fees. In addition, numbers presented in the study of the Australia investment sector showed that the AIIFs in 2011 had delivered 495 jobs at a cost of $49, 5000 per job, which was by far the most expensive, compared to $16,011 for VCs and £13,500 for private equity firms. Such findings highlight the need for the full policy goals to be outlined and clear signposting to be present in any research so the reader can ascertain the efficacy of the findings. In terms of financial returns, figures presented in DIISR (2011) implies an annual loss of 4% for the government over the 16 years of the AIIF programme and a 2% p.a. return or 5.6% if the PRVC fees are excluded for the private sector money.

The economics stream of writers included in table 2-5 are Harrison (2018), MWC (2016), Grilli and Murtinu (2014a; 2014b), Hayton et al. (2008), Lerner (1999) and Murray (1998). They focus on job and/or turnover growth as they seek to quantify the economic success. All, other than Grilli and Murtinu (2014a; 2014b), concluded PVCs did have a positive effect on jobs and/or turnover growth. Grilli and Murtinu (2014b) concluded they did only if led by the private sector. Murray (1998) looked at the European Seed Capital Fund Scheme during 1988-91 and although reports on the creation of more than 2000 jobs, he questioned the viability of such funds due to the large degree of capital required to sustain the growth of the companies in the long term and highlighted that despite the regional funds having economic development goals as clear outcomes, the commercial funds, which did not, created more jobs. The future saw the EU concentrate on creating commercial capital funds that target high growth technology enterprises and attract their capital from the private sector and so one might conclude the pilot was deemed a failure and PRVCs were preferred. Lerner (1999) showed that the beneficiary companies of the SBIR program had substantial growth when compared to the study's control group but that that growth was limited to areas where there was already PRVC activity. These reports add support for the view that for regional PVCs to be successful some eco-system already needs to exist and that much money is often required when funding companies from an early stage.

Three serious discussion lack in the literature -firstly, a discussion on the time required for companies to establish themselves, find the correct product and business model, establish it and grow. Much of the conclusions that PVCs, when compared to PRVCs are not effective, may be explained precisely by this fact. PVCs are generally earlier investors than PRVCs so are more prone to experience a period with little economic return while a company establishes itself. This is examined in Chapter 6 where some of the statistics from the companies do give an indication of the time it takes for companies to get any degree of traction and support this idea. Secondly the timing of policy gets little attention and is yet a critical component of success (Cumming and Johan, 2016; National Audit Office 2009) and thirdly context is rarely discussed.

2.8.5 The necessary considerations

After a review of the PVC literature, in evaluating the contribution of the research to field of study there are necessary considerations:

- the timescales – the length of the study
- the economic backdrop of the historical period in which the policy was undertaken
- the context of the policy
- whether true outcomes are measured or whether the paper addresses the success of some hypothesis.

Until work done by Owen (Baldock) and Mason (2017), most studies, which discuss PVC financial returns, highlight the poor financial returns and their unlikely sustainability. Unfortunately, most of these returns are derived from short time periods of around 4 years (Hayton et al., 2008) or less (National Audit Office, 2009). The studies, which focus on the finance metrics of IPO and syndication incidence do not add value to this consideration as no real values for return on invested capital are articulated. Longer time periods are required to ascertain true impacts.

Many of the reports mentioned in the previous paragraph focus on policy, which was in effect in the early 2000s, a time where returns were generally lacking for VC firms (Cumming and Johan, 2016) and so success was difficult for all, whether they were PRVCs or PVCs, so it is not surprising the results were not encouraging. In contrast, the Archangels study (Mackenzie & Coughtrie, 2015) which covers a period of 23 years and covers at least two VC cycles delivered a more comprehensive picture.

Historical context is important to generate and understand success and, indeed, this is very true of this policy area (Perchard et al., 2017; Coopey, 2005). The successful

Israeli Yozma VC Programme (Avnimelech et al., 2007, Ehrlich, 2004) was developed and ran in the 1990s, at the time when there were massive flows into VC opportunities. The programme created 3747 start-ups between 1990 and 2004 and 93 VC funds (Avnimelech et al., 2007; IVC, 2005). After the tech boom of the late 1990s, the VC industry preferred lower risk projects (US Department of Commerce, ITA & EC DG Enterprise and Industry, 2005). The Australian programme was developed between 1998 to 2014, which was a time, other than the first two years, when capital flows were not strong, company valuations were flat and there were two economic crises, which caused demand to dry up each time. This may explain the criticism that only 135 firms were funded in that sixteen-year period. Given these two long periods give very different answers, due to the economic back drop, MacKenzie and Coughtrie (2015) is the only report. which offers real indirect insight into the potential sustainability of PVCs, as it covers both the buoyant era of the 90s, the rather flat next 15 years and the two economic downturns.

2.9 The Impact evaluation approach in this work

This thesis aims to evaluate the effect of the two FI policy tools aimed at increasing early-stage risk capital in Scotland – the EIS/SEIS and SCF. It is believed two things are important. One is a deep understanding of the context of the policies, as most likely aspects of the context will be the main explanatory variables for the results achieved, however it was also believed necessary to have some measurement so outcomes could be ranked and considered but with the total belief that any numeric representation is a mere representation. This study is not attempting to address causality, but rather attempting to lift the lid of a system underpinned by the assumption in the literature that there is an equity gap due to market failure in early-stage risk financing and government action is required for improvement. It does not seek to make causality or correlation claims but reflect historical facts using an enhanced public sector prescribed methodology and a consideration of the context in which they occurred.

The foundation of the numeric methodological approach is the policy evaluation approach Gross Value Add Impact Analysis (GVAIA) recommended by SE (Scottish Enterprise, 2014b). One reason for this preference results from it being the recommended approach of the development agency of Scotland and the hope that this research would be a foundational work that could be developed further. It is believed there would be a greater interest to do that if the recommended evaluation approach was chosen. Other reasons for the choice are the methodology focuses on economic outcomes, is ex-post, has degree of ease of application, it uses publicly available data, did not need control groups and the required computation tools were readily available.

Focusing on economic outcomes was the main interest aligned to the research questions and alternative manageable approaches were limited. Many other approaches reviewed, such as econometric work hypothesisng sales growth it was believed were more appropriate to the monitoring or ex-ante evaluation of policy rather than the post hoc evaluation (HM Treasury, 2018a; Storey, 2000). As the research questions seek to evaluate a historic time-period it was very important an ex-post methodology was chosen. In addition, given the limitations of time, it was important to have a data set and measurement process, which was manageable and offered ease of execution, so the thesis could be completed within a realistic time frame. Any methods which involved control groups were not possible, due the difficulty of getting data on non-invested companies and the use of econometrics was discounted due to the general low R – squared of previous studies and challenge of devising an appropriate and effective model as well as access to the computing power to execute it.

To calculate the policy additionality adjustment factor required for this methodology and gain contextual insights, a BA survey was undertaken, as previous data were UK wide and somewhat dated Pierrakis, 2011, Wiltbank, 2009; Boyns et al, 2003). A survey of Scottish BAs is more appropriate to a study, which is using Scottish data. The same methodology, however, of these studies was used due to its ease of implementation. In a desire to validate many of the positive developments that have

happened in the informal capital markets, the questions from Mason and Harrison (2002a) were included, to get some regional specific and updated data.

The GVAIA was a useful tool for this research as a control group was not necessary to create a counterfactual analysis. Its application works better for some subject matters than others. In this application to nascent companies, there are aspects of the methodology, which may impact results. Firstly, the GVAIA model excludes capital and finance which is the main independent variable in this work. Subsequently, the dynamism and the growth, which one expects capital to produce is dealt with in a statistic way – from equilibrium to equilibrium. The DAA GVAIA compensates a little for that by dealing with each calendar year on a discrete basis, with the accomplishments for that calendar year recognised, given the capital that was invested to achieve them. Nevertheless, the capital deployed is not captured in any way and this may have an impact on results. Secondly, one of the key variables in the model is turnover. It can take time for new companies to generate revenue and indeed 14% of the sample companies were pre-revenue which meant they could not be included in the analysis. Thirdly, the industrial sectors included in the IOTs seem rather out-dated compared to the activities of early - stage companies. In addition, the data is collected by survey from the entire economy so it may be the case that the multipliers and numbers represented in the tables are not representative for new companies in that sector albeit so for established ones. So, this too may provide some limitations. Fourthly, if the assumptions in the analysis that there were no leakage, displacement or substitution effects are incorrect and there were indeed some, the results would have an upward bias. The approach included interviews, to garner data on the history of the policies, their development and the experience of their users as there were large gaps of knowledge in printed sources. The mixed methods approach was one which enabled the research questions to be answered and allowed a depth of data which allowed greater contributions.

2.10 Conclusion

Strategic priorities of government are the determinant of policies and to attain these strategies objectives there will be a multitude of origins, designs, layers, beneficiaries

and implementing agents. This thesis deals with two FI policy tools implemented by different governments who act, see their role, and evaluate their success differently. The UK government sees the implementation of the EIS as a tool to deal with the log believed market failure in the provision of finance for small businesses and help solve the equity gap which prevents small companies from accessing finance to grow and contribute their strategic goals of economic growth, productivity, innovation, and expansion. The Scottish government implemented the SCF as a consultative process responding to the local embedded knowledge which highlighted increased capital was required to enable more small companies to grow. Employing different means both policies focus on increasing the supply of capital to small businesses. Success of the EIS policy requires BAs are sufficiently motivated to provide capital they otherwise would not, the companies in which they invest to grow and for that growth to add value at a macroeconomic level in terms of economic and jobs growth. For the PVC policy, success requires that the companies that the funds support likewise grow and contribute to economic and jobs growth.

Monitoring the success and evaluating policies are usually required by the entity allocating the policy money for which they provide some guidance with varying degrees of detail. Evaluating policy effectiveness is however challenging and complicated due to the interconnectivity of economic variables, the difficulty of defining representative input variables and measuring them and often proxies and common sense are needed. This problem is amplified by potential superposition of policy which makes any attempt at attribution even more challenging.

Policymaking generally involves a family of policies, which relate to the strategic ambitions of the government. Although policy evaluation is becoming more prevalent, different government and their departments have different interests and different recommended approaches to evaluating policy. For some they wish evaluations pre, during and post implementation, for others no evaluation is required. Depending on the economic theory being considered, the role of government differs. In the neo-classical framework, from which the macroeconomic evaluation approach being used here comes, the government is seen as exogenous to the system and intervenes, when

markets fail. On the contrary, in institutionalism the government is an endogenous actor, who alongside other agents in the system, determine the rules of engagement, social norms and cultural norms. Since devolution, the Scottish government is seen very much to act in this manner.

The EIS, implemented in 1993 raised a relative stable amount of money during the research period, with increases in the last two years. The monies raised exhibit a cyclical trend and the policy money paid out in incentives is only 0.1% of the government's expenditure. From launch to 2018 the scheme has raised more than £20bn for 30,000 companies. It is a well-designed policy by the UK government, in many respects: it targets individuals who are sufficiently rich to be able to lose money and investing in early-stage businesses is very risky with half the monies invested lost; it enables investors to have non-executive directorships also allows for expertise to be passed on; using HMRC as the administrator of the plan means seamless integration into company and individual tax reporting cycles. The rebates are only paid on taxes due so more money could be raised if this were not the case, however it does contain the cost. Studies have shown the policy to lever additional funds, as was its original intent and contribute to job growth, the investee companies' turnover growth and additional advice for the companies. There is no evidence of increased profitability on the part of the companies however, which has been interpreted as an unrealistic expectation given the stage of growth of the companies and their emphasis rather on capacity building. Studies overseas concur with these results and in most cases such tax incentives have been deemed successful. Ares of research on this policy tool remain underdeveloped, however, those considering the macroeconomic outcomes, its context, the effect of economic cycles, policy superposition and many of the studies are dated and undertaken when BA investing was at the early stages of development and hence it is questionable how applicable they are to today's environment.

The SCF launched in Scotland 2003, structured as a Private Limited Partnership, aimed directly to provide affordable early-stage capital, enhance Scottish investing capabilities and capacities and lever monies and skills from the private sector. Overall, is has been deemed a successful policy tool and, in some cases, cited as the reason for

the Scottish vibrant BA sector. It has been well-designed as in its capacity as the marginal capital provider, it does not crowd-out private investment, yet is able to benefit from the private sector skill sets in deal origination, assessment, and advice. The Fund, however, lacked a robust accountability and monitoring framework, with published reports covering short time periods, including inconsistent definitions and data, which thus enabled no independent assessment to be made.

PVCs have been subject to many evaluations and the work can largely be categorised into an economic stream and financial stream. There is no consistency in the body of literature and some of the research does not focus on what the intent of the policy was. Often, the focus of the economic writers is company sales growth and job creation and those of the finance stream, comparisons of PRVCs to PVCs, syndication incidence, no of exits or IPOs experienced by the investee companies. The finance stream is more likely to use econometric techniques and with the general low R squared recorded from such studies, it is surprising they have been so noticed. There is also evidence that some of the particular characteristics of PVCs, such that there deal size may be smaller and they invest earlier than PRVCs, are over looked. General conclusions from the research are that PVCs run by governments alone are not successful policy tools but should they take the form of joint public/private partnership they can be successful. Their role in regions has been another research topic where again, albeit the research periods have been short, they have been deemed to fail due to restrictive mandates, insufficient funds, thin capital markets and a lack of expertise. To properly assess any research on PVC it was noted that the length of time of the research period, its economic backdrop and general context and whether indeed the research topic was one of the policy objectives of the fund were all necessary considerations.

The GVAIA measure is useful for this research as a control group was not necessary to create a counterfactual analysis, as per the approaches in Storey (2000) and Cowling et al. (2008). In this application to nascent companies, there are aspects of the methodology which may impact results. Firstly, the GVAIA model excludes capital and finance which is the main independent variable in this work. Subsequently, the dynamism and the growth, which one expects capital to produce is dealt with in a

statistic way – from equilibrium to equilibrium. The DAA GVAIA compensates a little for that by dealing with each calendar year on a discrete basis, with the accomplishments for that calendar year recognised, given the capital that was invested to achieve them. Nevertheless, how the capital deployed is not captured and this may have an impact on results. Secondly, one of the key variables in the model is turnover. It can take time for new companies to generate revenue and indeed 14% of the sample companies were pre-revenue which meant they could not be included in the analysis. Thirdly, the industrial sectors included in the IOTs seem dated compared to the activities of early-stage companies. In addition, the data is collected by survey from the entire economy so it may be the case that the multipliers and numbers represented in the tables are not representative for new companies in that sector albeit so for established ones. So, this too may provide some limitations. Fourthly, if the assumptions in the analysis that there were no leakage, displacement or substitution effects are incorrect and there were indeed some, the results would have an upward bias.

3 Chapter 3: The Scottish Risk Capital Context

3.1 The importance of context

The focus of this research involves the demand and supply of risk capital for early-stage businesses and economic development, which occur within economic cycles and are subject to underlying trends. Risk appetite varies over the economic cycle both in terms of the those investing and those undertaking entrepreneurial activity and trends result in a repositioning of important competitive landscapes and influences. A lack of contextual consideration has been highlighted as one of the failings in this area of research (Carpentier and Suret, 2016) and is one of the main determinants of results, good and bad, as can be seen by the success of the Yozma programme and the lack of success of the DBIS Venture Capital Fun (National Audit Office, 2009; Avnimelech et al., 2007, Ehrlich, 2004).

This chapter presents important topics to provide context for the Scottish risk capital market, those of the growth of institutionalism, SME capital risk policies, the supply of VC capital and the importance of economic cycles which includes a data comparison section. It also considers the deepening and widening of BA investing, the retreat of PRVCs from early stage investing, some pertinent macroeconomic trends, differences between PRVC and BA investment and PRVC and PVC parameters.

3.2 Growth of Institutionalism

In Britain, a trend of governmental decentralisation began in the mid-70s and accelerated over the 20 years that followed, as local governments received diminished powers and economic development initiatives were shifted back into the local communities from central administration. For example, Strathclyde in Scotland was established in 1976 as local government for 2.5m people (almost half the population of Scotland). In 1996 it was split and one part of it, Ayrshire, with a population of around 350,000 was governed by three local authorities.

The Scottish institutional framework changed significantly during the Conservative government from 1979 to 1996 – two sub-national Scottish development agencies – Scottish Enterprise and Highlands and Islands Enterprise – were created and merged with the Training Agency. These agencies began operations in 1991. Although much of the implementation of policy devised at Westminster was already well orchestrated by the Scottish Office, Scotland received greater autonomy over policy with the establishment of a devolved Scottish parliament in 1998.

This period of change in the Scottish institutional framework was accompanied by a period of great cultural change from 1975 to 2002 as can be noted by the list of some of the changes below:

- the establishment of the Scottish Development Agency in 1975
- the establishment of local government regions in 1975, the largest being Strathclyde which governed half the people of Scotland
- increased partnerships, strategic planning and new programmes, which were necessary to draw down EU Structural funds, which Scotland received from 1979 (Danson et al., 1997)
- the election of the Thatcher government in 1979
- an increase in non-governmental agencies, which were part of the governing structure in servicing and managing policy goals, but were non-elected entities
- the establishment of Highlands and Islands Enterprise, SE in 1991 and local Enterprise Companies (LECs) – as the responsible agents of local and regional development.
- The birth rate strategy in 1991, which aimed to double the number of new businesses in Scotland by 2000 and increase entrepreneurship
- the change of policy from encouraging foreign direct investment (FDI) to stimulate economic growth by enabling endogenous resources.
- the break-up of the local governments in 1996 into much smaller governmental units
- Scottish devolution in 1998 and a parliament established in Edinburgh

- the Alba project in 1998 which sought to create an indigenous ICT value chain by establishing a technology design and research centre to service the incoming and established multinational tech companies.

Such initiatives highlight the role the government played as a proactive participator of change – creating a more flexible enterprising economy, aligned with general economic thinking and evolving economic growth theory of the time (Coopey, 2005) with its focus on the encouragement of endogenous economic growth and the comparative advantages of regional competitive structures (OECD, 2005; Audretsch and Thurik, 2001). There was a greater emphasis on investing in local assets rather than encouraging FDI and, as Cochrane (1991) points out, the role of government shifted from that of government to governance. The work of Goodwin and Painter (1996) also concludes that the drivers of change for the functioning of local government since the 80s caused

> …crucial transformations in the social, political, economic and cultural relations which operate in and around the local state.
>
> Goodwin and Painter (1996, p.635)

and changed the local government's role in the UK, from independent execution to the governance of the relationships between all the interested organisations and the promotion of dynamic technological change and growth, as outlined by the Labour Party's consultation document in 1975 with respect to their plans for regional government in England

> …the form of local government changed from a system of local government into a system of local governance of complex sets of organisations from both the private and public sectors organisations In the late 90s when regional development agencies (RDA) became the dominant model in the United Kingdom they were the ones to be proactive and then report back to the locally elected assemblies.
>
> Labour Party (1995)

Increasing availability of development monies, such as the European Structural Funds from EU, were also an influence on the institutional framework, as they funded programmes rather than projects, and these programmes required regions drawing on both regional and local input to make the economic case to attract funds (Taylor and Wren, 1997) so encouraged partnerships and new ways of working.

After this expanded role for local communities, the policy accordion bellows compressed with severe austerity measures implemented by the UK government after the GFC in 2010, when public spending was 45% of GDP (BBC, 2017, by which, they hoped to eliminate the budget deficit of £121bn 2020 (HM Treasury, 2011). As a result of these measures, spending in local governments experienced particularly large cuts (Fitzgerald and Upton, 2015), which resulted in much of local regional economic development resources being stripped away. This resulted in some of the agreed EU funded programmes not being progressed, as there were insufficient local resources to administrate or implement the programme, alongside the lack of funds to match it.

It is not surprising that policies and evaluation practices adopted by the Scottish Office/Executive/Government were refined as the years progressed, nor that their adaptation reflected a wider consensus, as this reflected the new way of consensual thinking and decision-making (Hayton, 2017). This is also true of the period before and during the period this thesis reviews. For Lanadabaso (1997) consensus amongst the various actors, both private and public, creates the required institutional conditions to encourage innovation, and Gregerson (1992) sees the local government acting as a pacer for the development of innovation and a stable influence in the face of globalisation competitive pressures and transnational regulation. The institutional backdrop to the period of this study saw the government very much as a collaborative organisation, seeking to shape values and norms within the institutional framework as alluded to by North (1991) in an attempt to reduce the transaction costs of the early-stage risk capital market, through the influencing and co-creating of new or improved institutional frameworks.

Mention was made before of the Birth Rate strategy – in this initiative, as outlined in a paper by Charlie Woods (n.d.) former Chief Economist of Scottish Enterprise, £20m p.a. was spent on a series of measures in co-operation with partners, such as schools, LINC, and quangos to achieve:

- Unlocking the Potential: persuading more people in Scotland to set up businesses – including building enterprise into the education system, at both school and university levels
- Improving the Environment: making Scotland a more encouraging place for entrepreneurs by improving formal and informal support networks
- Improving Access to Finance: helping potential entrepreneurs gain access to appropriate funding to develop their businesses – including VC, BA capital, and bank finance
- Widening the Entrepreneurial Base: unlocking the untapped potential among women, the under-35s and non-homeowners – all under-represented among Scotland's entrepreneurs
- Increasing Start-ups in Key Sectors: obtaining more new starts in key industries, such as manufacturing, high-tech and business services
- Increasing the Number of Fast-Growing New Starts: increasing the number of starts that achieve substantial growth, across all sectors.

Woods (n.d., page 1)

This initiative provides strong evidence of the government taking an active stance in trying to reform norms and culture to promote a more entrepreneurial culture in stark contrast to its old economy management role (Peden, 2005). Likewise, they contributed by creating a supportive environment with the provision of contract law, tax incentives, conducive regulatory conditions, and the establishment of a network of shops to help people with information, skills and to showcase their business ideas (Hood, 2000; Woods, n.d.).

It also is an example of this consensual thinking and decision-making, where various organisations, including government, interacted and reshaped the institutional

framework. Another later example which worked on changing the focus of the Birth Rate strategy begins with an article in The Herald (Glasgow Herald, 2001), Glasgow's leading daily newspaper, which discusses a report by the Scottish think tank, the Fraser of Allander Institute, on the success of the Birth Rate Strategy, detailing recommendations from the Institute for improved outcomes, such as a focus on High Growth Firms (HGFs). Then, as outlined by North (1991), the government worked with various stakeholders to create a consensus, which they subsequently tied into policy, by tabling a consultation, followed by a four month extensive review by SE and the Scottish Executive, to digest and institutionalise these ideas, concluding with the 2002 policy initiatives to focus on HGFs, with the establishment of the 'High Growth Start Up Unit', the 'Companies Can Scale' initiative and the launch of the SCF programme (Mason and Brown, 2010).

The SCF was the direct policy FI response to the high market transaction costs, which hampered investment in early-stage companies. It sought to alleviate the perceived market failure in the provision of an adequate supply of early- stage capital in Scotland. SE has supported and still supports the early-stage business eco-system in many ways; for small businesses they fund market research, provide investment readiness programmes Intellectual Property audits, skills development, attendance at trade fairs and management development skills (Scottish Enterprise, 2020; SIB, 2015, Hayton et al., 2008). For the investors, SE has helped fund the growth of the number of BA investors through LINC, who offered programmes to broaden their skills and share best practice, as well as sponsoring many events to aid with networking and general capacity building (LINC, 2020; Mason et al., 2016) thus helping shape the backdrop and environment, in which the polices discussed in this thesis operated. Indeed, Wilson and Silva (2013) have established that PVCs are insufficient operating alone and need to function within a greater supportive ecosystem.

The private sector also acted as a partner and influencer of the institutional framework during the period. During the 80s there had been much concern about the extent of the public sectors' investment, via SDF, in Scottish industry, which resulted in a non-accomplished and challenged intent to privatise them (Hood, 2000). Greater private

sector investment participation was wanted. A first step in this direction was the establishment of the SEP fund in 1994 with private equity partners and a further major event occurred in 2001 when members from Archangels BA syndicate influenced the Scottish government to include BA groups amongst the financial partners of the PVCs they were developing, as they were already prolific investors in the Scottish economy (MacKenzie and Coughtrie, 2015). Peter Shakeshaft, the then CEO of Archangels presented to Robert Crawford (as the then CEO of SE) and several policymakers the prolific and consistent nature of Scottish BA investing and secured the possibility that BA syndicates could be financial partners of the new hybrid passive Fund – the SCF – alongside PRVCs.

Again, one sees the institutional framework morph over time, in response to the environment, as another Fund objective was added for the Fund on the second tranche of European money received by SCF, for the period 2007-2013, which was to attract foreign capital (MWC, 2016). One of the ambitions of the first tranche – to create a domestic self-sustaining early-stage risk capital supply – had not materialised, so a new institutional framework was adopted, with a revised objective of seeking capital from abroad. The Scottish risk capital market was thus supported by a well-functioning operational institutional background where a proactive government was broking and seeking progressive change with their many collaborators to engender endogenous economic improvements.

3.3 SME Risk Capital Market policies

'Market failure' or 'equity gap' have been the overarching descriptors of the discerned major problem in early-stage UK capital market. This is true regardless of the type of finance. Documented history since 1931 shows there has been a perceived inadequate supply of early stage or small business capital in the UK as outlined by the list of working parties, committees, reviews in the table below:

Date	Report/Committee	Reference	Conclusions
1931	MacMillian	HM Government, 1931	Explored reason for recession in 1929 and formed 3i (formerly ICFC) to address the MacMillan gap, where the banks were failing British industry in providing capital up to £200,000 to companies (equivalent to almost GBP5m today)
1959	Radcliffe	National Institute Economic Review (1959)	Considers monetary policy, outlines and suggests avoiding the danger of impeding SME growth, which is valuable economically and socially, but no real steps implemented
1971	Bolton	HM Government, 1971	Concluded although IFCF satiated the MacMillan gap, there were still impediments for small firms to get access to risk capital
1979	Wilson	HM Government, 1979	Still obstacles for small companies gaining access to equity finance to create and grow. Small Loans Guarantee Fund (LGF) created
1986	NEDC	NEDC, 1986	Attributed the shortage of supply of funds for small companies to both demand and supply issues; Advocate management training for entrepreneurs so they are more convincing to investors. that more capital supply was needed for smaller needs and that these costs should be contained. Much progress attained from government initiatives like the

			Guaranteed Loan Fund (GLF) and BES as well as longer term lending options from banks.
Date	**Report/Committee**	**Reference**	**Conclusions**
1990	ACOST	ACOST, 1990	SMEs vital for wealth creation. Strategic management competence failing in small firms. Capital for growth for small firms cited as a barrier for economic growth and increased supply required. More innovations needed from small form. Greater awareness required for IP protection.
2000	Competition in UK banking	Cruickshank, 2000	Clear market failure, mismatch demand and supply of small-scale equity investments, VC deals too big and BAs underdeveloped
2005		US Department of Commerce, ITA & EC DG Enterprise and Industry, 2005	Confirmation PRVCs moving away to larger deals and encouraged governments to intervene to address market failure at the small deal end.
2009	Rowlands Growth Capital Review	IOP, 2009	Provision of capital still lacking. Set up a series of co-investment funds with the Department of Business, Innovation and Skills (BIS)
2011	Project Merlin	BBC, 2011	Still shortage of capital. Initiative to have large banks lend to SMEs
2011	ICB	ICB, 2011	Lack of competition in supply of capital to SMEs
2012	Breedon Review	Breedon, 2012	Working group reviewing alternative debt options

Date	Report/Committee	Reference	Conclusions
2013	Finance White Paper	Fraser, Bhaumik, and Wright 2013	Discussion of factors affecting funding gaps – demand and supply side.
2017	Patient Capital consultation response	HM Treasury, 2017; HM Treasury, 2018a	10-year action plan to release a £20bn response to provide capital for scaling innovative firms. Work with pension plans to release long term investment money, create a £2.5bn Patient Capital investment programme with the BBB. Three other funds launched by BBB – Managed Funds programme (fund of funds), the Regional Angels programme and the National Security Strategic Investment Fund

Table 3-1: Major early-stage capital parliamentary working groups

As the table outlines, these activities often resulted in concrete policy measures to increase the availability of capital and sometimes not. Other indirect FI policy initiatives to grow the supply of capital for small or early-stage businesses, not listed here, were the establishment of the BES in 1983 followed by the EIS in 1993, SEIS in 2013 and Venture Capital Trusts (VCTs) in the Finance Act in 1995.

Investment powers were granted to the government agency, when the Scottish Development Agency (SDA) was established in 1975, as it was believed the region's economic development was restrained by an underdeveloped VC market (Hood, 2000). In the early years these investment activities were more politically motivated, but with the advent of the Thatcher government in 1979, these financing activities were moved to a non-departmental government body, known as Scottish Development Finance (SDF), with greater accountability and visibility of its economic development objectives. A further change of focus and form happened in 1994, as VC investing was accelerating, Scottish Equity Partners (SEP) were formed from SDF, with the issuance of the European Investment Banks's (EIB) first ever equity guarantee to establish a £25m fund. The fund operated as a public/private partnership with a focus on commercial returns and its relationships were key to Scotland's participation in this VC boom. It was deemed a sufficiently deep VC market had been achieved in Scotland at the end of the twentieth century, that the need for SEP to act as a government agency was no longer required and so it was privatised in August 2000. As a private entity, it was no longer restricted to Scottish investments, nor to those in the start-up phase (Scottish Business Insider, 2011) and as SEP diversified, funds allocated to fund start-up Scottish businesses diminished. So, the accordion was deflated again.

Like expanding the accordion again, the next decade saw many policy initiatives to stimulate the supply of capital such as the EIS, the ability for BAs to self-certify as sophisticated investors, investment readiness programmes, which included management training, presentation training for investee companies, the creation and training of BANs to improve access and scale for investment opportunities and investor training schemes, as well as the establishment of the SCF (Mason, 2009a). These policies were largely the foundations of the policies evaluated in this thesis or

were complementary supportive policies to them, which created a stable supportive backdrop to enable the policies described in this thesis to thrive.

England, in contrast, experienced a much less stable policy environment as can be seen below. English direct FI policy tools included the creation of the RVCFs by the Department of Trade and Industry in the late 1990s (Department of Trade and Industry, 1999)

> … to increase the amount of equity gap venture capital available to SMEs.
>
> BISa, n.d.

and the Regional Growth Fund (RGF) in 2010 to

> .. support business employment and growth.
>
> HM Treasury (2010, HC 61).

The RVCFs were launched in January 2002. The programme was a public/private partnership with nine privately managed PRVC funds, to cover the nine newly formed development regions in England. The funds were funded with £250m, £75m of which came from the British government, with the aim of closing the equity gap for English SMEs. Each fund had a 10-year life, with strict regional spatial limits and provided capital of amounts between £100,000 and £200,000 (Webster, 2009).

The RGF was a fund of £2.4bn announced in the budget of 2010. It provided loans and grants with a minimum sum of £1.0m from 2011 to 2015 for areas in England, which were most at risk of the public spending cuts. It supported initiatives which levered private sector funding and decisions were made by the Local Growth Ministerial Committee, which was chaired by the then Deputy Prime Minister, Nick Clegg, on the advice of an advisory panel (House of Commons Library, 2016). Its creation by BIS, along with the creation of Local Enterprise Partnerships (LEPs), voluntary partnerships of local communities and businesses, were the UK government's response to the dismantling of the nine RDAs, set up in the 1990s, in a bid to cut costs (House

of Commons Library, 2016). The intent with the LEPs was for them to establish local priorities and lead economic growth and job creation initiatives in their local area. The expectation was that similar economic development to that of the RDAs would be administered by local councils and LEPs (Times and Star, 2010), however, LEP funding lacked, and local governments were under severe cost constraints (BIS, 2011) so it proved challenging. Although the LEPs were viewed as advantageous by the British government, they left the governments of Scotland and Wales to decide, whether they would be useful for their devolved nations (House of Commons, 2010) and they were never implemented in Scotland. Scotland continued to offer its local business support through Business Gateway which was initiated in 2003.

Other policies were UK-wide, such as the Enterprise Capital Funds (ECFs), in 2005

> …to address a market weakness in the provision of equity finance to SMEs.
>
> BISb, n.d.

and the BBB in 2013, funded by BIS to

> …make finance markets work better for small businesses in the UK at all stages of their development.
>
> British Business Bank (2018).

The UK-wide ECFs has two main objectives a) provide seed and early-stage growth capital of amounts between £250,000 and £2m to potential high growth SMEs and b) establish an eco-system of early stage PRVCs with new managers entering the market. From each of their partner managers for each fund, they required one third private investment, for which there are preferential terms. The UK government provided £280m in 2006 for an initial eight funds, £200m in 2010 for a further eight and then a further £400m for the period q32014-2017 (Baldock, 2016). Their management was transferred to BBB on its creation in 2013. The BBB is a UK wide institution, fully funded by the British Government, as an economic development bank. It works with

130 different partners to help supply capital in poorly functioning markets (British Business Bank, 2018).

It is noticeable that many policy initiatives have been undertaken over the years and a few important points can be made about them. The first point relates to indirect FIs, where there has been a consistent UK-wide policy since 1993, when the EIS was launched. One could even argue that the EIS was not that different from the BES and so conclude, UK indirect FI policy for early-stage risk capital has been consistent since 1983. Changes have been made along the way with one or two goals – one to ban opportunities, which were believed to be against the spirit of the policy of providing capital to small companies, who otherwise would struggle to get it and another to increase the generosity of tax breaks whether by amount of rebate or maximum investment amount permitted. The changes made in 2015 are a good example of both of those.

A contrast can be drawn between direct FI policies for the early-stage risk capital market, implemented in England and Scotland, particularly PVC policies. Scotland, a small nation of little over five million people, has experienced a stable institutional framework since the launch of the SCF in 2003. The Fund's business model remained intact throughout the whole period of part ERDF funding, with small objective amendments, as previously outlined, and where any revisions to the framework were an effort to reduce transaction costs, such as the SIB asking its investment partners to collect operational investee data on all transactions, to improve the productivity of the ecosystem (Interviewee B, 2015). It is true SE have played the accordion around the Fund, with the launch in 2006 of the Scottish Seed Fund and SVF to address investment requirements above and below the investment range for the SCF of between £0.5m to £2m and £20,000 to £100,000 respectively - only to reverse tack in 2011 and merge the funds to become the SVF and cover the whole range of financing from £20,000 to £2.0m. Unlike the SCF, where the Fund has financial partners, the SVF can partner with any private investor, who is investing in a qualifying company. In addition, SE has the Portfolio Fund, which it can use at its discretion and sometimes this Fund is used if the SCF limits have been reached (Interviewee B, 2015). The

£107m (to March 2015) SCF has, nevertheless, been the most consistent Fund (SIB, 2015). The inclusion of BA syndicates amongst its partners from the start was extremely fortuitous given the increasingly important role they played in the provision of early-stage capital as PRVCs retrenched.

England, in contrast, has experienced a tumultuous time, with the RVCFs launching with a ten-year life and region bound, to be completely replaced by a whole new geographic structure and business model at the end of their life. Another noticeable policy feature of the English Funds is the focus on a model of PRVC funding. In terms of their common institutional model of 10 year funds, they are sub-contracted to PRVCs themselves and the ambition to develop regional PRVC capacity, of course at a time when established PRVCs human capital and networks were in retreat in major financial centres, never mind virgin territories. The UK-wide PVC policy likewise focused on PVCs working with the PRVC market until the launch of the ACF in 2011.

The Scottish risk capital market has experienced a relatively stable policy background and has shown evidence of innovative thinking with the formation of the EIB's first hybrid PVC and the early establishment of a co-investment fund. Particularly with respect to PVC policy initiatives, Scotland has had a much more stable experience than England, which has allowed experience and capability to develop. The market also received much support from many policy initiatives, alongside the provision of direct funds through many readiness programmes both on the demand and supply side of the market and well as funds being deployed to encourage a greater market through the promotion of BANS. There are thus many policies at play in the Scottish Risk Capital market and superposition of policy is certainly a real consideration when evaluating policy effects.

3.4 The Growth of VC Funding and economic cycles

In line with global trends, the UK experienced a huge growth in the supply of VC capital in the 1980s and 1990s, accompanied by more entrepreneurial financing methods (Coopey, 2005).

In 2000, the total amount of VC invested in the UK had increased by a multiple of over 45 times over the previous 15 years - from £140m in 1984 to £6.4bn by 2000 (BVCA, 2007). In Scotland the growth was lower, yet still robust, and was one of the stronger UK regions, in the wake of the leaders, London and the South East, from £16m in 1985 to £262m in 2000, a multiple of 16.0x or growth of 20% p.a. (BVCA, 2007). Investment in UK start-up businesses also grew exponentially during this time from £25m to £175m (BVCA, 2007) and although start-up VC amounts for Scotland are only available from 1998, numbers show that start-up funding in Scotland was growing rapidly with the numbers representing 13% of the UK total in 1998 and 20% in 2000 (BVCA, 2007).

Mason and Harrison (2002b) highlight the dominance of London and the South-East in the development of VC in the UK during this period and Scotland as the only region that recorded a greater than 'expected 'share of provision of capital', which they attributed to the developed financial services sector in Scotland, the large presence of 3i PLC (previously the government formed IFCF) and the activities of SEP. These numbers for Scotland likely underestimate the true value of venture investments as only investments undertaken BVCA members are included, and there were other significant players such as Archangels and Barwell plc, a family office, who were not BVCA members. However, despite this exceptional growth, a lack of early-stage capital remained an important issue, as is highlighted in the GEM Scotland Report 2000.

> …the general private investment market in Scotland is only about half of what it should be, given Scotland's rate of entrepreneurial activity,
>
> GEM (2000, p 22)

VC is a very cyclical phenomenon, with volumes totally drying up in periods of recession and strong flows peaking after the economy has peaked. There is nothing surprising in this, it merely reflects the degree of confidence investors have in future economic prospects and their animal spirits (Keynes, 1936), they move up and down

the risk of asset classes through the economic cycle (Pflueger et al., 2018). Evidence of this cycle is the privatisation of SEP in August 2000, as it was believed a sufficiently strong organic domestic VC market had been developed. In fact, this was the peak of the cycle and the following years saw the gradual withdrawal of 3i PLC as volumes of investment were low and opportunities were scant.

The bursting of the tech bubble in 2000/02 saw a major retrenchment in VC activities. The Scottish early-stage capital supply, thus, not only suffered from SEP's privatisation and the broadening of its investment universe outside Scotland, but the sharp decline in general interest in the market and the gradual retrenchment of 3i PLC who finally left Scotland in 2004 (Glasgow Herald, 2004).

Moving on to the research period of this study, which begins in 2003, the flattish trend of sums invested recorded in Scotland for most of the period is typical of early-stage risk capital and VC investing at this time. Risk appetites had much diminished after the bust of the tech boom, only to begin a gradual recovery in the mid-2000s, to only to diminish sharply again with the GFC in 2008. In fact, the 15-year period of this study covers 3 mini cycles – growth to 2008, decline 2008-2010, growth 2012 to 2017. The three tables and figures below present a historical perspective on sums invested in the Scottish VC market from three different sources. They are included for two reasons. Firstly, to show amounts invested remained more or less flat from the bust of the tech boom in 2000 until 2016 and 2017 (depending on the data source), which is largely the period under review in this thesis and secondly to illustrate the data issues which Professor Mason referred to in his 'faith quote'.

Figure 3-2 below outlines the amounts invested by BVCA members in Scotland. These numbers include Management Buy Outs and other financial engineering deals (which some do not consider as true VC), and only the investment of BVCA members yet many angel investors in Scotland are not members of the BVCA (as previously discussed), however the BVCA data is the only series which captures both the bust of the tech boom of the late 2000s and the GFC in 2008 and so has been used to illustrate the sector trend. Amounts invested doubled in 2001 over 2000 which reflected

commitments made prior to the tech bust and attempts to salvage companies shortly thereafter but then halved consecutively in the next couple of years. A gradual recovery began in the mid-2000s, only to diminish sharply again with the GFC in 2008. After a few years of flatlining, the figures show a couple of years of sharp growth in 2007 and 2008, only to slam back with a more acute decline the following four years before starting again to grow again.

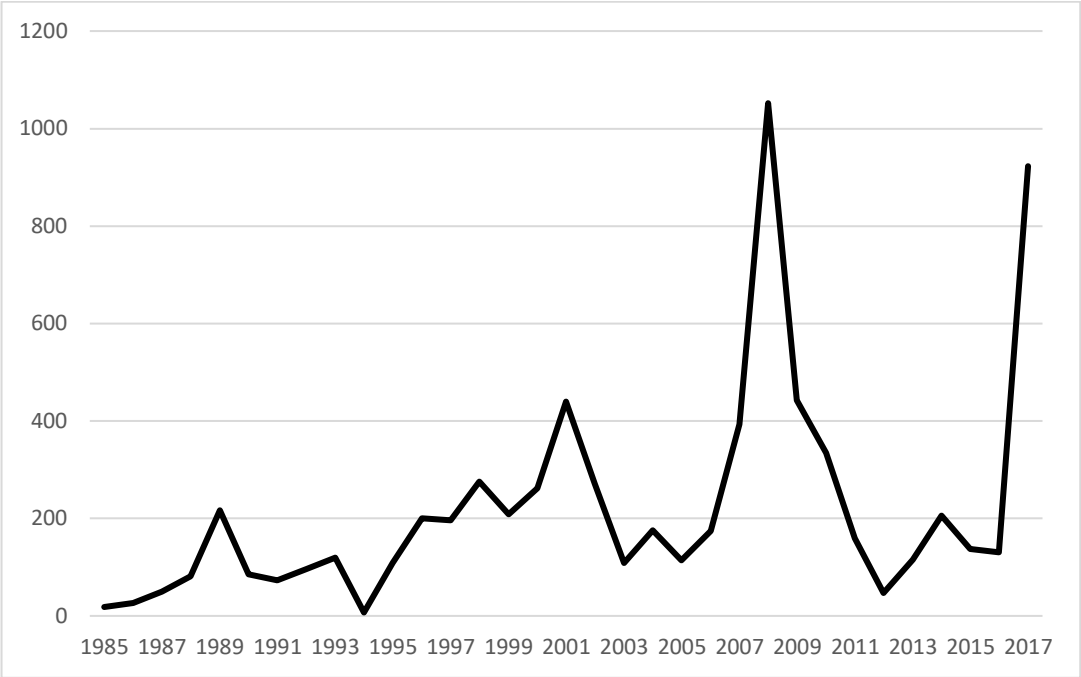

Figure 3-1: BVCA deals in Scotland £m

Source: BVCA 2019, 2016, 2015, 2013, 2011, 2007

The second early-stage risk capital data source, from Young Company Finance (YCF), is depicted in Table 3-2 overleaf. This data is Scottish data. YCF was set up in the late 90s, partly funded with Scottish government monies, with the intent of monitoring deal flow at the early stages of companies' growth trajectory. As early stage is the focus of the YCF report, its numbers are at the smaller end of the transaction value scale, compared to the larger BVCA deals in Figure 3-1. Deals over £10m were defined as megadeals by Harrison et al. (2010) in their report. Even within this YCF data set definitions have changed over time; until 2011 the public sector was labelled 'SE/ Public' and was wholly Scottish government money, thereafter was only 'Public,' and

now includes (small amounts) of other public investors such as the ACF, the Development Bank of Wales where the investment in the companies started in Scotland, but now these companies have operations in Wales like Jellagen, etc. and have received funding from other local sources (Harris, 2019). The 'Other' category is mostly other BA investors, who invest alongside angel syndicates so actually swell the angel numbers somewhat, other than in 2017, when capital raised during the IPO of Nucana on NASDAQ is included in the 'Other' category. Crowdfunding has been included in the BA numbers and affects, inflates and muddies the numbers towards the end of the period. Interestingly, the total amount invested in this dataset does not decline sharply during the GFC and exhibits a much greater growth trajectory in the 2010s, as does the VC segment, which suggests the capital flows into early stage Scottish companies may have been experiencing a greater growth trajectory than UK overall. The table also depicts BAs filling the gap in the GFC years of 2007 and 2008.

	Annual Amount Early stage Risk Capital in Scotland £m									
			2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Angels								35	53	71
VCs								16	15	20
SE/Public								16	9	13
Other								15	36	10
Total			**200**	**250**	**115**	**135**	**170**	**82**	**113**	**114**
Angels % total								61%	79%	71%
	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Angels	71	14	17	15	17	16	31	43	91	75
VCs	22	53	76	48	96	156	168	389	196	317
SE/Public	25	31	24	18	21	21	49	31	38	34
Other	1	8	11	9	7	22	16	8	11	112
Total	**119**	**106**	**128**	**90**	**141**	**215**	**264**	**471**	**336**	**538**
Angels % total	61%	21%	20%	27%	17%	18%	18%	11%	30%	35%

Table 3-2: YCF reported deals in Scotland

Source: Harris, (2019); YCF (2015, 2014, 2005-2007).

The third data set is the amounts raised by businesses through the EIS and SEIS and is outlined in Figure 3-2 below. Levels in this data set were relatively stable until they started to decline again after the GFC in 2008. In 2015, certain renewables were

disallowed, which is believed to be a contributing factor to the decline in EIS/SEIS qualifying investment levels that year

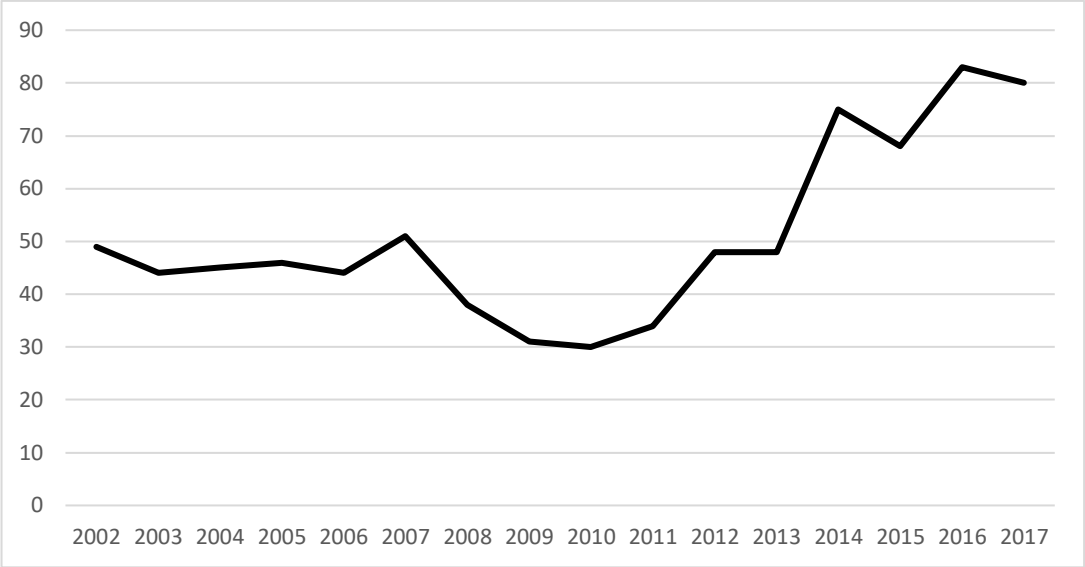

Figure 3-2: Investment with EIS and SEIS in Scotland 2002-2017 £m

Source: HMRC 2019, 2018b, 2015, 2011, 2005, 2003.

Two very important factors to acknowledge in any consideration of the Scottish Risk capital market is, like all VC markets, it is very cyclical, and any analysis needs to consider these cyclical factors. Another aspect is the quality of the data and the necessity to understand that sources differ and all to some extent tell their own story, so triangulation of data sources would be recommended, if at all possible.

3.5 Deepening and Broadening of BA investing

The development of BA investing has been a global phenomenon over the last twenty-five years, as has increased organisation within their activities, resulting in lower transaction costs. Over this time the market has deepened and information flows amongst themselves and potential investee companies have improved. A study in Sweden showed BAs on average were introduced to eight investment opportunities in 2004 compared to three in 1992 (Månsson & Landström, 2006).

Scotland has one of the most developed BA networks in the world, when amounts invested on a per capita basis are considered. If Scotland were a US state it would rank 11th in importance yet 29th in terms of GDP (Mason et al., 2016). Although reasons given for such growth differ, one set of explanations evolve around government policies – both directly and indirectly – which began early in the 90s to encourage a culture of entrepreneurship and BA investing.

Other influencing factors have been

- SE's Birth Rate Strategy in the early 90s aimed to close the gap in the number of business start-ups in Scotland with the rest of the UK by 2000 (McVey, 2000) and included measures to encourage entrepreneurial activities both business formation and angel investing
- LINC, the Scottish Angel Investment Association, which was established in 1992, is partly funded by the Scottish and European Governments, and has goals, which include facilitating the growth of angel syndicates and their capabilities.
- Archangels, an angel syndicate formed in 1992, and believed to be the oldest syndicate in the world was instrumental in sharing their knowledge with others who wished to form syndicates (MacKenzie and Coughtrie, 2015).
- The establishment of SCF in 2002, which has been instrumental in developing the BA market in Scotland by providing leverage and increased deal size (Harrison, 2018, Interviewee E, 2017).

Over the 15 years research period of this thesis the number of BA syndicates has grown from five syndicates to more than 20 and three of those five have disappeared so in fact almost 25 new groups have been formed.

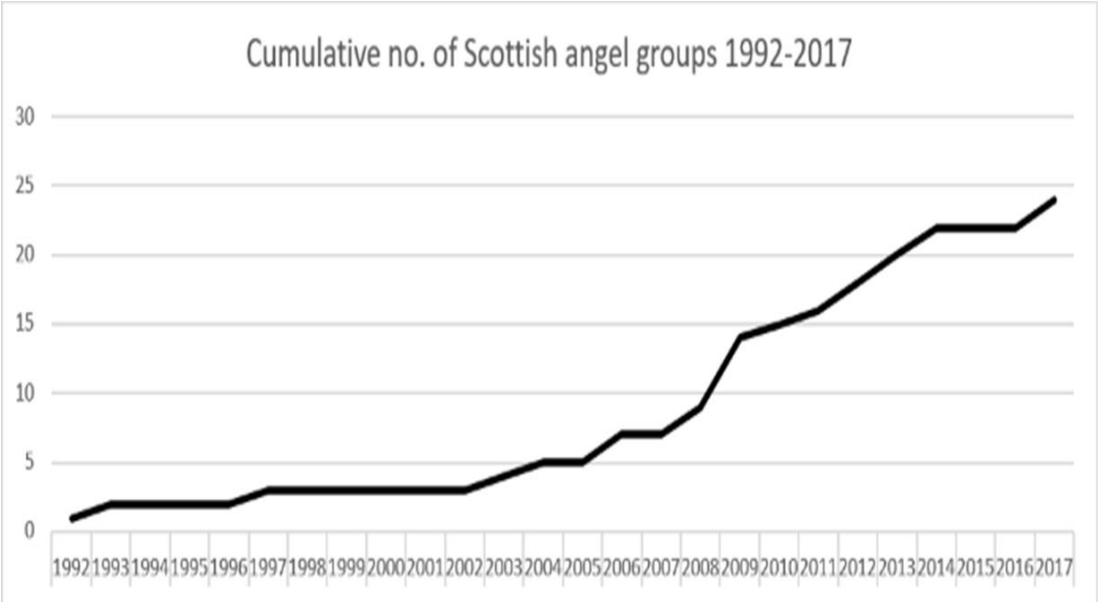

Figure 3-3: Cumulative number of Scottish angel investment syndicates

Source: LINC Scotland

In 2015, it was estimated that still three – quarters of the BAs in Scotland or around 3000 people were not in syndicates (MacKenzie and Coughtrie, 2015) For economic development purposes, however, and addressing the research questions of this thesis, it is not the number of BAs that is important, but rather the value of their transactions and the quality of the investee companies, which receive the money Later data is presented, which shows the deals covered in this research, represent on average 14% of the total Scottish EIS/SEIS qualifying investments.

Although there was not much growth in invested sums during the research period, there has been evidence of a deepening and broadening of the market, as the already active Scottish BAs increased their deal size, leaving a place for some smaller groups to establish and come in at the very initial stages of a business' capital search, providing smaller amounts of capital for smaller deals and to some degree segmenting the market (Harrison et al., 2010). In addition, during the research period they came from marginal players in the SCF at the beginning to become accountable for over half of the investments (Harrison, 2018; Hayton et al., 2008).

The research period was concurrent with as deepening and broadening of BA activity within the Scottish Risk Capital market as is evidenced by the formation of more BA groups which have enabled an increased number of investment opportunities to meet, larger ticket writing and greater segmentation of the market.

3.6 Retreat of PRVC from early stage investing

During the late 90s there was much demand to invest in software and mobile development companies, which got a momentum of its own, and became known as the dot.com bubble. Many companies were listed on the NASDAQ stock exchange, which was viewed as the 'growth' market, and increased 70% p.a. between 1996 and 2000. This demand was fuelled partly met by the creation of VCTs in 1995, which gave access to high-risk unlisted companies, in return for tax breaks (AIC, 2012). These are often closed end investment vehicles, with set life spans, and are professionally managed by PRVCs, for a management and performance fee. Generally, these funds have short investment periods, of under five years, and then in the latter half of the funds' lives, the PRVCs seek to harvest their investments.

The collapse of the dot.com bubble between 2000 and 2002 (Fedprimerate, 2017), resulted in PRVCs reassessing their risk appetites and retrenching to safer investment opportunities (Block and Sandner, 2009; Bertoni et al. 2015, US Department of Commerce, ITA & EC DG Enterprise and Industry, 2005), A trend also evident in Scotland. Harrison et al. (2010), in their analysis of transaction records at Companies House, showed that the vacuum left by the PRVCs, as they evaded early stage and first round funding during the period 2000-2004, was filled largely by BAs and hybrids. Although the Joint working Group recommend the creation of hybrid funds to solve the problem (ITA & EC DG Enterprise and Industry, 2005), Scotland was well ahead of that recommendation and had already established their second Fund, the SCF, in 2002.

The GFC was next large sell off in markets and in its aftermath, PRVCs retrenched

even further, which raised concerns over their long term viability in funding innovation and technology investments due to an expected environment of lower returns and overpriced opportunities (Mason, 2009a; Kedrosky, 2009; Block and Sandner, 2009)

The economic malaise of the research period did little to increase the risk appetite amongst PRVC investors. Policy changes, however, encouraged/forced PRVCs to move further back up the risk spectrum to earlier stage companies, after the policy accordion expanded, with tax changes in 2015 to the EIS, SEIS and VCTs with a reminder of the policy intent

> …encourage private investment into those small and growing companies which would otherwise struggle to access finance.
>
> HMRC (2015).

The new rules barred VCTs from investing in less risky opportunities such as acquiring businesses and income opportunities and forced, them to invest in growth (Intelligent Partnership, 2017).

The Scottish Risk Capital market was able to continue operating, even with the retrenchment of PRVCs, due the relative strong development of a BA market and the creation of the SCF, which were able to fill the void. It also gave them an opportunity, with the policy support, to have greater opportunities and allowed the market to deepen and develop further.

3.7 Global Trends

This study covers a period of 15 years, which also experienced profound global macro changes. Main influences were increased

1) Neo-liberal Globalisation
2) Financialisation

3) Disempowerment of labour
4) Penetration of Information Communication Technology (ICT)

The effect of these acutely affected economic structures within companies and industries. Globalisation, with competitive foreign capital flows and technology freely flowing to the areas of potential (Stigliz, 2017), aims to establish nations as dominant suppliers of products or services in the global market marketplace. In fact, within the globalisation literature an academic debate centres around the appropriateness of the application of Ricardo's theory of comparative advantage for industry, being applied to the national level of an economy (Krugman, 1996; Ricardo, 1817). The result of globalisation however has meant that non-competitive areas do not flourish and a constant pressure on prices. This constant pricing pressure has meant that the hoped-for pricing power or operational improvements resulting from innovation is often not seen as these benefits need to get passed on to the consumer. This makes the effects of FI policy on economic growth less obvious, and one of the reasons given why productivity gains have now become illusory.

The financialisation trend can be defined as

> …the increasing importance of financial motives, financial markets, financial actors and financial institutions in the operation of the domestic and international markets.
>
> Epstein (2005, p.3)

and its impact, along with the disempowerment of labour, which results in labour being a cost of production rather than a source of aggregate demand (Jessop, 2017) affects this research topic, as it encourages policy evaluators to focus on the financial returns of FI policy, rather than the real economic benefits, such as jobs and economic growth as was noted in Chapter 2.

The last trend, the increasing use of ICT, has resulted in a seismic shift in the economy (Nishimura, 2016), where lower paid workers using technology are displacing the mid skilled workers, contributing also to the declining productivity metrics recorded since the late 90s, and most of the new value created being passed to the established companies' shareholders or the wealthy, such as BAs, which has exacerbated the wealth distribution disparity.

The trends of globalisation, finalisation, the disempowerment of labour and increased use of ICT are changing companies and industries competitive advantages, lessening the obvious impact of innovation or improved processes through innovation and the ability to price these things into the market is getting more difficult. It has also resulted in research becoming often focused on financial metrics rather than real economic variables, which again adds to the lack of clarity of policy outcomes. On the positive side, the wealthy have become wealthier, and this most likely means BAs have had an increasing amount to invest during the period.

3.8 Requirements of PRVC versus BA money

PRVCs are running investment businesses with costs and return promises to their investors, so their preference is to invest just before an investee company experiences strong sales growth, with the hope they can exit in 3-5 years, having made multiples of their initial investment (Mazzucato, 2013; Block, 2008). To achieve this goal, they can also ask for preferential investment terms. PRVCs generally have the capacity to write bigger tickets than BAs and so are most likely to come in as a later supplier of capital as we see in Chapter Six, when company growth is discussed.

BAs, on the other hand, as can be seen from the survey of this thesis, can have other goals when investing, which are as equally important as financial returns, such as having exposure to entrepreneurial activities, helping the next generation of entrepreneurs, benefitting from the tax breaks and other research has shown having fun and giving back are also criteria (MacKenzie and Coughtrie, 2015). As a result, BAs provide a more patient, forgiving and reliable capital, as usually they will

continue supporting their companies even if the promised traction has not been delivered (Harrison et al., 2016). The BAs' broader ambitions, than just financial returns, and their patience mean they are better suppliers of entrepreneurial capital, however, this can have a downside as their demands are less stringent.

In the Scottish risk capital market BAs account for 35% of the private investment. Given their patience and less aggressive financial return requirements, it is a more friendly source of capital, but perhaps their lack of demands means companies develop less quickly, however as the early stage of a company's life is generally funded by BAs they have a very important part to play.

3.9 **Requirements of PRVC versus PVC money**

This tension between financial returns and other kinds of returns is also a consideration when PRVCs invest alongside PVCs. PRVCs are generally focused solely on financial returns, so their businesses can survive, whereas PVCs, as policy instruments, have real economic ambitions, often to generate jobs and economic growth or intermediate goals such as help develop a regional VC capability, as was the case with some of the English initiatives. A good example of this tension in seen in Table 2-4 in Chapter Two, where the financial return on SCFI was a loss of -1.8%, whereas for every £1m invested almost 18 jobs were created.

In light of that PVCs are good early-stage investment partners, as their focus is the capacity building, which is happening but takes time to become profitable. Given the economic focus of PVCs they are ideal investors in the early stage of a company's life when capacity is being built. As a PVC, SIB is a big player in the Scottish Risk Capital Market, involved in 40% of all deals. Given their economic remit they are a good partner for early-stage investors when capacity is being built.

3.10 Conclusion

This chapter addresses some of the important contextual issues occurring during the research period. The contextual background is believed to be as an important contributor, if not more important contributor, than the operation of the policy tools themselves in any success they record.

The period covered in this thesis begins with the aftermath of a sharp sell-off in global risk assets, amongst which early-stage risk capital can be considered amongst the riskiest. Indeed, from their peak in 2000 values invested in early-stage risk assets had dropped almost 80% in Scotland. There was a dearth of PRVC activity as risk appetites had diminished, previous PRVC protagonists were leaving Scotland or investing more broadly.

Scotland had, nevertheless, established many foundations for successful VC investing. The nation had experience of private /public co-operation in managing an early-stage risk capital fund with government personnel being the decision makers and the public sector guaranteeing a floor. Members of Archangels, the oldest BA syndicate in the world, had convinced SE that BA syndicates should be considered as potential partners of the, about to be launched, SCF hence permitting a longevity to the Fund, which lacked in other UK PVCs, as PRVCs retreated up the risk curve over the following decade, away from early stage investing. The results of the Birth Rate Strategy were being debated, and refined, with the launch of the High Growth Unit in 2002 and its focus on growth companies and there was evidence that the improved investor benefits of EIS had attracted more capital to the market.

Global trends, particularly the lack of pricing power, ICT deepening and financialisation, made it harder to see evidence of effective policy initiatives through innovation or process improvements. However, there were many positive contextual factors, which supported the Scottish Risk Capital market during the research period. It was supported by a well-functioning operational institutional background, where a proactive government was broking and seeking progressive change with their many

collaborators to engender endogenous economic improvements. It experienced a relatively stable policy background and has shown evidence of innovative thinking, with the formation of the EIB's first hybrid PVC and the establishment of a co-investment fund long before peers. This policy stability allowed experience and capability to develop which proved beneficial.

The market also received much support from many policy initiatives aside from the tools considered in this thesis, such as various readiness programmes, both on the demand and supply side of the market, funds deployed to encourage a greater market, through the promotion of BANs, which resulted in policy superposition, a necessary consideration when evaluating the policy effects as occurs in this thesis. However, these policies were instrumental in helping facilitate a deepening and broadening of BA activity; BAs now account for 35% of private investment in Scotland. Given their patience and less aggressive financial return requirements, BA capital is a more friendly source of capital, but perhaps their lack of demands means companies develop less quickly, however, as the early stage of a company's life is generally funded by BAs, they have a very important part to play. In addition, as PVCs generally focus on economic rather than financial success, they are ideal investors in the early stage of a company's life, when capacity is being built and hence ideal partners for BA investors. Another contextual consideration that needs to be considered in any work of this type is the cyclicality of the market and the data quality and any analysis need to be cognisant of potential effects these issues may bring.

4 Chapter 4: Research Philosophy and Methodology

4.1 Introduction

This chapter presents the research philosophy and methodology of this work. It outlines the rationale for the choice of a social constructionist philosophical approach and includes a detailed discussion of the mixed methods approaches deployed, referencing conventional mixed method styles presented in academic literature as well as the advantages and disadvantages of using a mixed methods approach. The methodology section is split into two parts and the methods of analysis described in turn for the determination of the context discussion and that of the macroeconomic output.

A mix of qualitative and descriptive quantitative methodologies are used in the context determination such as documentary analysis, a literature review, a survey, and semi-structured interviews. The macroeconomic analysis employs a series of descriptive quantitative methodologies in the series of analyses undertaken. These likewise fall into two parts - the first to ascertain a descriptive effectiveness measure for each of the policy tools and with them working together. The novel DAA GVAIA and jobs analysis, which connects the micro data to the macroeconomic outcomes is described in detail and is considered a contribution to knowledge due to the resultant increased data productivity. The second part of the macro analysis seeks to contextualise the macro analysis results through aa comparative evaluation and augmentation analysis within the national Scottish economy and with the consideration another policy tool to consider the superposition of policy.

4.2 Philosophical Approach and conceptual issues

4.2.1 Philosophical and research paradigms

The philosophical aspect of this research is an important discussion as every social scientist undertakes research from a paradigm or underlying set of beliefs which shapes the reality they study and explains their research methods and methodology (Schumpeter 1954; Dennett 1995; Crotty 1998; Simpson 2015).

> In general, a scientific paradigm is a whole system of thinking. It includes the basic assumptions, the important questions to be answered or puzzles to be solved, the research techniques to be used, and examples of what scientific research looks like.
>
> Neuman (2003, p.70)

Burrell and Morgan (1979) proposed mutually exclusive definitive paradigms for social theory and organisational analysis and the assumptions that the analysis or theory deployed. These are depicted in Figure 4-1 overleaf where the two key determinants of the research paradigm are

a) whether the research is subjective/objective
   or
b) whether it is being conducted within a background of social order or the researcher has an interest in social change.

Depending on where the work is situated on these two axes the work will fall into one of the following paradigms

a) Radical humanist research
b) Radical structuralist research
c) Interpretivist research
d) Functionalist research

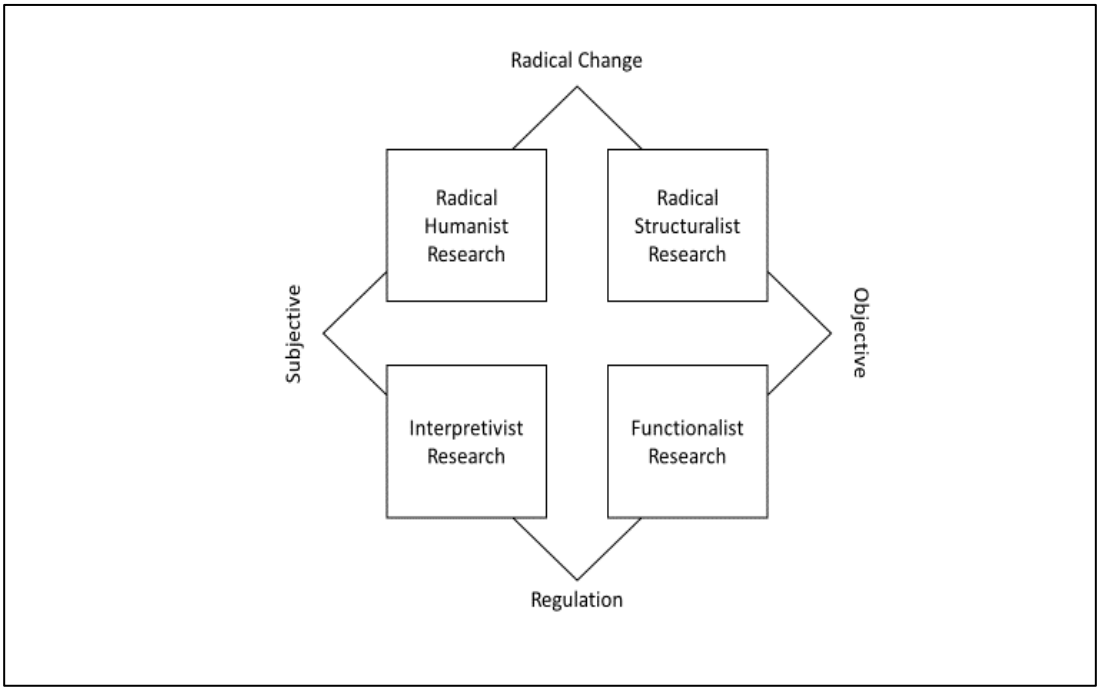

Figure 4-1: Burrell and Morgan's paradigms

Source: Burrell and Morgan, 1979

4.2.2 Ontological and epistemological perspectives

A key aspect of the objective /subjective worldviews is how they address the world. The former – the objective or positivist world view - aims to explain the world as it is, whereas the later seeks to understand the world. The subjective or interpretivism frame automatically makes the researcher part of the research outcome as they relay their different findings from each subject, hence offering interpretation, rather than discovering universal external truths (Simpson 2015). A complicating element of this discussion is the lack of agreement on terms – which are outlined in Table 4-1 below – so for Crotty (1998, p.5) positivism is a theoretical perspective, whereas for Simpson (2015) it is an epistemology and objectivism is Crotty's corresponding epistemology. For the purposes of this thesis the objective approach or paradigm will be referred to as positivism and the subjective paradigm as interpretivism. The research conducted by positivists aims to

> ...discover and document universal laws of human behavior… [but also for instrumental orientation… which] assumes knowledge can be used as a tool… to control the physical and social environment.
>
> Neuman (2003, p.71)

Thus, for the positivist there is world out there to be discovered and, if need be, mastered.

Another important difference between the paradigms is the belief of human behaviour. For the positivist a person's behaviour is determined by their surroundings and over the years as economic theories have developed in that positivist world, humans are assumed to be self-seeking, rational, profit and utility maximising and risk minimising or our 'homos economicus'.

The interpretivists, on the other hand, believe that

> social reality is intentionally created out of the purposeful actions of interacting social beings… [and] ordinary people are engaged in a process of creating a flexible system of meaning through social interaction. [Understanding] individuals' motives are crucial… even if they are irrational, carry deep emotions and contain false facts and prejudices.
>
> Neuman (2003, p.77-78)

Table 4-1 below expands the interpretivist/ positivist paradigm with a taxonomy of its levels with their descriptions

Paradigm Level	Purpose	Interpretivism	Positivism
Ontology	Study of Being	**Nominalism** irreality of universals	**Realism** Realities exist outside the mind
Epistemology	Certain Way of understanding what is to know	**Relativism** no single correct view, the views are correct for those who hold them	**Objectivism** things have truth and meaning in them as objects and research can reveal the patterns, casual laws. Uniformities and universal truths
Human Nature	What role do humans' play?	**Voluntarism** human intentionality dominates over emotion or reason	**Determinism** individuals little freedom to decide and act, affected by external forces
Paradigm Level	**Purpose**	**Interpretivism**	**Positivism**
Methodology	Approach	**Idiographic** focuses on detailed descriptions of specific events in particular times – avoids social theory and casual laws	**Nomothetic** based on laws or a system of laws

Table 4-1: Expansion of Burrell and Morgan's (1979) analytical scheme

Source: Crotty (1998), Neuman (2003)

4.2.3 Philosophical Assumptions in this work

Enterprise Policy & Economic Development is an area of research which deals with governments' actions to facilitate the formation and growth of enterprises due to their important role in creating employment, undertaking innovation, generating economic growth and increasing competitiveness (Birch, 1979; Schumpeter, 1934; Grossman and Helpman, 1991). Previous research confirms in this field of research the positivist paradigm predominates. Albeit based on small sample of articles, Leitch et al. (2010) confirm this paradigm and quantitative analysis overwhelmingly predominate research on economic growth, with a focus on the 'amount of economic growth' rather than its process. Grant and Perren (2002) likewise showed that a functionalist paradigm was predominant in the articles published by leading authors in the small business and entrepreneurial journals they studied.

In contrast, the paradigm followed in this thesis is that of social constructionism, which is a mix of the two approaches. This thesis analyses data to explore the success of the FI policy tools in Scotland by considering the additional economic growth and jobs that were created as a result of the two policies, the degree to which the investee companies grew, having received that capital, and the context in which they operated. The intent is to create a foundational piece of research, with a wider application across geographies to spark debate and development within this nascent field of research. For the social constructionists, truth is determined by the individual's engagement with the world as their mind constructs the reality (Crotty, 1998) and their relativism is not of a interpretivist frame (such as Figure 4-1), where personal models of reality are portrayed, but rather a belief that as that that construction of truth works with the sociocultural environment as a canvas:

> …the way things are is really just the sense we make of them… seeing [our understandings] as historically and culturally effected interpretations, rather than eternal truths of some kind.
>
> Crotty (1998, p.64).

The effectiveness of these policy tools result from the decisions taken by entrepreneurs, investors, and policy makers at a certain point in time and is particular to that time and that place. The input into those decisions results from local embedded knowledge, local social and cultural norms, and a local consensus amongst the actors as to the institutional framework at that point in time, and this will differ from one canvas to another canvas - one time period to another, one region to another. The context reflects a social reality, which has been purposely created through the institutional environment. Investors, entrepreneurs, and policy makers are making decisions in response to the particular social and economic canvas of the research period. There are no universal truths to discover. The intent with this research is to understand the effectiveness of the tools, not explain it. In such an exercise, the researcher is automatically part of the research outcome through the choice of variables and his interpretation of the context as was seen earlier with the contrasting conclusions drawn in Gray (2014) and Harrison (2018). The intent with this work is to discover the unknown, which means the researcher is an active participant in the defining of the reality and truth is determined by the researcher's engagement with that world as his/her mind creates the reality as it works with the sociocultural environment as a canvas.

Context and history are critical determinants of its complex and broad backdrop. Without a consideration of the context in which these policies and actions occurred, the numbers would be meaningless. Perhaps the general lack of considerations of contexts Enterprise Policy & Economic Development research is the reason why the dominant paradigm in Enterprise Policy & Economic Development research is positivism (Molina et al., 2012; Zamo, 2007). In addition, the limitations of the model and data require an interpretation, which moves us from a positivist regime to that of the interpretivist and it is expected that would be required, when this methodology is applied in other jurisdictions. In addition, contextualisation of the outputs from the descriptive quantitative methodology is required in this instance, and it is expected that would be the case when the model was applied elsewhere. Section 2.8 discusses the oversight of a consideration of context in research undertaken in this domain and how the positivist interpretation led to perhaps the wrong answer. This work incorporates

history and the socio-culture, along the lines of historical institutionalism and historical structuralism (Wadhwani & Jones, 2014) and as such justifies the use of both ideographic and nomothetic methodologies, hence resulting in a social constructionist stance. The ideographic methodology relates to data collected from the subjective accounts of individuals, for which the historical socio-cultural context for the impacts has been built, for differing policy tools with differing degrees of representativeness of the variables sought to be captured and such data will differ across the geographies and different socio-cultural backdrops (Batterbury, 2006). The nomothetic methodology measures the impact from the stated relationships and data collected.

Taking a social constructionist approach may seem somewhat contradictory to the descriptive quantitative methodologies of the thesis as quantitative work is generally considered in the positivist camp, suggesting truth is established by rigid scientific enquiry, in contrast to the social constructionist camp, which believes truth is established by on-going conversations and interactions (Changing Minds, 2021). Note should be taken, however, that the quantitative methods are named DESCRIPTIVE quantitative methods in this work, meaning the output describes, it does not dictate. As mentioned before, there are many variables at play in this area of research, this is a ground-breaking piece and its mission is to begin a journey of a discovery of truth. It is also conducted within one geography, within its own context. Although it is believed the general methodology used here can be applied elsewhere, the context of that region and discovery of the unknown, will require the researcher's engagement and interaction with the canvas of the context and it is believed it will that engagement and interaction that will be what determines the effectiveness of the tools - not the numbers from the model.

4.3 Methodology

To answer the research questions, this study deployed a mixed methods approach. The research focused on two elements – one was a consideration and determination of the context, in which the tools were deployed, and the other was the determination of

macroeconomic variables to gauge the economic development success of the tools in descriptive numeric terms and then to contextualise them.

To develop the contextual narrative, data was collected through a series of semi-structured interviews with people who had been involved with the design, implementation and use of the policy tools in Scotland, which are the subjects of research of this study. The people included users, policy makers, support professionals, and academics. They were asked about both policy tools and what they believed were key to their design and implementation as well as their view on the experience of the each of the tools within Scotland at that time. In addition, a survey was taken of BAs to gather their views on the policies, get an increased understanding of the motivations behind their investment behaviour and update previous research. Lastly, data on the turnover and FTEs of investee companies was analysed to review the growth profile of such companies. Other contextual issues were reviewed through desk research with a review of the literature and documentation analysis.

To get some descriptive numeric measure of policy effectiveness, the methodology to judge policy effectiveness recommended by SE was adapted and a novel Discrete Annual Approach Gross Value Add Impact Analysis (DAA GVAIA) approach developed. Like the SE methodology, the output from the analysis is the £GVA per one pound of policy money spent and cost per job, however the discrete annual approach allows each calendar year to be considered as a discrete entity and enabled a greater productivity of the data. The data used in this methodology is a mixture of primary data and secondary data sources. The primary data sources are as follows:

- behavioural data through a survey of Scottish BAs. This was used to calculate the additionality statistic.
- financial and operational investee company data from the investee companies of four Scottish BA syndicates, either from the records of the investing BA syndicate or directly from the companies themselves
- primary investment transaction data from the four BA syndicates pertaining to the investments they and their partners had undertaken during the period.

All the secondary data was from either UK or Scottish government sources. For both tools. The output from these macro analyses was then contextualised within the Scottish economy through a relative analysis with national numbers of Scottish GVA and employment and an additional policy tool was included in the analysis, that of relevant SE expenditures in 2016 to consider the superposition of policy.

Mixed methods can be categorised in different ways. This thesis deploys mixed methods in an adaptation of the various approaches outlined by Creswell (2003) and not just one of the approaches he outlined in Table 4-2 below:

Type	**Characteristics**	**Purpose**
Sequential explanatory	Collection/analysis of quantitative data followed by collection/analysis qualitative data	Use qualitative results to interpret findings of quantitative data
Sequential exploratory	Collection/analysis of qualitative data followed by collection/analysis quantitative data	To explore a phenomenon
Sequential Transformative	Collection of either qualitative or quantitative data first. The results are integrated into the interpretation phase	Employing methods to best serve a theoretical perspective
Concurrent Triangulation	Concurrent collection of data with two or more methods used to confirm cross-validate or corroborate findings	Both methods are used to overcome the weakness of using one method with the strength of using the other
Concurrent Nested	One method has priority and guides the project while another is embedded or nested	Addresses a different question than the dominant question or seek

		information from different levels
Concurrent Transformative	The theoretical perspective or research question guides all methodological choices	Evaluate a theoretical perspective at different levels of analysis

Table 4-2: Different types of mixed methods by Creswell (2003)

The advantages of a mixed methods research enquiry are numerous. Combining different data-gathering methods results in a richer data set, which offers greater information depth and knowledge of the subject matter, which is particularly helpful with complex subject matters such as covered by this study (Creswell and Plano Clark, 2007). The use of this research enquiry enables the researcher to better interrogate the context around their subject matter and 'context' has been an area of entrepreneurial research, especially with regional work, which has been highlighted as an area where greater development is needed (Molina et al., 2012; Zamo, 2007).

Molina et al. (2012) review research methods used in entrepreneurial research in three of the main regional entrepreneurship journals. They highlight the benefits brought by the use of a mixed methods research approach to the detailing of the context, the analysis of multiple levels of the enquiry and the choice of appropriate variables. Such was the case in this study, where the use of different methods enabled an enquiry at the different levels of the economy- macro, intermediate and micro. Another advantage is the weaknesses of one method can be offset by strengths of another through triangulation (Jick, 1979) and if through triangulation the results are confirmed the researcher has greater confidence in the results (Niglas, 2004), which again was helpful here.

Mixed methods research enquiry also has disadvantages- it requires more planning, management and analysis, hence more investment in time and resources, than the use of a single approach. Planning is important to ascertain how the different data will be integrated into the final output and also the compatibility of the epistemological

approaches, although on that latter point it does seem adopting a pragmatic philosophical approach will cover all dissonances and indeed, it has been held that the use of mixed methods has been considered one of the main premises for the increased use of pragmatism as a philosophical stance in research (Ihuah and Eaton, 2013; Tashakkori and Teddlie, 2003; Creswell, 2003). Creswell and Plano Clark (2007) highlight other issues with the use of mixed methods – the likely requirement of a greater level of skill, which may mean some training is required and constraints presented by publishing and sharing the research at conferences due to page and time limits respectively. The process followed in this thesis is outlined below in Figure 4-2 overleaf

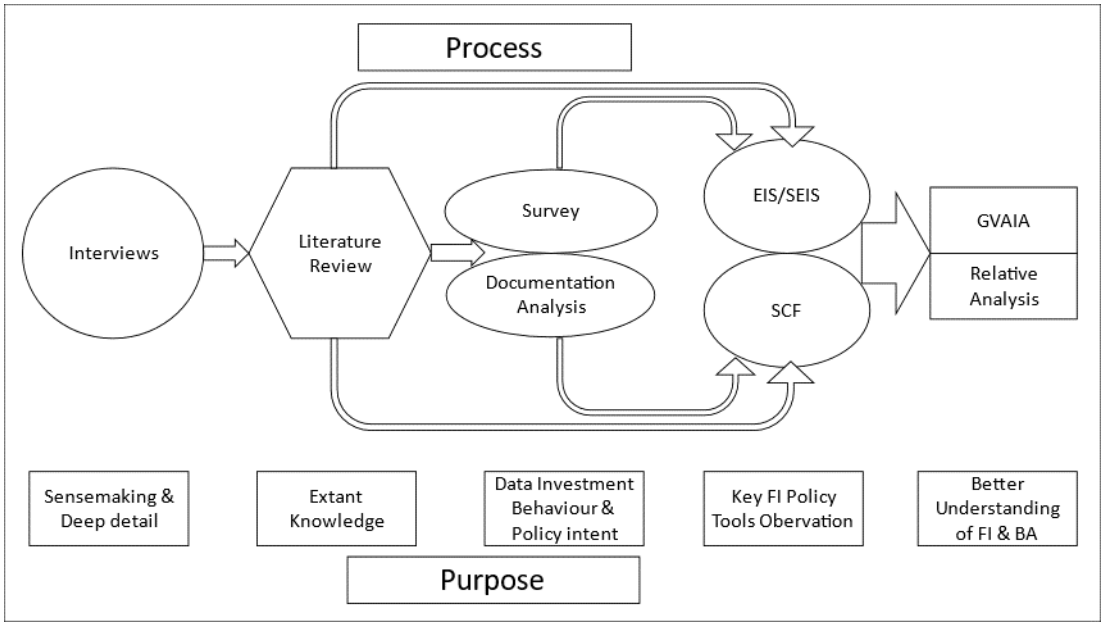

Figure 4-2: Mixed methods methodological process adopted.

4.3.1 Context

The four contributing data sources to the study of the context came from

- semi-structured interviews with people who had been involved with both tools, some uses, some policymakers, some who had been involved with the design, implementation, support professionals and academics
- a survey of BA investors

- primary data on investee companies' turnover and FTEs over time since investment
- Documentary analysis
- Literature review

4.3.1.1 **Semi-structured exploratory interviews**

17 semi-structured exploratory interviews were undertaken to understand the history and context of the subject matter and collect data on the policy initiatives. The sample of those interviewed was determined by the snowball sampling technique. Each interviewee was asked about both policy tools and what they believed were key important factors - positive and negative - to their design and implementation, their understanding of how they fit into the sector, what they knew of their history and intent as well as their view on the experience of the each of the tools within Scotland at that time. On occasion additional questions were tailored to the experiences of the interviewee or to attempt to triangulate previous information, but questions were always related to the research topic of this thesis. The purpose of the interviews were to gather contextual information and fill information gaps.

At each interview, enquiries were made as to who would be the best candidates to augment the understanding of this field of research and follow up was then conducted with named individuals. The interviews were not recorded or transcribed as the interviewees considered their commentary commercially and/or politically sensitive and did not want there to be a formal record of the conversation – they spoke on the conditions of both anonymity and no recordings to be taken. Extensive field notes were taken from the interviews instead and used to inform the research design. An example of notes from one of the interviews is included in Appendix A with sensitive information redacted.

4.3.1.2 **Survey of BAs**

Data on BA activities is difficult to access, partly as the population is not known and such investors have a preference for privacy.In this study eight of the Scottish BA syndicates were approached to help and four agreed. The survey was prepared on Google forms and sent out to LINC, who forwarded on the survey to all their members. In addition, the gatekeeper of the four BA syndicates who offered to help with the research received an online link to the survey, which they then forwarded to their members for completion. In comparison, the Mason and Harrison (2002a) survey was posted to members of the UK-wide National Business Angels Network (NBAN). They received 84 responses from BAs, a 20% response rate, and as only one of their respondents was located in Scotland, these two studies are not geographically comparable. Despite these geographic differences, data was captured which reflects the reality of a developed and maturing of the BA investing sector since the Mason and Harrison study.

The survey had 33 questions which fall into seven main categories. These categories are listed below. All questions gave three multiple choice options – 'very important', 'important', 'not important' – other than one question which permitted a free text answer.

- ten questions along the lines of Mason and Harrison (2002a) in an attempt to update their analysis although they mostly would also be included in one of the categories below
- two questions which sought to determine the degree economic development was a motivator of investing behaviour
- eight questions which sought to determine the importance of EIS//SEIS as determinants of angel investing behaviour
- four questions which sought to ascertain the importance of SCF to an individual BA investor's behaviour
- two questions which sought to determine the outcomes desired from investors
- two questions on the type of money being invested
- three questions which sought to ascertain some of the characteristics of the investment opportunities.

In order to reflect the opinion of the BAs the scores of the 'very important' and 'important' responses were added together, which was the methodology followed in Boyns et al., (2003).

4.3.1.3 **Investee company development profile analysis**

The investee company universe was dictated by the investments undertaken by the four BA syndicates who helped with the research. To conduct the development profile analysis, a times series of annual turnover and FTE levels was created for each of the companies from their first year of investment to either their failure, exit or to the end of the research period. For each of the calendar years after investment, the sales and FTE numbers of the companies, which had data in that annual period were averaged, to give an average sales number and FTE for that particular year. This was conducted for each of the years in the research period.

Many of these companies were pre-revenue and on occasion their revenue line is made up wholly of grants received and R&D tax credits. If this was the case, a zero turnover was recorded as either there was no turnover to record or these positive values were a transfer from the government to the company rather than from company to the economy, which is the focus of attention here. If, however, FTE data was available the company was included for the job analysis.

4.3.1.4 **Documentary analysis**

Documentary analysis was undertaken on parliamentary discussions, discussion papers, policy evaluations, and government reports to understand the intent of the EIS/SEIS and various PVCs, the policy environment they were operating and the means by which they were implemented through the various agencies. A historical perspective was also sought so relevant government reports from the turn of the century were considered. This method was also deployed to research the role of government, their mode of operandi and changes thereof. Due to the fragmented nature

of information in such reports the mosaic method of analysis was deployed to build comprehensive pictures (Corporate Finance Institute, 2018).

4.3.1.5 **Literature Review**

Various topics were covered in the literature review such as the policies themselves and comparable policies, the developing nature of government, different philosophical and methodological approaches etc. where topics were explored at length in a systematic manner. To understand the context fully, the historical development of government, politics and the policy debates themselves were explored. The approach was generally to focus on one subject at a time. Sometimes through reading a new topic would be added to the list that was deemed necessary to explore.

4.3.2 Macroeconomic Analysis

There were eight aspects to this analysis, and it is in two sections. There were three separate analysis which focused on answering the research questions directly which is the first section. Each of the three analyses included a GVA and jobs impact analysis. One was for the EIS/SEIS policy tool, one was for the PVC policy tool alone, and one was for a combination of the two policy tools. These analyses focus on linking the micro data from the surveys, company data and investment transactions to macroeconomic descriptive numeric output through applying the enhanced SE recommended policy evaluation methodology developed to gain a greater productivity of data – the DAA GVAIA and Jobs analysis. This is the section which might be seen to bluntly answer the research questions of this thesis if this were a positivist report, however due to the importance of context it a descriptive output like many other in the context overview described in chapter three and is treated as such.

The results of the joint policy tools analysis are then considered contextually, which is the second section. Here the results from the joint macro policy analysis were incorporated into a simple comparative relative analysis to offer a context in terms of the whole Scottish economy as measured by GVA and employment adjusted for the

public sector. These same joint results are then used to consider superposition of policy for the year 2016, where other SE policy monies were included in the analysis to see what degree the results were affected.

4.3.2.1 **The DVA GVAIA and jobs analysis**

To get some descriptive numeric measure of policy effectiveness, the methodology to judge policy effectiveness recommended by SE was adapted and a novel Discrete Annual Approach Gross Value Add Impact Analysis (DAA GVAIA) approach developed, which is a methodological contribution to knowledge. Like the SE methodology, the output from the analysis is the £GVA per one pound of policy money spent and cost per job, however the discrete annual approach allowed each calendar year to be considered as a discrete entity and enabled a greater productivity of the data. The data used in this methodology uses a mixture of primary data and secondary data sources. It generates estimates for the cost per job and value of GVA created for every direct pound of policy money dispensed by the government by means of

a) investment sums deployed by their PVC
   or
b) rebated to investors through the EIS/SEIS policy tool,

The DAA GVAIA and Jobs analysis enables a greater use of the data set and every relevant data point to contribute to the outcome, rather than being excluded due to a broken time series, resulting from missing data or ends sooner, because of missing data. This is particularly helpful in this area of research, as obtaining data remains a major challenge so an analysis methodology, which enables all data to be used is of great benefit. In this methodology, each year is treated as a discrete separate year and accounts for all available data for that year in that year. This approach aligns very well with the equilibrium approach adopted in the 'Industry by Industry matrix at Basic Prices in 1998-2012', is also known as the IOT Input Output Table (IOT) as for the data therein each year is self-contained.

To standardise the data for each of the policy tools each annual level of turnover or annual number of jobs data point, which benefited from that government money is related back to the total amount of policy money invested in the company up until that year, to create that level of turnover or number of jobs. In that regard, the turnover or jobs generated, in any given year, reflect the total policies monies directly invested in the sample companies to produce them. It is true the companies' employee and turnover numbers are skewed data sets and that will be discussed later but because there is a direct link to the policy amount of money deployed and real data is used with no estimations, regardless of the skewness of the data, policy monies cost per job and £ of GVA generated per policy £ invested are real meaningful outcomes.

To calculate a company's GVA contribution for a calendar year, the GVA and Total Output statistics are taken from the IOT, for the industry, to which the company belongs, as well as the Type II multiplier from the IOT. Due to data lags the multipliers for 2015 were applied to years 2016 and 2017 to get full use of the data set as the multiplier data for 2016 and 2017 was not available at the time of analysis. The company's industry annual GVA number is then divided by the company's industry's annual Total Output number to get the GVA ratio for the company's industry, which is then multiplied by the investee company's sales number which after deducting the leakage, displacement and substitution percentages gives the company's GVA contribution for that year as presented in Equation 1:

Equation 1:

$$\text{Total } GVA_{ct} = (\{[(GVA_{ti}/\text{Total Output}_{ti}) * \text{Turnover}_{tc}] - \text{leakage percentage}_{c} - \text{displacement percentage}_{c} - \text{substitution percentage}_{c}\} * \text{Type II multiplier}_{ct})$$

Where

t = the calendar year

c = the company

I = the industry of the company

In this analysis, the deadweight or additionality calculation was done at the end. This exercise is done for each of the companies for each of the years they have sales data. As the GVA is essentially a net profit related figure, one would expect the GVA ratio to change over the course of a business cycle, expanding for industries in economic up cycles when operational gearing is experienced and then the reverse as the economy slows. Likewise, for sectors which are experiencing trends in margin expansion or contraction, one would likewise expect the multiple to expand or contract. As for the multipliers one would expect the results to be the opposite.

The total GVA generated for each company for each year is then compared to the cumulative FI policy money which was spent every year since the original investment to that year in the company to generate that GVA. There are two lots of policy monies. There is the direct FI in terms of invested capital from the PVC and then there is the indirect FI which is the tax rebate received by the BAs who invested the said companies. The rebate calculated during the time period reflected the changing percentages of the EIS tax rebate rates, but SEIS was ignored, as it was not introduced until late into the time period and remains a very small percentage of the invested capital. For instance, a sales data point in 2011 may occur four years after the initial investment and so the sales number would be related to all the policy monies invested during those four years. If in 2012 there was another sales data point it would relate to five years policy money, however had 2012 not recorded an investment the total policy number would be the same. If it had the amount invested would be added to the cumulative total that was used in 2011. in previous years, which resulted in the output or sales of that year having four transacting years.

When considering the economic benefit produced by the EIS/SEIS tax rebate for each calendar year, the GVA of all the companies, which had a turnover figure for that year are summated and compared to the equivalent cumulative FI policy money spent in line with Equation 2.

Equation 2: $\text{GVA ratio} = \sum_{c=1}^{t=1} GVA_{tc} / \sum_{t=1}^{t=1} \sum_{c=1} T_{tc}$

where t = the calendar year, c = the company, i = the industry of the company, T=value of tax incentives or investment by PVC

The result of this ratio then gives the annual sample total GVA or the gross value which is before the additionality adjustment per £ of tax incentive granted or cost of the tax incentive (before administration charges (BAC)).

The approach taken to calculating the averages is to take the average of the annual numbers. The calculation of the jobs' numbers used the same methodology and to get the average cost per job, the average of the annual job numbers was taken.

4.3.2.2 Additionality and calculation of other counterfactual metrics

As the policy evaluation is of a counterfactual nature, deadweight, leakage, displacement and substitution need to be accounted for. Explanations of those phenomena are below in Table 4-3.

Effect	Explanation
Deadweight	The extent to which policy interventions are not resulting in any additionality: for example, SE supports a company, but the company does exactly what it would have done without the support. In such a case deadweight is 100% as the outcomes and impacts would have been exactly the same if there had been no SE intervention.
Leakage	Effect due to non-Scottish factors. An example would be supplies come from abroad which is a higher percentage than typical of the industry
Displacement	Negative effects on Scottish competitors
Substitution	The event when a company deliberately stops doing an activity to take advantage of public sector financial support.

Table 4-3: Adjustments to create the counterfactual analysis

Source: Abbreviated from Scottish Enterprise (2014b)

Scottish Enterprise (2014b) outlines that of 280 regional evaluation studies undertaken the median estimate for deadweight was 43%, displacement 25% whereas those of leakage was 5% and substitution 0%.

This analysis followed the SE guidance of a 0% substitution factor, but the leakage and displacement effects were also set at 0%, as the study's sample companies are generally inventing new products and services and so local displacement is unlikely. It is also thought unlikely their percentage of supplies will be a higher proportion of the sector average, as most of the entrepreneurs are still learning and most likely will not know of global procurement possibilities. This thus resulted in no deductions from the GVA or cost of jobs calculated, other than that of deadweight or additionality which occurred at the end as was calculated as described below for each of the policy tools.

The survey responses were used to determine an appropriate deadweight factor for the EIS/SEIS and separately for the PVC element of this analysis. Previous work evaluating the deadweight factor for the EIS policy tools are Boyns et al. (2003) and Pierrakis (2011). This study followed the approach adopted in the Boyns et al (2003) and taking the first two important options from the three possible answer options in the survey – 'very important' and 'quite important' – for the questions

QU 1) The continuation of the EIS is critical to me continuing
QU 2) The continuation of the SEIS is critical to me continuing

- and the average was taken which was 80%.

In the case of the PVC's additionality, Table 4-4 below outlines some additionality estimates for the SCF in previous writings.

Publication	Estimated Additionality	Comments
Hayton et al. (2008)	23%-33%	relates to SCF
Centre for Strategy and Evaluation (2008)	90%	relates to SCF
MWC (2016)	86.5%	relates to SCF

Table 4-4: Estimated additionality of the SCF from previous writings

In this instance again the survey response was used to the question –

QU - continued SIB fund participation is critical for my continued investment,

which gave an additionality number of 68.5%. When the studies for both tools was undertaken the additionality figures were averaged.

4.3.2.3 **Relative Validation analysis**

The final part of the research approach taken deployed five quantitative analyses to seek to contextualise the output from the DAA GVAIA and jobs analysis.

The first analysis compared the amount of annual Scottish EIS invested capital, secondary data collected from government sources publications (HMRC 2019, 2018b, 2015, 2011, 2005), for each of the calendar years of the research period, to the value of the annual EIS invested capital in the sample companies. This was undertaken to gauge how much of the EIS investment in Scotland was captured by the study.Some adjustment were necessary to data set to present the numbers on a calendar year basis. EIS/SEIS data was of that nature as their data is released on a fiscal year basis with April 5 as year-end and so to convert the data to calendar annual numbers, the following formula was applied and similarly for the number of companies

Equation 3: EIS Scotland $_{\text{year t}}$ (£m) = (3/4) EIS Scotland $_{\text{year t+1}}$ (£m) +(1/4) EIS Scotland $_{\text{year t}}$ (£m)

where t is the year of the report.

The second analysis was a triangulation exercise to try and ascertain the representativeness of the sample PVC data. Here the PVC sample data was compared to PVC data acquired at a presentation by the then SCF Portfolio Manager presentation (Kinnaird, 2017), a series of government publications (HMRC 2019, 2018b, 2015, , 2011, 2005) and data acquired from the evaluation reports (MWC, 2016; Hayton et al., 2008)

The third analysis compared the annual GVA produced by the DAA GVAIA over the research period to national Scottish GVA numbers and consideration was given as to how representative and important these numbers were. The approach adopted compared the annual GVAI number calculated from the DAA GVAIA and expressed it as a percentage of the annual total. This percentage was then compared to the percentage of the economy, which the sample was deemed to represent, which was 14% on average of the annual EIS/SEIS rebates, so the number was grossed up in that manner.

The same approach is undertaken for the DAA jobs numbers in the final analysis. They too are compared to total annual employment data for Scotland excluding the number of public sector employees as this work focuses on the growth of companies in the private sector and so the desire was to compare like with like. These numbers are presented relative to economic values where the public sector employs over 20% of the nation's workforce (Scottish Government, 2018c) so the base was adjusted by 20%.

The fourth analysis seeks to consider some of the contextual matters discussed in Chapter three and considers the amount of government capital spent on both policies and compares that amount for one year - 2016 – with one other policy money spent by

SE to seek to get some insight into the superposition of policy (Scottish Enterprise, 2017; 2016). The calendar year 2016 is considered and sums of money in excess of £25,000 granted by SE to participants of the early-stage business eco-system as well as to companies included in the sample. Each payment is listed individually so for each relevant institution all the entries in both documents were added and then adjusted for their contribution to the 2016 calendar year. Generally, it was assumed that all the monies allocated to those institutions were 100% allocated to activities in the early-stage ecosystem. In the cases of the Chambers of Commerce and Royal Society of Edinburgh (RSE) only 20% of the allocated monies was accounted in the calculation, although 100% is listed in the table below, as most likely they were also supporting other economic development activities than those of early-stage companies. The institutions included are LINC Scotland, Chambers of Commerce, who host events to encourage entrepreneurship, the RSE who grant fellowships to young entrepreneurs for a year – giving them a £35,000 stipend and various training modules, Napier University Ventures and Edinburgh Innovations, who deal directly with venture creation at the universities. Edinburgh Innovations is attached to Edinburgh University. The overall funding for the universities has been included, as given the money is from SE, the assumption was made it is for economic developments purposes. In addition, grants paid to the sample companies were added to the total.

The total monies identified were then adjusted so 14% of them was considered, which was the percentage the sample rebate represented of the total Scottish EIS/SEIS tax rebate that year (see Table 7-2). This number was then adjusted by the additionality number for both tools. Finally. the increased policy monies percentage is allocated to the average which assumes a similar percentage of money is being dispersed every year.

4.4 Conclusion

The research philosophy and methodology adopted in this work was presented in this chapter. A case was made for the social constructionist approach taken in this work, contrary to the positivist stance often adopted in Enterprise Policy & Economic

Development research. It was argued for the social constructionist, truth is determined by the individual's engagement with the world. As their mind constructs the reality, there is a belief that construction of truth works with the sociocultural environment as a canvas. The effectiveness of these policy tools result from the decisions taken by entrepreneurs, investors, and policy makers at a certain point in time. The effectiveness of the tools is particular to that time and that place. The input into those decisions results from local embedded knowledge, local social and cultural norms and a local consensus amongst the actors as to the institutional framework at that point in time and this will differ from one canvas to another canvas - one time period to another, one region to another. This will be true of a replicate study in another country. There are no universal truths to discover. The intent with this research is to understand the effectiveness of the tools, not explain it. In such an exercise the researcher is automatically part of the research outcome through the choice of variables and his interpretation of the context. As the intent with this work was to discover the unknown, the researcher was an active participant in the defining of the reality and truth is determined by the researcher's engagement with that world as his/her mind creates the reality as it works with the sociocultural environment as a canvas. Context and history are critical determinants of its complex and broad backdrop, and it is believed without a consideration of the context the numbers would be meaningless. Perhaps the lack of considerations of contexts is the reason why the dominant paradigm in Enterprise Policy & Economic Development research is positivism.

The advantages of a mixed methods research enquiry results in a richer data set, which offers greater information depth and knowledge of the subject matter, which is particularly helpful with complex subject matters such as covered by this study (Creswell and Plano Clark, 2007). It is particularly helpful in interrogating the context which is an important aspect of this work. The disadvantages however are the amount of implementation time and resource required as well as the need to ensure consistency and good presentation organisation.

The determination of the contextual data was undertaken by documentary analysis and a literature review where topics were explored at length in a systematic manner. On

occasion a new topic would be introduced through the reading material In order to understand the context fully the historical development of government, politics and the policy debates themselves were explored. This information was complimented by a survey of Scottish BAs, which included 33 questions and sought to understand their views on the policies, motivations behind their investment behaviour, how those might have changed since the Mason and Harrison(2002a) survey and the responses from questions in the survey were used to determine the additionality adjustment which was part of the macro economic analysis. This is discussed further in Chapter six where company data was also part of the contextual consideration and as such is discussed in relation to the development profile of the companies' turnover and FTEs.

The macro analysis contains a series of descriptive quantitative analysis. This occurs in Chapter seven. Three analyses focus on linking the micro data from the surveys, company data and investment transactions to macroeconomic descriptive numeric output through applying the enhanced SE recommended policy evaluation methodology developed to gain a greater productivity of data – the DAA GVAIA and Jobs analysis. This is the section which might be seen to bluntly answer the research questions if this were a positivist report, however due to the importance of context in this thesis it a descriptive output like many other in the context overview described in chapter three and is treated as such. These analyses are followed by others which aims to contextualise the data such as relative comparison of the sample EIS data to the total for Scotland, the sample jobs and GVA data in comparison to the Scottish national numbers and then lastly one small attempt at considering the superposition of policy but integrating expenditure of SE for one year into the joint policy descriptive outcome numbers.

5 Chapter 5: Data Sources

5.1 Introduction

This chapter describes the data used in the analyses. It covers the four distinct data sources used in this work – individuals, BA syndicates, companies and government. The data which comes from the individuals, BA syndicates and corporates are all primary datasets and the government data is secondary. The semi-structured interviews were the only qualitative data source in this work, all other sources are of a descriptive quantitative nature.

The data from individuals involved opinions, facts and historical information and was collected via semi-structured interviews and a survey. Four Scottish BA syndicates helped with this work. They provided data on the investments they made or had made over the study period and these investee companies was the complete sample of investee companies included in the analysis. Turnover and FTE data was collected for those investee companies. As discussed in the last chapter these data points were paired with the investments undertaken by the BAs to create input data for the DAA GVAI and jobs analysis for the research question regarding the economic development effectiveness of the EIS policy tool. To answer the research questions pertaining to the economic development effectiveness of the PVC policy tool, the PVC policy money could be determined from the BA investment data and that was then paired with the companies that received that money for the DAA GVAIA and jobs analysis for the PVC policy tool. That analysis is discussed in Chapter seven.

For each of the primary data series the chapter includes a discussion of its representativeness of the whole population. In addition, for the investment data a comparison is drawn with another study within the PVC literature so explore the importance of size in explaining the effectiveness of PVCs (Grilli and Murtinu, 2014a).

The secondary government data used in this study is the annual EIS and SEIS data for Scotland, national statistics on employment and GVA, industry GVA and macro-

economic multiplier data from the IOTs and financial data from SE. The government data fulfilled one of two purposes. Firstly, the EIS/SEIS, GVA, Employment and SE Accounts data was used to evaluate the representativeness of the samples and results and, in some cases, provide context. The IOT data provided input variables for the DAA GVAIA and Jobs analysis in the form of economic multipliers and industry GVA statistics. Information on these data sets is presented.

The final part of the chapter reviews the input into the DAA GVAIA and jobs analysis for each of the policy tools. This analysis had four separate samples which are explained in detail.

5.2 The complementarity of the data sets

This thesis focuses on two policy tools – the EIS/SEIS and the SCF – the main Scottish SCF and the research analysis seeks to give insight into the success of those policy tools at the micro level in

- securing the supply of capital from the BA investors
- facilitating the growth of the recipient company

and at the macro level by evaluating any contribution to economic growth and employment creation.

Data on early-stage investment transactions and the corporate recipients of such capital is not in the public domain and so some of the contributions to knowledge of this thesis are empirical in nature, due to the analysis of real investee data obtained from the BA syndicates and their investee companies. On a stand-alone basis this data gives insight into the growth of the companies and the jobs they create and then when combined with government statistics, from the IOT through the application of the novel DAA GVAIA, a methodological contribution to knowledge from this thesis, macroeconomic contributions can also be considered.

The secondary data sources used are as follows – documents, which comment on the purpose and success of the policies, data, which register the extent of the use of the policies and Scottish annual economic data. They provide great complementarity to the primary data as firstly; they were used to establish the intent of the policy and consider the degree of representativeness of the data sample used in the work. Secondly the BA survey and interviews gave contextual information which is absent in many of the secondary sources.

As the DAA GVAIA and jobs analysis combines the secondary data from the National Statistics Office IOTs with three sources of primary data – the additionalities calculated from the BA survey, the turnover and jobs numbers gathered from the investee companies and the transaction data collected from the BA syndicates. This work would not be possible without these complementary data sets.

Figure 5.1 below outlines the primary and secondary data sources used in this research, categorising them as such as labelled and coloured.

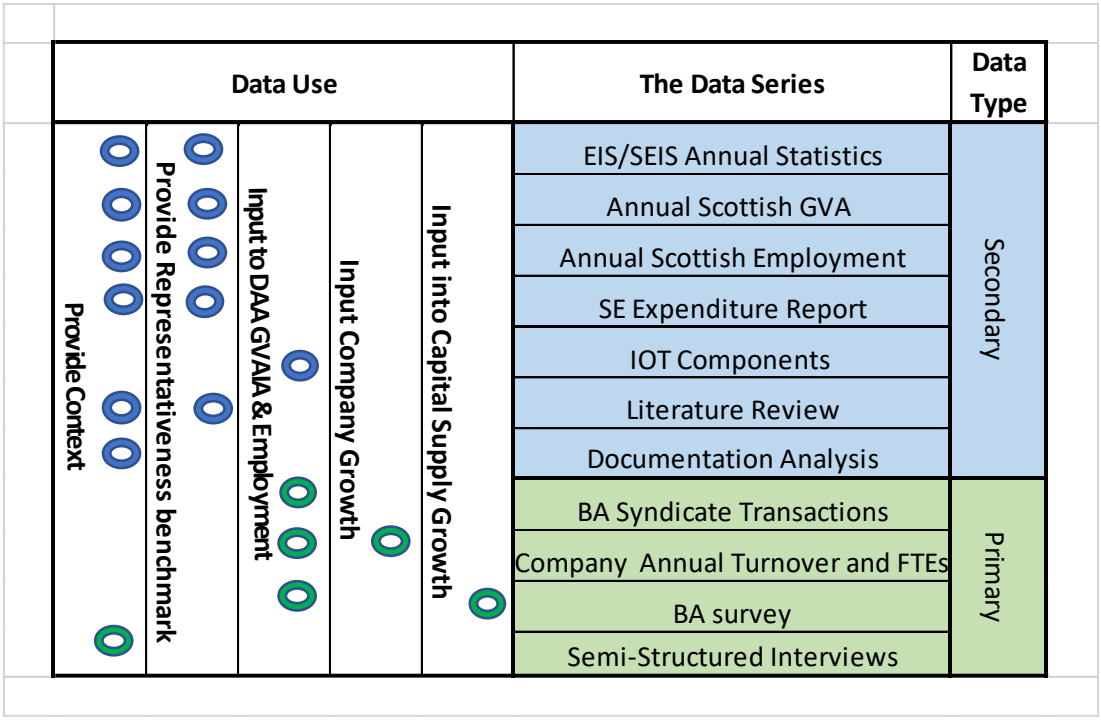

Figure 5-1: The sources and uses of data collected in this research

On the left of the figure a circle has been placed into the categories for which the data is used with blue circles corresponding the secondary data and the circle aligning with the data type it is considering and likewise with green for the primary data. The categories highlighted are as follows

- Provide Context
- Provide Representativeness benchmark
- Input to DAA GVAIA & employment analysis
- Input to Company development profile analysis
- Input into Capital Supply Growth analysis

In the discussion of the data sets which follows, the secondary data sets are discussed first, due to their use in representativeness analysis of the primary data sets.

5.3 The data sets used and their representativeness

5.3.1 Annual EIS/SEIS data for Scotland

EIS and SEIS data is collected and administered by the government under the auspices of HMRC and is published quarterly. One publication each year, usually in the second quarter, releases the first estimates of the annual totals of the previous years. These estimates are then updated quarterly based on new submissions as the requirements are fulfilled by the companies to release the tax benefits (HMRC, 2016). Although the EIS and SEIS apply to the year of investment for the investor, it can take up to three years to have the correct data and for individuals to get their certificates corresponding to the time the companies have post investment to comply. This means that the final EIS/SEIS data points used in this study are still provisional due to the approach of annualising the data. As the scheme is a UK-wide scheme and administered by HMRC, most of the detailed data is at an overall UK level. At the regional level, of which Scotland is one, defined by the HQ address of the companies, rather than where the investment was raised or the addresses of the individual investors, the granular level of the data is less.

The main source for the historic data was the national archives of HMRC (The National Archives, n.d.,) which are accessible by the internet (although not easy to use) and are the repository for the UK Government publications used for research purposes, more recent reports are available on the government web site. Since the beginning of SEIS, in April 2012, there are two sets of tables in the EIS/SEIS publication, one for EIS and one for SEIS, which outline at the UK level

- the number of companies benefitting from the programme
- total amount raised
- number of subscriptions
- number of companies raising money for the first time
- amount of taxes claimed by size of investment
- the industries the companies belong to

As this thesis analyses tax incentives at the company level and uses industry statistics in the DAA GAIVA calculation, the last item is really the data set would be of great interest, however this data is not presented on a regional level and so cannot be used in this thesis. This thesis this uses the EIS/SEIS tables, which give a breakdown by region of the number of invested companies and the total amount invested and these numbers are outlined in Table 5-1 below

Year	Amount of SEIS invest. in Scotland £m	Amount of EIS invest in Scotland £m	Total EIS/SEIS Scotland £m	Total no. of companies EIS/SEIS Scotland
2003	-	44	44	168
2004	-	45	45	180
2005	-	46	46	176
2006	-	44	44	160
2007	-	51	51	165
2008	-	38	38	150
2009	-	31	31	124
2010	-	30	30	139
2011	-	34	34	153
2012	2	46	48	190
2013	4	44	48	208
2014	5	70	75	251
2015	5	63	68	243
2016	6	77	83	261
2017	7	73	80	274

Table 5-1: EIS/SEIS and sample investment values compared

Source: Propriety information and HMRC 2019, 2018b, 2015, 2011, 2009, 2008, 2005, 2003.

5.3.2 Annual Scottish GVA and employment numbers

Scottish national annual GVA and employment numbers were taken from the UK governments national statistics site (Office for National Statistics, 2020; 2018). The total employment numbers and the numbers of those in the public sector are time series supplied by the Office for National Statistics. Scottish GVA data was taken from a time series known as 'Regional gross value added (balanced) by industry: all NUTS level regions', where both UK-wide and regional GVA statistics are available. The statistic considered here are those for the whole of Scotland labelled as 'Scotland All'. The current GVA was chosen so no deflationary adjustments were required

Year	GVA £bn current	Total employed Scotland m
2003	86.7	2.40
2004	92.7	2.44
2005	98.3	2.46
2006	105.0	2.48
2007	109.0	2.55
2008	112.0	2.55
2009	112.0	2.51
2010	111.0	2.47
2011	114.0	2.50
2012	117.0	2.50
2013	122.0	2.55
2014	129.0	2.60
2015	130.0	2.63
2016	135.0	2.62
2017	139.0	2.66

Table 5-2: Annual Scottish current GVA (£bn) and total employment numbers

Source: Office for National Statistics (2020; 2018).

5.3.3 SE expenditure data

The SE expenditure data was obtained from SE's annual public expenditure disclosure documents (Scottish Enterprise, 2017; 2016). Publishing an annual report which lists all recipients of SE sums exceeding £25,000 is a regulatory requirement and SE publishes these numbers along with their Annual Reports online. SE's financial year ends in March and so the reports for 2015/16 and 2016/17 were considered for this analysis of calendar year 2016 (Scottish Enterprise, 2017; 2016).

The data considered is listed in the table overleaf. It lists all the monies paid to participants of the early-stage business eco-system as well as to companies included in the sample were considered

Funded Organisations	Amount £m
LINC Scotland	0.24
Chamber of Commerce	0.25
Edinburgh Innovations	0.10
Napier Uni Ventures	0.40
Royal Society of Edinburgh	0.81
Scottish Chamber of Commerce	0.13
SDS	10.49
Edinburgh Napier University	0.12
Heriot Watt University	0.34
University of Strathclyde	0.51
University of Aberdeen	0.43
University of Edinburgh	1.04
University of Glasgow	1.07
University of St. Andrews	0.24
University of W. Scotland	0.20
Total	16.37

Table 5-3: Consideration of other policy monies in Scotland

5.3.4 IOT components

Industry GVA, Total Output and Type II multipliers are intermediate data created by the Scottish National Statistics Office via business surveys or returns (Scottish Government, 2018a; Scottish Government, 2018b; Scottish Government, 2018c; Scottish Government, 2018d) and they are also the administrators of the data. This is the data that links the micro data to the macro data and each company will have its own metrics based on the industry it belongs to.

GVA is a macro-economic measure and has a direct link to GDP or the overall size of the economy and is defined by Office for National Statistics (2015) as follows:

The link between GVA and GDP can be defined as:

- GVA (at current basic prices; available by industry only)
- plus taxes on products (available at whole economy level only)
- less subsidies on products (available at whole economy level only)
- equals GDP (at current market prices; available at whole economy level only)

Office for National Statistics (2015)

Increased GVA was one of the Scottish Government Economic Strategy National Performance Framework Purpose Targets until a new framework was introduced in 2018 (Scottish Government, 2018f) which highlights the importance of this measure, and is considered as.

> …a measure of the wealth generated within the economy (over time) resulting from direct investment in economic activity.
>
> Scottish Enterprise (2014b, p.1)

The multiplier and industry data comes from a data set, known as the 'Industry by Industry matrix at Basic Prices in 1998-2012', is also known as the IOT. They are calendar year matrices since the Scottish Assembly began in 1998, which depict the input and output relationships of each of the different classified industry groupings within the Scottish economy annually. One axis of the matrix represents the purchases of an industry and the other axis the sales of that industry. On the axis that registers sales, GVA and Total Output statistics for each industry is in the last section of entries and it, in effect, reflects the excess cash once all the intermediate costs of purchases from each industry group have been met. An example is shown in Table 5-4 overleaf. The table shows that for the agricultural sector for the year 2015 the government statisticians have calculated a GVA for that industry of £1137.9m and this related to its total output of £3008.1m which gives a GVA ratio of 0.38. Another section of the IOT has a list of economic multipliers for each of the industries.

Industry by industry table at basic prices in 1998-2015 (SIC 2007) £m							
Uses by industry group (basic prices) →							
Year	SIC	Sales by Industry group ↓	01				
			Agriculture	Forest Planting	Forest Harvesting		**Total use for Industry Output**
2015	01	Agriculture	266.3	3.5	0.1		3008.1
2015	02.1, 02.4	Forest Planting	0.1	0.0	80.1		150.4
2015	0.2.2-3	Forest Harvesting	0.2	0.0	0.0		240.7
2015	TIU	Total intermediate use at basic prices	1818.4	61.8	160.4		328,945.1
2015	TisPrds	Taxes less subsidies on products	51.9	2.1	-3.1		16,945
2015	TisPrdn	Taxes less subsidies on production	-442.9	0.2	0.2		
2015	CoE	Compensation of employees	378.4	46.1	52.7		
2015	GOS	Gross Operating Surplus	1202.4	40.2	30.5		
2015	**GVA**	**Gross Value Added**	**1137.9**	**86.5**	**83.3**		
2015	**TOut**	**Total output at basic prices**	**3008.1**	**150.4**	**240.7**		

Table 5-4: Examples of the industry GVA and total output statistics

Source: Scottish Government (2018e)

The Type II multipliers are part of the IOT and measure the direct, indirect and induced effects on the economy of an increase in the final output of a company or industry. In that respect, they capture the impact of the increased intermediary resources required to produce an increase in final output, as well as the increased consumption by the increased number of employees as a result. They vary by sector, as some sectors employ more economic resources to produce their final product than others or have higher labour numbers who consume more. The more final output they create, the higher the multiplier.

Although a welcome tool kit to deploy the industrial sectors included in the IOTs seem rather out-dated compared to the activities of early - stage companies and so it is expected this will affect the outcomes somewhat. In addition, the data is collected by survey from the entire economy so it may be the case that the multipliers and numbers represented in the tables are not representative for new companies in that sector albeit so for established ones.

5.3.5 Analysis of academic literature and Documents

The academic literature was gathered through searching library databases such as University of Strathclyde library, Edinburgh University library, the National library of Scotland, Google Scholar, academic journals for which the University of Strathclyde has a subscription. References in read articles was also used as a source of relevant literature. The academic literature was supplemented by policy reports and discussions published by various organisations such as Parliamentary papers, Hansard, HM Treasury, the Scottish Government, Scottish Enterprise, the European Commission, British Venture Capital Association (BVCA), the Department for Business, Innovation and Skills (BIS) and LINC. Documents were sourced primarily online from various government and government agency websites and their archives such as the European Commission, the Scottish Government, SE, HM Treasury, OECD, the Department for Business, Innovation and Skills (BIS), the National Endowment for Science

Technology and the Arts (NESTA) and Statistics Offices such as the Scottish National Statistics Office.

5.3.6 Semi-structured exploratory interviews

17 semi-structured exploratory interviews were undertaken to understand the history and context of the subject matter and collect data as to the policy initiatives. Table 5-5 below outlines the types of people interviewed. For data protection issues all interviewees have been anonymised and their role within the early-stage risk capital eco-system has become their identifier. The interviews were conducted between November 2014 and May 2017.

Stakeholder type	**No of interviews**
Academic	3
Angel syndicate gatekeepers	4
Investors	4
Policymakers	2
Government Officials	2
Accountants	1
Service provider	1

Table 5-5: Details of participants in exploratory interviews

Several key insights were derived from these interviews which influenced the research strategy and contributed to contextual discovery. They were –

- SIB's refusal to grant access to any SCF data for this research and so a proxy was required (Government Official A).
- the continued emphasis of the importance of the SCF in the development of the early-stage enterprise sector in Scotland (Academic A, Policymaker A, Policymaker B, Investor A, Investor B, Investor C, Service Provider A) highlighted there was more to explore than merely impact statistics

- the dedication of the Scottish Government in helping to develop the sector in Scotland (Academic A, Academic C, Policymaker A, Policymaker B, Investor A, Investor B, Investor C, Gatekeeper A)
- the Importance of SME development and support within Europe as a whole (Academic B, Academic C, Policymaker B)
- with the exception of a couple transactions, only EIS and SEIS compliant deals are undertaken by all four sample angel syndicates (Angel Syndicate Gatekeepers A. B, C, D)
- SIB had asked BA syndicates to collect data on their investment activities (Investor B)

And this allowed the following conclusions to be drawn

- this was an area where further research was required to ascertain whether such policies are an effective use of taxpayers' money
- BA investment data would need to be used as proxy data for the SCF

With respect to the representativeness of this data, it should be remembered that the beginning of this research period was around 15 years before the time of the interviews. The data received may well not be representative, as individuals' recollections may have change over time, other necessary opinions may have been excluded, however, that having been said, the intention was to interview as many of the historic and current protagonists involved in the research - relevant aspects of these policies and so it is believed that this is the best job possible with the data opportunities.

5.3.7 Collection and analysis of primary data via a BA survey

This data and analysis are presented in chapter six. A BA survey was developed as one primary source of information to obtain deep data on the views of BAs on policy tools, their investment behaviour and decision-making and to have information that was Scotland centric. The purpose was to collect micro data to aid in answering the research questions by providing opinions on economic development objectives and permitting additionality adjustment factors to be calculated. The survey replicated the

questions asked by Mason and Harrison (2002a) where they had asked views on one policy tool - the EIS. In addition, this survey explored BAs' attitudes to SEIS, their thoughts on the provision of PVC money, on their preferred form of that PVC money and on its importance to their continued provision of capital. It also enquired the degree to which the BAs were motivated by the economic outcomes of those policy tools such as creating jobs or economic growth. The survey received responses from 82 BAs based in Scotland anonymously between May and August 2017.

Representativeness of the data as to the population is impossible to comment on. It was mentioned earlier David Graham, the CEO of LINC, had to guess the number of BAs in Scotland, but he believed only a third were involved in BA syndicates. That having been said, representativeness in this context should not be reflected by a percentage of the population, as the research questions address economic development and that is rather related to sums invested. The next chapter shows the sample here capture 14% on average of the EIS invested sums during the period -so to that degree it is representative. As to their answers, it may well be there is an upward bias in their responses to the questions regarding PVCs as it is assumed most of the respondents will have been in syndicates, which invest alongside the SCF, and others outside may have another view.

5.3.8 Primary financial and operational data of investee companies

The annual number of FTEs and turnover for each company, for each year since the BAs first invested, were collected for two reasons – firstly to ascertain how the companies profile developed over time and secondly to be input variables into the DAA GVAIA and jobs analysis. It is the annual turnover and FTE figures of the investee companies that is combined with the secondary government IOT data to produce the economic development impact analysis. The profile development output is discussed in Chapter Six.

The company data sources were mixed; some accounting and employment data was from the syndicates themselves, from their own occasional records on the company or after they had asked the companies to supply the data. For other data the companies were approached directly and for others the FAME database or Companies House filings were used. FAME provides pretty comprehensive balance sheet information and sometimes covers the number of annual FTEs but profit and loss items are scant, as FAME uses company annual account filings at HMRC and Companies House as its source and many of the companies at this stage of their growth get 'Small Companies Exemption' from filing accounts in the UK due to low levels of FTEs, assets or turnover (HM Government, 2018; Companies House, 2017b). This means there was no turnover or access to turnover numbers for small companies unless they were provided by the company. The available financial and employee sample data for this report concurs with the findings of others, who research SMEs - that missing data is a challenge and inherent in small company analysis (Nightingale and Coad, 2013; Mason, 2009a; Cowling et al., 2008).

To assess the economic impact of the policy the following data from the investee companies was sought

- Turnover is sold output created and is used in the GVA calculation
- FTEs as this gives an indication of the economic livelihood the company is creating
- Taxes paid as this would be money the company gives back to the government
- R & D expenditure as this gives an indication of how the company is contributing to the knowledge economy and upskilling the nation
- Employee costs as this gives an indication of the quality of jobs being created with the idea that more highly paid people generally create more value add

The latter three data series produced little data, so any analysis of those metrics has been excluded from the main body of the research.

The sample universe had 101 companies, 71 companies had annual data for sales since the investment had originally occurred, and 69 companies had data for the number of employees. The total sample had the possibility of 571 annual data points, and in the case of sales 172 of those data points are lost due to missing data. 14% of the sample companies, which had sales data were pre-revenue at the end of the period and 30% at the time of the initial investment (for the data available), which left 261 data points to be included. For the employee data, the total number of possible data points were 416 across 69 companies, of those 192 are represented by the missing companies, and 224 points were available, which gives a representation of 59%. Table 5-6 below outlines some parameters on the data.

Sales £m				Years since investment				FTEs			
Mean	SD	median	n	Mean	SD	median	n	Mean	SD	median	n
3.5	13.6	0.56	261	6.0	4	5	261	32	43.9	11	224

Table 5-6: Sample data parameters

5.3.8.1 **Representativeness**

The representativeness of this data set of the whole population is considered in a few ways in the following discussion. Firstly, firstly with respect to the industry sectors of the Scottish economy, the sectors invested in by the SCF, and then to the profile EIS/SEIS benefitting companies. Secondly, with extant research namely the data used in Cowling et al. (2008) and Grilli and Murtinu (2014a).

Table 5-7 below considers the industry representation

Economic sector	**GVA % of Scottish economy**	**SCF 1 % of money invested**	**SCF2 % of companies**	**Sales Sample %**	**EIS % 2016-17**
Real Estate	11.6				
Wholesale & Retail	10.7		1		
Other consumer related			1		
Manufacturing	10.7	1	5	22	6
Health and Social work	9.5	30	30	25	
Prof, scientific & technical	6.6	1		1	
Admin & Defence	6.3				
Finance & Insurance	6	3		1	
Construction	5.9	1	1	1	1
Education	5.8			4	
Transport & Storage	4.4			4	
Admin Support Services	3.8				
Information and communication	3.6		13	7	
Accommodation and Food services	3.4	9		4	
Electricity, Gas & Steam & water	4.8	10	1	5	2

Other services	2		7		2
Culture	1.8	10			
Mining & Quarrying	1.5				
Agriculture, Forestry & Fishing	1.4				
Software			20	18	
Other		4	18		
Enabling Technologies		37		4	25a
none			2		
transport & communication					2
recreational activities					5
Distribution, restaurants & catering					6
Business Services					51

Table 5-7: Sector breakdown of the sample and population

a. Categorised in HMRC's numbers as Hi Tech Companies is not a category identified by the Trade Classification system. This category includes selected companies from other industry groups involved in activities such as research and development, chemicals and computer consultancy.

Sources: Scottish Parliament, 2018; HMRC, 2018b; MWC, 2016; Hayton et al., 2008.

Unfortunately, it is difficult to draw significant conclusions from this analysis. Not only do the comparative sources offer no value but determining the population would also be an impossible task. However, the table offers a clear depiction the challenge of conducting research in this area. Excepting the sample data, which is column four, all other data sources are governmental and yet there is no consistency with the data definitions. The SCF data comes from the evaluation reports – even between the two seven-year programme reports there are different definitions. The importance of the tax incentives can also be noted, as the low incidence sectors on the Table, such as real estate and wholesale and retail are sectors, which do not qualify for EIS/SEIS incentives.

Innovation is a strong catalyst for investor demand and features strong in the early-stage segment of the investment market, unfortunately often it is categorised as different things. In the SCF reports, enabling technologies, software, other, information and communications are the labels used; in the EIS categorisation, business services and hi tech are important categorisations, these are also included in the table as ‘enabling technologies. For the sample companies much of this innovation has been classified within manufacturing as their categorisation was constrained by the options available in the IOTs so again difficult to draw conclusions.

5.3.8.2 **Comparison with Grilli and Murtinu (2014a)**

This section considers the work of Grilli and Murtinu (2014a) and compares some of their data parameters to those of this work. During the literature review it was noted that commercial databases were being used and yet often small company data. as discussed earlier, is not present and so to put these works in perspective and again contribute to the context considerations of this work this section will consider the data.

A consideration of different data sets is presented below.

Study		
	This study	Grilli and Murtinu (2014a)
Turnover		
mean £m	3.5	3.2
Median £m	0.56	n/a
SD	6.0	
n	261	239
Employment		
mean	32	27
Median	11	n/a
SD	43.9	
n	224	239
Age since investment/ No of data points		
mean	5.7	6.8
Median	5	n/a
SD	4	
n	261	239

Table 5-8: Comparable data sets

The table above compares the data set in this work to those the PVC data used in Grilli and Murtinu (2014a). As a reminder, Grilli and Murtinu (2014a) did not find that PVC's investments created jobs or helped sales growth. A comparison of the numbers show that the metrics of the investee company sample used in this work compares well with the data used in the Grilli and Murtinu (2014a) – the sales and employment mean are similar, the number of observations is similar. Although one might like to conclude the data set are not comparable due their focus of hi-tech companies with the use of the VICO database, on analysis the sample companies in this study are of a similar

industrial grouping and so they are comparable. In Fig 5-2 below the industries of the VICO dataset are presented

Sector
Pharmaceutical
ICT manufacturing
Robotics
Aerospace
TLC services
Internet
Software
Web Publishing
Biotechnology

Figure 5-2: High Tech sectors in the VICO Database

Source: Bertoni & Martí Pellón, 2011; p. 4

This is another example of how terms can be very misleading and can lead one to draw false conclusions. Although for Grilli and Murtinu (2014a) their definition of PVCs are funds that are government managed and their misclassification of SE casts doubt on the study, the table does show that the data sets seem comparable. The time periods considered in these two studies are also long. In the case of Cowling et al (2008) it is 11 years for panel data, between 1993 and 2000, but only 3.5 years for time series data and for Grilli and Murtinu (2014a) it is the 17 years. So, the sample here is comparable to that of Grilli and Murtinu, yet the conclusions of this thesis are very different. The most interesting statistics, however, are missing from Grilli and Murtinu (2014a) and these are the median and mode values. As mentioned before, skew is a large concern with the application of quantitative methods in this area of research and had the median been included in their article, the non-parametric skew could have been calculated by applying Equation 4 below:

Equation 4: S^2 = (Mean- Median/ SD) or $(\mu\text{-}\nu/\ \sigma)$

[2] S is a measure of aa random variable's skewness

or the Pearson Co-efficient of skewness, which is a similar statistic, but uses the mode rather than the median. The non-parametric skew gives an indication of how skewed the dataset is and given their comments in the footnote 15 on page 20:

> Usually, IVC-led syndicate-backed firms receive more financial resources (median value: 1,514.050 k€) than IVC backed (1,425.944 k€) and GVC-backed firms (211.467 k€). This evidence might help to explain the result, and it suggests that the financial effects on the firms' growth are produced for only sizeable VC investments.
>
> (Grilli and Murtinu, 2014a, p. 20)

It would have been interesting to have had more information on the median values as the average investment in their GVC or PVC companies is €211, 467, less than half the average PVC amount invested in this study which is £539,210. Perhaps this larger Scottish figure is a reflection on the greater maturity in the Scottish BA market as it has developed into more group and syndicate investing and so it is not surprising positive results have been found with this work and not with Grilli and Murtinu (2014a).

This exercise questions further the conclusions reached by Grilli and Murtini, particularly as the VICO database sources its UK numbers from the FAME database which has Companies House data and so generally small companies are exempt from recording sales numbers. The UK represents 21% of those companies. For UK accounting information VICO uses the Amadeus database which sources its data from FAME as well so encounters the same issues. This means most of the operating data of the sample here is not available in public databases such as FAME or VICO as most of the companies are too small and get 'Small Companies Exemption from filing accounts in the UK aa result of low levels of FTEs, assets or turnover (HM Government, 2018; Companies House, 2017b). This thus suggests the studies discussed in the Literature Review section are most likely more developed companies than those discussed here.

5.3.9 BA syndicate primary investment transaction data

This data set are input variables into the DAA GVAIA and Jobs analysis which is discussed in chapter seven. The four participating BA syndicates provided macro and micro transactional data, which captured the total amount their members had invested in each investee company on each transaction, as well as the amount levered from elsewhere, amongst which, included the value of the investment by PVCs run by SIB. In an anonymised fashion, access was also given to the details of the investment rounds that took place, how much money was raised by each investor type and at what price.

Data obtained was generally in word or excel format and listed all the deals the syndicate had participated in, the date of the transaction, the instrument type and then, to varying degrees, aspects of the following data – the type and amount invested by external investors, the share price of the transaction and the post money company valuation. Overall data of 423 transactions for investments in 101 companies was received.

The 423 sample transactions took one of six forms:

- Solely angel money which would then qualify for the EIS or SEIS benefits. External individuals who were not syndicate members were treated as if they were part of the syndicate
- Solely external money to the syndicate often VC, university or specialist funds
- Angel money and external money
- Angel money and PVC money (mostly the SCF)
- External money and PVC money
- Angel money, PVC and external money

The initial intention of this thesis was to get transaction and holdings data from SIB for the research period for the companies, in which SCF has invested, to assess its performance and efficacy. However, as SIB were unwilling to provide that data, the

only option was to work with accessible BA syndicate data and reconstruct the SCF data. SCF and other SIB PVCs, which invested in 87 of the total 101 investee sample companies.

Table 5-9 below outlines the average value of the equity transaction during the research period by each of the sample syndicates. The determinants of the syndicates' transaction size are wealth of the individual syndicate members, the number of members and the syndicates' rules of engagement. Syndicates have different rules of engagement, for some all members must participate in every investment if the majority of the syndicate vote for it, others have a lead investor group, who undertake to invest a set amount in all chosen companies and then the rest of the syndicate is given the choice to participate and others progress with deals if there is sufficient interest from individual members (Interviewee B, 2015, Interviewee E, 2017).

Syndicate	Start date post 2001	No. active members end 2017	Average annual deal size over period / life to end 2017	Average annual deal size over period /life including partner money to end 2017
A	2002	85	£364,590	£704,614
B	2010	147	£108, 942	£434,500
C	2012	19	£33,200	£67,446
D	2013	18	£267,207	£465,371

Table 5-9: Average transaction size and no. of members of sample syndicates

Source: Propriety syndicate databases

Table 5-10 overleaf provides a summary of the investments in ordinary shares undertaken. The diversity of the syndicates is evident from the table – syndicate A exhibits little collaboration with other angel syndicates during the period, whereas syndicates B and D show they have raised more from other syndicates than they themselves raised. In the case of syndicate D, however, this is largely due to the absence of their collaborating syndicates from the sample and hence them picking up

the deal totals, whereas had their collaborators been included, the numbers invested by Syndicate D would have been much less, as the larger syndicate would have accounted for the deal. Syndicate C ‘s small deal value is explained by its policy which requests from its members an investment of £2000 per deal.

For each of the sample syndicates, it outlines how many of the investee companies had SCF as an investor and how many investee companies had other PVCs managed by SIB without SCF. In some cases, SCF and another SIB PVC fund would be invested, here they would be categorised under the SCF. The table thus tells us that SIB invested in all the deals of syndicates B, C and D and Syndicate A undertook 15 investments without a PVC as a partner and three with the other SIB funds. As the data showed SCF was not the only PVC present in these transactions, the second research question of this thesis widened out to a general PVC consideration as although the other funds invested with the SCF and there were three transactions where there was a PVC investor which was not the SCF which totalled £8.8m.

S	No. of SCF cos	No. of cos solely other SE funds	No. of invested cos	No. of trans.	Total I by Synd. £m	Total I by other syndicates £m	Total I by SCF £m	Total I by other SIB funds	Total I £m
A	41	3	59	312	86.4	1.9	17.8	8.8	170.2
B	22	0	22	75	8.1	10.2	12.6	0	40.6
C	12	0	12	19	0.3	0	0.6	0	1.3
D	8	0	8	12	0.5	1.4	1.7	0	5.6
Total	83	3	101	423	95.3	13.5	32.7	8.8	217.7

Table 5-10: Syndicate transaction information

Whether the PVC was the SCF or another of the SIB funds does not matter, as the main variable considered is the amount of direct public money invested. The table excludes the amounts raised from other parties, but the totals in the final column include those numbers and so that amount can be calculated. Of the £217.7m invested the sampled investee companies, the four BA syndicates were responsible for raising £95.3m from their own members, with a further £13.5m and £41.5m raised from other syndicates and SIB respectively and £67.4m from other external investors. The sample had six transactions which used convertible loan notes (CLN). Table 5-11 shows the annual investment undertaken by the sample syndicates during the period

Year	Actual EIS/SEIS qualifying invest in sample (£m)	Corresponding EIS rebate (£m)	PVC Investment Amount (£m)
2003	3.7	0.7	0.13
2004	5.3	1.1	0.43
2005	5.2	1.0	1.09
2006	3.4	0.7	1.38
2007	6.9	1.4	1.77
2008	8.1	1.6	2.91
2009	5.3	1.1	3.34
2010	4.2	1.2	5.00
2011	5.2	1.6	6.88
2012	6.5	2.0	7.24
2013	6.6	2.0	8.35
2014	8.9	2.7	12.87
2015	10	3.0	14.86
2016	11	3.3	17.79
2017	18.5	5.6	16.96
total	108.5		

Table 5-11: Annual investment amounts into sample companies 2003-2017

Source: Proprietary Information

This thesis covers the provision of capital at the early stages of a company's life. One of the main contributions from this thesis to this area of research is the analysis of real company data. Datasets used by other authors for research in this field include the

VICO dataset (Cumming et al., 2017; Guerini and Quas, 2016; Grilli and Murtinu 2014b, 2013) and FAME (Nightingale et al., 2009). FAME was also used in this research to fill in a few sample gaps and was particularly helpful with companies which were no longer trading as it draws its data from Companies House and keeps the archives which the online database of Companies House does not. For the most part, the databases which draw on Companies House data prove often to be an unhelpful data source for profit and loss items such as turnover which of course, as discussed earlier, is a key requirement for the analysis undertaken in this thesis. The VICO dataset is for high tech companies in Europe and includes 7700 companies. The UK represents 21% of those companies. For UK accounting information VICO uses the Amadeus database which sources its data from FAME as well so encounters the same issues. This means most of the operating data of the sample here is not available in public databases such as FAME or VICO as most of the companies are too small and get 'Small Companies Exemption from filing accounts in the UK aa result of low levels of FTEs, assets or turnover (HM Government, 2018; Companies House, 2017b). This thus suggests the studies discussed in the Literature Review section are most likely more developed companies than those discussed here.

Almost 20% of the sample had already received £35.7m of investment prior to the beginning of the study period of January 2003, when the average age of those firms post investment was 3.5 years. Of that cohort, almost half of the companies failed during the research period, and almost another half were sold, with two still being part of the active portfolio at the end. Figure 5-3 below shows the initial investment years of the sample companies and increased activity in the later part of the period, which may well be explained by three of the four syndicates beginning in the second half. A notable feature is the distinct lack of new investments in 2008 and 2009, which aligns with the dearth of capital and liquidity resulting from the GFC. Most of the investments at that time were to provide extra cash flow to previous investments as the global economy declined. Table 5-11 earlier in chapter shows that investments continued in those years nevertheless and the sample syndicates invested £8.1m in 2008 and £5.3m in 2009. The amount in 2008 was even higher than the year before which might suggest the investee companies needed help.

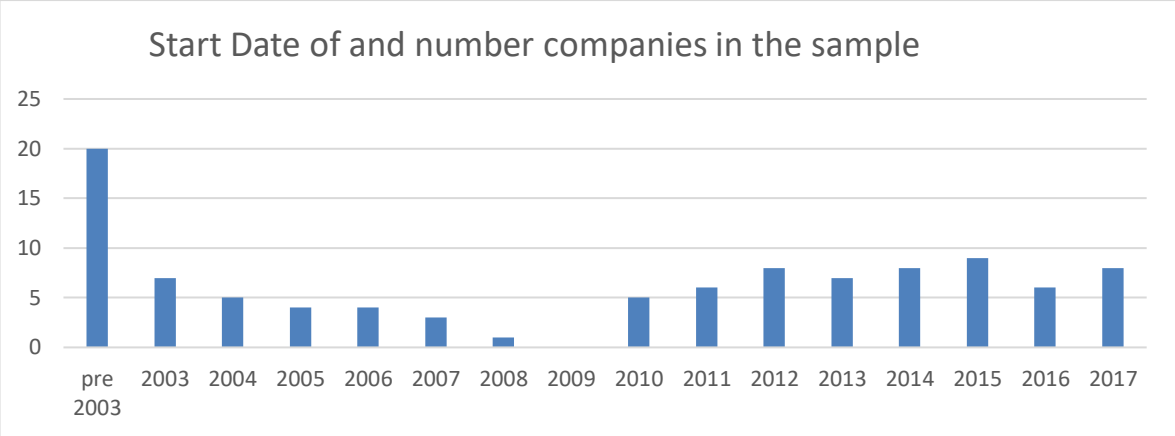

Figure 5-2: The initial investment dates of the sample companies

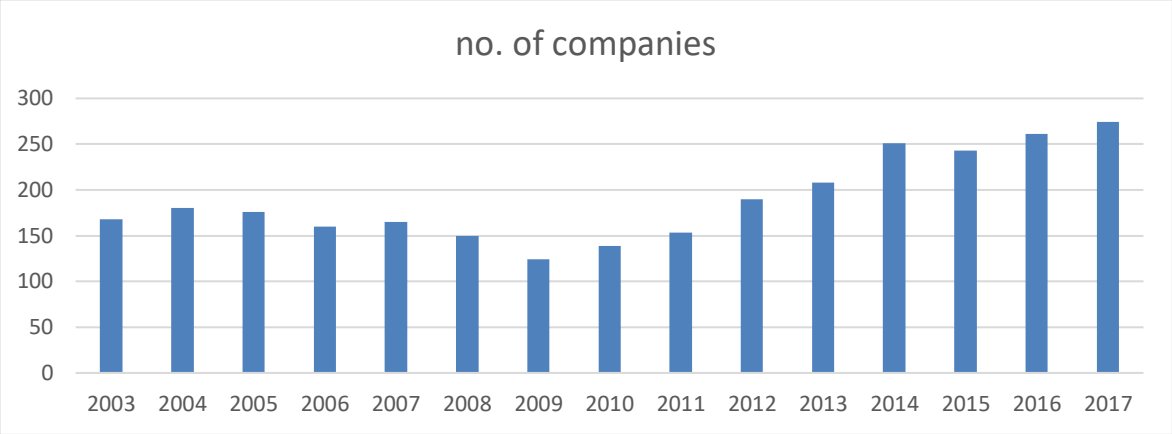

Figure 5-3: Number of companies benefitting from EIS/SEIS funding in Scotland

Figure 5-3 above outlines the no. of companies in Scotland that benefited from EIS and SEIS funding. The EIS/SEIS data includes both follow on funding rounds as well as initial rounds. Although the UK data splits the data for companies raising money for the first time and follow-on funding, this is not done at the regional level and so that data could not be presented for Scotland.

Of the 101 sample companies 26 failed during the research period with an average age of 5.1 years, 17 were exited with an average age of 8.1 years after initial investment and 58 are active with an average age of 5.3 years at the end. This failure rate is low compared to other studies – MacKenzie & Coughtrie (2015) reported a 46% failure rate on the Archangel syndicate's portfolio to 2015, Wiltbank (2009) recorded 55%

amongst the 158 BAs they surveyed, and OECD (2011) suggest it is 56%. Noble (2011) cites an experienced professor at Harvard saying that if failure is defined as liquidating assets, 30-40% of start-ups fail, if it's defined as not getting the projected return on investment then that number is 60-70% and Belsie (1991) reckons 85% of high-tech companies live past five years, while 90% of all other businesses fail in the first five years, and 15% of those become significant financial successes. Failure in this thesis has been defined as liquidating assets. In the year after the study period, six of the sample companies failed, which brought the numbers into lower end of the failure range of expectations.

5.4 Reconstructed SCF data

As no investment data from SCF or any of the Scottish PVCs was offered directly and not much comprehensive public information is available, it was necessary to construct a proxy measure to represent the investments undertaken by this direct FI policy tool to establish whether the sample PVC data set was representative or not. The BA syndicates' transactions data sets were, thus, used to construct a dataset for SCF from individual company data (which broadened out to cover all invested monies by SIB as discussed in the last section). This data was then triangulated with other sources to attempt to sense check the numbers derived.

5.4.1 PVC data from the syndicates

Table 5-12 below outlines the amounts invested by the SCF and other SE funds on an annual basis over the period as reconstructed from that data.

Syndicate	No of cos. invested in by SCF	Total SCF investment £m	Total investment other SE funds £m	Total SIB investment by %	Total invested £m
A	41	17.8	8.8	16	170.2
B	22	12.6	0	13	40.6
C	12	0.6	0	46	1.3
D	8	1.7	0	30	5.6
Total	83	32.7	8.8	19	217.7

Table 5-12: Sample and SCF data

As evident from Table 5-12 SE funds other than the SCF have contributed £8.8m and in total SIB has invested £32.7m in the sample companies, which is 19% of the overall monies invested. The approach taken in the analysis was to group all the PVC non-SCF money with the SCF money, if SCF had participated as an investor in a company. From this data it is evident most of the early-stage risk capital deals for the investee sample companies have been co-invested in with the SCF, although in the early period that frequency was much less, the trend of the co-invested deals with SCF increased over time. Other funds that co-invested were the British Growth Fund, the Scottish Seed Fund Scottish Ventures Fund and Scottish Portfolio Fund.

5.4.2 Representativeness of PVC data for SCF

5.4.2.1 **With respect to SE documents**

Given the importance of the PVC data to the thesis, to its research questions and the lack of a direct data source**,** it is important to triangulate the data as much as possible to establish whether the sample data collected is representative. Below the data garnered from the BA syndicates is compared to a) various published reports on the SCF (MWC, 2016; SIB, 2015; Hayton et al., 2008, Scottish Enterprise, 2007); and comments by the Portfolio Manager of the Fund at Dec 2017 (Kinnard, 2017) and c) the Fund's evaluation reports (MWC, 2016; Hayton et al., 2008). Unfortunately, due to a lack of transparency, no annual data reconciliation or industry comparison

confirmation of the representativeness of the investments included in the sample was possible. Nevertheless, what is provided in this thesis is the closest set of measures available.

Table 5-13 below triangulates the amount of money invested in the sample companies by the Scottish PVCs with other PVC information elsewhere to try and ascertain how representative the sample companies may be of the SCF overall. The second column gives the annual data for the PVC investments in the sample companies and all the other columns represent cumulative data to that particular year.

Year	Amount of SIB invest in sample (£m)	Annual Investment £m	Cumulative total £m	Total value from elsewhere £m	Cumulative % of total value
2003	0.22				
2004	0.55				
2005	2.07				
2006	1.54		4.38	23a	19
2007	1.69		6.07	30.7b	19.8
2008	3.11				
2009	3.04				
2010	2.96	11.7c			
2011	3.7	8.9c			
2012	4.77	7.1c			
2013	5.47	7.1c	29.2	78.8c	37
2014	5.71			107d	33
2015	17.2				
2016	27				
2017	30.7				
TOTAL	109.3				

Table 5-13: SIB investment in sample companies compared to value in published sources

[a] Scottish Enterprise (2007) [b] Hayton et al. (2008) [c] MWC (2016) [d] SIB (2015)

5.4.2.2 **With respect to a talk by the Portfolio Manager**

At a lecture on the SCF presented the Fund's total investments, Michelle Kinnaird, the Fund's Portfolio Manager at December 2017, outlined that during the period of research the SCF undertook 480 investments and had 220 active investments at the end of the period (Kinnaird, 2017). If the meaning of investments is the same as that in Hayton et al. (2008), this means transactions and the sample used for this analysis had 201 transactions, which involved the SCF, which is 41% of the Fund's total. Of the total 101 sample companies 58 were active at the end of the study period in this thesis' dataset. Amongst the sample companies, SCF had been an investment partner with 83 companies in 201 transactions, which represent 41% of the Fund's total transactions. For the GVA and jobs analysis, however, due to missing jobs and sales data, the sample was reduced to 56 companies and 51 of those active at the end of the period. Of the 30 missing companies. 17 had failed during the research period.

It is worth remembering here that a failed company still adds value to the economy. Debate therefore focuses on the degree of economic contribution because if they were weaker companies they would have contributed less, however had their failure been due to overexpansion and failure due to a high-cost base, they would have contributed more to the economy due to the multiplier effects. Again, a reason why this work joins Mason's plea of 2009 that better data records need to be initiated and maintained if more precise insight to these policy measures is to be maintained.

5.4.2.3 **With respect to the evaluation and annual reviews**

The macro data SCF sources available are Kinnaird (2017), whose comments were mentioned earlier, and details of amounts funded, as outlined in the evaluation reports (MWC, 2016; Hayton et al., 2008). The total funded to December 2015 from those two reports was £76.2m, however there are also further publications which suggest other numbers and do not concur, so finding a true barometer is challenging. Harrison (2018) published another number for SCFI and if that is added to the number for SCFII given by MWC (2016) the Fund's investment totals £78.8m. In addition, there is the

application for funds to participate in the management of SCFIII it says the Fund has made £107m of investments (SIB, 2015). Funded amounts and amounts invested can differ, however, due to positive or negative realisations during that period on sales or liquidations and then the money could well have been reinvested and generated yet another contribution to the value of the Fund or lessened the value of the Fund through losses so perhaps considerations such as these explain the different numbers. The Scottish Enterprise Annual Review of 2007 gives some data on the SCF, where is says £23m had been invested since 2002 in 99 companies and 146 transactions (Scottish Enterprise, 2007). This compares with eight companies in the sample at that time, so around 8% of the number of companies and in these companies, £1.7m had been invested in those which is 7.4% of the Fund's total which is a lower value than the average during the research period but is not surprising given this is older data and less available.

Table 5-14 shows the annual investment amounts that the sample has for SCF Investment:

Item	**Sample**	**Kinnaird**	**Eval. Reports**	**YCF**	**EIS/ SEIS**	**Harrison (2018)**	**Application SIB (2015)**
Total co-invested transactions	201	480					
Amount Invested £m	32.7	n/a					
% of total transactions	42						
Amount invested/funded £m	73.1		76.2	330	229	78.8	107

Table 5-14: Triangulation of the SCF monies

Sources: Harris (2019), Kinnaird (2017), Harrison (2018) SIB (2015) MWC (2016) Hayton et al. (2008), YCF (2015, 2014, 2005-2007).

From the BA syndicate sample data, the identified total amount invested over the period by the SCF was £32.7m. If this amount were divided by forty-two and then

multiplied by 100 (although a rudimentary step as not all transactions are equal) to gross up the number, a value of investment of £73.1m is arrived at for the total Fund if this sample was a fair reflection of the Fund. This figure compares with the grossed up funded value of £76.2m from the evaluation reports. As can be seen from the table none of the other approximation methods proved to offer any value add so one can only conclude unfortunately, regardless of source it is difficult to achieve a level of consistency as to the possible value invested by the SCF.

5.5 The DAA GVAIA and Jobs analysis data inputs

The DAA GVAIA and Jobs analysis uses the BA survey data for its additionality number, the turnover, FTE, invested amounts data from the investee companies' operational and financial data and the BA transaction data. This is combined with the IOT data to get the descriptive macro outcomes. In its relative analyses, as discussed in the last chapter it uses the Scottish national GVA and employment data and the SE expenditure report data.

The company turnover, FTE, the investment transaction value, the IOT and the survey data were all input variables. The extent of the analysis is determined by the availability of the turnover and jobs data. Investment transactions data was complete for the whole sample universe but as it works with the FTE and sales data at the company level, the FTE and sales data needs to be there for it to be used. Although all data series have been discussed individually, due to the nature of the DAA GVAIA and jobs analysis there are further aspects to discuss – six macro analyses occur in DAA GVAIA and jobs analysis and four different data sets are used due the availability of data. When the analyses of both policy tools are calculated, the EIS data sets are used again as that is the overarching set.

To be included in the DAA GVAIA and jobs analysis of the direct and/or indirect FI, the company needed to have either a turnover data point or a jobs data point for a calendar year. Although all companies qualified for the universe of the indirect FI –

EIS or SEIS – by the nature of the original data set coming from BA investors, who use that policy tool, this was not the case for the direct FI policy tool as not all deals included an accompanying PVC investment from a PVC. There were 14 companies of the EIS sample companies, which did not use PVC.

Of the 101 companies, 87 received PVC money, 70 companies were used for the EIS/SEIS or indirect FI analysis and 56 for the PVC analysis. For each of the FI samples there are two subsequent subsets – one for the GVA analysis and one for the jobs' analysis as the availability of the critical turnover or jobs data differed from company to company and hence dataset to dataset. There were 56 companies included in the EIS GVA analysis and 54 in the EIS job analysis. In the case of the PVC analysis, 46 companies contributed to the GVA analysis and 50 to the jobs' analysis. Not only did the sample of investee companies differ between the four sub-sets but so too did their corresponding investment transactions. As Figure 5-4 below provides an overview of the data samples for each of the analyses. The transaction years reflect the years of the number of transactions encompassed in the analysis and those transacting years for the EIS analysis were 255 and 213 respectively for the GVA and jobs analyses and the correspondingly numbers for PVC analyses were 177 transacting years in both cases.

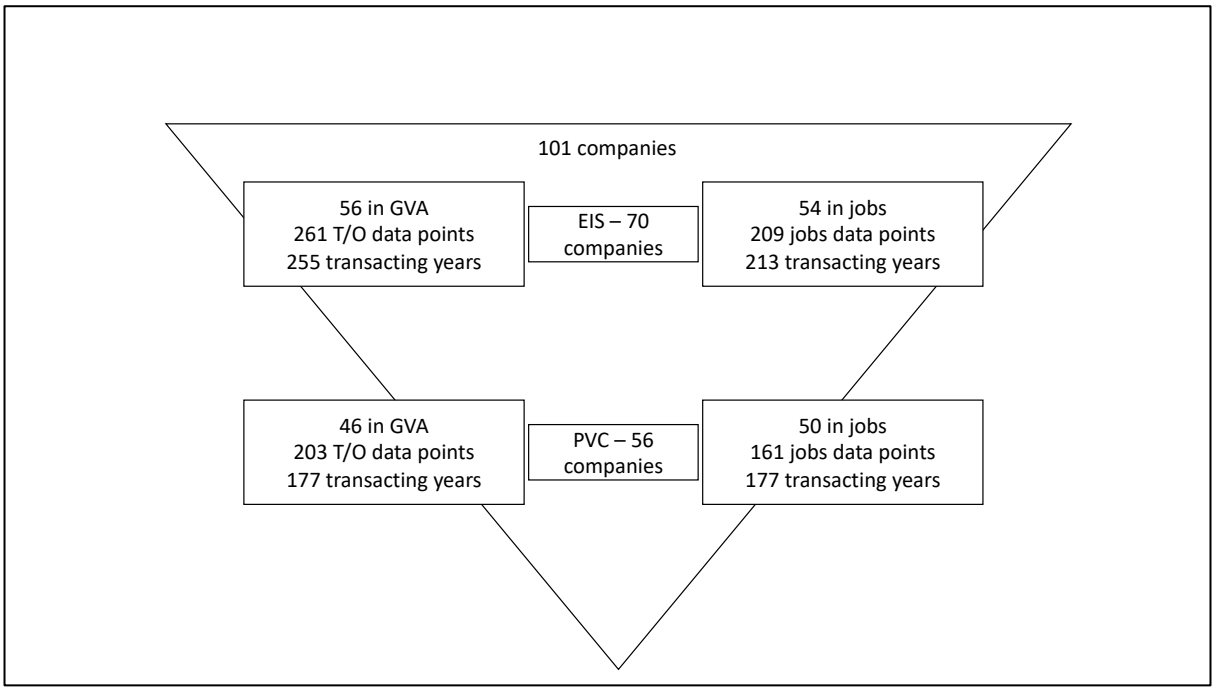

Figure 5-4: Data samples for the DAA GVAIA and Jobs analysis

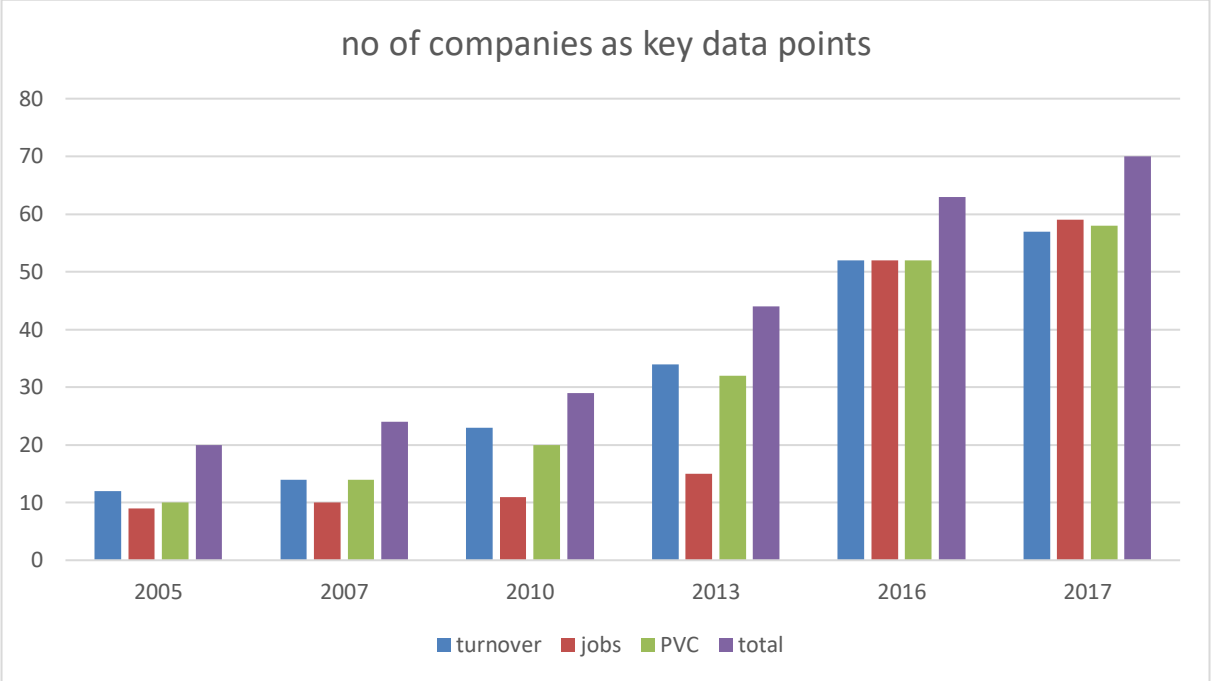

Figure 5-5: EIS/SEIS and sample investment values compared

Source: Propriety information and HMRC 2019, 2018b, 2015, 2011, 2009, 2008, 2005, 2003

Figure 5-5 outlines the cumulative progression of the data points of the key variables of turnover, jobs, and PVC at the company level for the PVC data set over the period as well as the total numbers of companies on the left-hand axis. It shows that turnover and jobs data is more available towards the end of the research period. This is true regardless of when the companies received their investment. This results from less data being available at the beginning of the period, due to a lack of interest in monitoring the development of such data or the provision of a data repository. Often the interest of this study has helped companies produce the data required. The data shows many more companies received PVC funding in the latter half of the research period. This is not surprising as the less than half of the companies in the first two years of the study received funding, but by the time the end of the period 83% had. All 70 companies do appear in one of the analyses, either providing a data point for one the four jobs or GVA analysis.

Eight failed companies are included in these numbers and their contribution to GVA and number of jobs is recorded, whilst they were contributing. Although it is expected around 50% of early-stage companies will fail – MacKenzie and Coughtrie (2015) recorded 46% of the Archangels' syndicate, Wiltbank (2009) recorded 55% amongst the 158 BAs they surveyed, and OECD (2011) suggest it is 56%. Survivorship bias could be a consideration for the data set however to what degree and in what direction is unknown. Another six failed in the year after the study was completed and many of those had long histories and so the effect might not be an upward bias as one might like to presume.

5.5.1.1 **The annual company universe**

Table 5-15 overleaf gives a holistic view of the data set. It shows for each calendar year how many companies were included in the calculation for each of the four analyses.

There the greater incidence of data towards the end of the period is more obvious with over 40 companies being included in 2017 compared to single digit numbers at the

beginning of the sample period. Some of that greater incidence of companies towards the end of the sample period reflects the activity in the market. There is, however, a distinct jump in the sample representation from 2014 to 2015, which may reflect the inclusion of three of the four samples in the latter period and the previously pre-revenue companies starting to contribute.

Year	EIS/SEIS No of cos. in job sample	EIS/SEIS No of cos. in GVA sample	Total no. of companies EIS/SEIS Scotland	Sample jobs cos. as % of total EIS/SEIS cos.	Sample GVA cos. as % of total EIS/SEIS cos.	PVC No of cos. in job sample	PVC No of cos. in GVA sample
2003	5	6	168	3.0	3.6	2	1
2004	6	8	180	3.3	4.4	3	3
2005	9	11	176	5.1	6.3	4	4
2006	8	11	160	5.0	6.9	4	6
2007	7	10	165	4.2	6.1	4	6
2008	7	12	150	4.7	8.0	5	7
2009	6	12	124	4.8	9.7	4	7
2010	5	14	139	3.6	10.1	3	11
2011	5	16	153	3.3	10.5	3	13
2012	6	17	190	3.2	8.9	4	15
2013	11	22	208	5.3	10.6	7	17
2014	12	28	251	4.8	11.2	10	26
2015	30	30	243	12.3	12.1	28	27
2016	44	33	261	16.9	12.6	38	31
2017	48	31	274	17.5	11.3	42	29

Table 5-15: The annual data points under the DAA GVAIIA and jobs analysis

The earlier years really reflect the lack of data and if all the data were available for the sample companies, instead of 11 companies in 2005 EIS/SEIS GVAIA analysis, there would be 25 and that would be representing over 13% of the total. The company jobs data begins to get momentum in 2015, where not only did this study help release data but there was also a requirement to report number of employees in all accounts filed at Companies House when abbreviated accounts were abolished (ICAEW, 2018).

Another way to look at the representativeness of the data is to consider the amount of tax rebated, which is the policy money being used for the EIS work and comparing that to the whole amount that would have been rebated in Scotland. Table 5-16 below outlines these numbers.

Year	Total amount invested in EIS/SEIS Scotland £m	Total tax rebate Scotland SEIS/EIS £m	Sample rebate as a % of total rebate
2003	44	8.8	8
2004	45	9.0	12
2005	46	9.2	11
2006	44	8.8	8
2007	51	10.2	14
2008	38	7.6	21
2009	31	6.2	17
2010	30	8.25	14
2011	34	10.2	15
2012	48	14.4	14
2013	48	14.4	14
2014	75	22.5	12
2015	68	20.4	15
2016	83	24.9	13
2017	80	24.0	23

Table 5-16: Tax rebates and SEIS/EIS in Scotland, 2003-2017

These number show that the EIS/SEIS sample represents around 14% of tax rebated in Scotland during this period. Adding to the previous discussion on the representativeness of the EIS/SEIS sample data here the value of the rebate received has remained a relatively consistent share when compared to Scottish data through-out the period averaging 14% of the total.

5.6 Logistical considerations and ethical issues

5.6.1 Missing Data

The lack of consistent informative public data on the SCF's other PVCs' investments and investment activity makes this area of research particularly challenging as although private datasets were used in this study, they are not easy to access and, in many cases, did not record all the data required. This resulted in additional research activity involving contacting the companies directly to ask for data or arranging for interviews with the executives to get further information. Even with that, the SCF data in this study was created along the lines of a mosaic or scuttlebutt approach (Investopedia, 2018; Fisher, 1960) not only for the micro company data but also the macro level data or totals invested. Given the lack of precision with these techniques it is to be expected that a margin of error will be present, and the degree of those biases is unknown.

Having access to propriety datasets, such as those used in this study, is usually not possible due to BAs preferring to keep their affairs private (Mason and Harrison, 2002a; Wetzel, 1983) and that is one of the unique aspects of the study. Incomplete company information in the proprietary datasets is another challenge and this is augmented by the lack of public relevant data in the early stage phase of companies (Nightingale and Coad, 2013; Pierrakis, 2011; Cowling et al., 2008) and errors in the data (Cumming & Johan, 2016), which has resulted in the research chorus calling for a comprehensive effort to record and collect data and for a reliable source to be established (Landström and Sørheim, 2019; Baldock, 2016; Wishlade and Michie 2014; Mason, 2009a; Mason & Harrison, 2008).

5.6.2 Ethics

The work herein was conducted in line with The University of Strathclyde's Ethics Committee guidance on research. The fieldwork took place over a 31- month period

between November 2014 and June 2017 and was driven by the opportunity to gain access to certain angel investors within the purposeful sample. Primary data collection began with interviews with individuals from the broader landscape of Scottish business angel investing in person and over the phone. As per the University of Strathclyde's Ethics Committee guidelines, all participants were informed that they were under no obligation to contribute to this study and could withdraw their involvement at any time. They were provided with a description of the research and its purpose, which many were already familiar with due to the nature of their investment activities. All interviewees insisted on complete anonymity to participate which was granted.

Due to the commercially sensitive nature of the data this thesis used, interview respondents also refused to be recorded and hence no transcripts were created. Interviews were on an open, exploratory basis and fieldnotes were taken and comments ascribed to them was shared with them to gain their approval. The angel syndicate and corporate data was provided on the condition that a legally binding Non-Disclosure Agreement was signed to protect access to the data, which means it will not be deposited with this thesis. This data is viewed as extremely commercially sensitive and was only provided on the condition that is was anonymised in any relevant commentary. Strict measures have therefore been undertaken to ensure that the data is non-attributable throughout the thesis and any identifying information has been stripped out. The remaining data gleaned from Companies House is publicly available and cited in the thesis, where used and can be accessed through their beta service online. No ethical concerns were present in the use of this data.

5.6.3 Limitations

Due to the nature and development of angel investment in the UK and Scotland, a number of limitations apply to this work. Angel investment was in its early stages in Scotland an informal activity, with some investors saying it was illegal to share business plans in the early 90s when they started. Legality considerations aside, the informal nature of angel support and early-stage entrepreneurship makes data access challenging at times. In seeking to connect up micro-level activities such as investment

with macro level economic development, the research for this thesis met a number of challenges. The original intention was to access data from official sources to assess the policy efficacy of the SCF and related FIs, but access to this was denied. The approach then turned to accessing angel datasets to ascertain how much such FIs supported angel investment activity and extrapolating from there. However, this is not the whole angel population as we know that a) not all those using SEIS/EIS are registered in angel consortiums, b) not all angel consortiums responded to the request for data meaning it is a sample presented here, c) the data accessed therein is a longitudinal snapshot that is necessarily incomplete picture but the best estimate available. Data access issues aside, the completeness of the data has been discussed throughout the thesis and addressed in the methodology, outcomes, and discussion sections. Angel investment and data are difficult activities to analyse from data perspectives, but this thesis has sought to mitigate these issues where possible to shine light on a number of different aspects and connections to economic development that were previously only guessed at, even at policy levels where data tends to be more comprehensive. Thus, although the limitations herein are clear, it represents a more detailed analysis of the connections between angel investment practices and economic development outcomes than has previously been reported.

5.7 Conclusion

This chapter describes the data and presents a table on its use in each of the analysis conducted in this study. Four distinct data sources used in this work – individuals, BA syndicates, companies and government. The data which comes from the individuals, BA syndicates and corporates are all primary data and the government data is secondary. The semi-structured interviews were the only qualitative data source in this work, all other sources are of a descriptive quantitative nature.

The data from individuals comes via semi-structed interviews and an anonymous survey of BA investors. 17 semi -structured exploratory interviews were undertaken to understand the history and context of the subject matter and collect data as to the policy initiatives. For data protection issues all interviewees have been anonymised

and their role within the early-stage risk capital eco-system has become their identifier. One important conclusion from these interviews was the refusal of SIB to grant access to the investment data on the SCF for the purposes of this research, which resulted in the PVC policy money having to be reconstructed from the BA investment data provided. The survey received 82 responses and sought to obtain deep data on the views of BAs on policy tools, their investment behaviour and decision-making and to have information that was Scotland centric. The survey replicated the questions asked by Mason and Harrison (2002a), where they had asked views on one policy tool - the EIS. In addition, this survey explored BAs' attitudes to SEIS, their thoughts on the provision of PVC money, on their preferred form of that PVC money and on its importance to their continued provision of capital. It also enquired the degree to which the BAs were motivated by the economic outcomes of those policy tools such as creating jobs or economic growth.

Four Scottish BA syndicates helped with this work. They provided data on the investments they made or had made over the study period and these investee companies was the complete sample of investee companies included in the analysis. The complete sample included 101 companies, which included 26 failures and 17 exit. The data also included details of the syndicate's co-investment partners, in an anonymised fashion, in each transaction. From this data it was possible to re-construct the investments by the Scottish PVCs into the same investment universe. Almost 20% of the sample had already investment prior to the beginning of the study period of January 200 and a notable feature is the distinct lack of new investments in 2008 and 2009, yet investments were still made to support existing companies as discussed in Chapter three. Most of the investments at that time were to provide extra cash flow to previous investments as the global economy declined, Turnover and FTE data was collected for those investee companies. As discussed in the last chapter, Turnover, FTE and investment data were linked to create input data for the DAA GVAI and jobs analysis for the research question regarding the economic development effectiveness of the EIS and PVC policy tool, which is addressed in chapter seven.

Any attempt to gauge representativeness of the primary sample data proved futile. Consideration was given to the interviewees, the BAs who took the survey, the investee company universe as being representative of both the EIS company universe and the Scottish PVC investable universe. The population and characteristics of the BA population is unknown so no progress could be made in establishing the representativeness of that data set. With respect to EIS sample companies the being representative of the Scottish total EIS population, further challenges occurred. Firstly, granular EIS data is not published for Scotland so comparing the industrial/services profile was not possible and secondly data labelling discrepancies rendered a mosaic construction attempt void. It could be established, nevertheless, that the EIS sample represented 14% on average of Scottish EIS tax rebates. No progress, likewise, could be made on ascertaining the representativeness of the PVC investment data set, due to data labelling deficiencies and just a lack of data, which supports the point in Chapter two about the lack of an accountability and monitoring framework for the SCF being a design flaw. The interviewees were ascertained by snowball sampling technique, and it is unknown if a key voice was not recorded. It should be noted this thesis covers the provision of capital at the early stages of a company's life.

Data on early-stage investment transactions and the corporate recipients of such capital is not in the public domain and so some of the contributions to knowledge of this thesis are empirical in nature, due to the analysis of real investee data obtained from the BA syndicates and their investee companies. Datasets used by other authors for research in this field include the VICO dataset (Cumming et al., 2017; Guerini and Quas, 2016; Grilli and Murtinu 2014b, 2013) and FAME (Nightingale et al., 2009). FAME was also used in this research to fill in a few sample gaps and was particularly helpful with companies which were no longer trading as it draws its data from Companies House and keeps the archives which the online database of Companies House does not. For the most part, the databases which draw on Companies House data prove often to be an unhelpful data source for profit and loss items such as turnover which of course, as discussed earlier, is a key requirement for the analysis undertaken in this thesis. The VICO dataset is for high tech companies in Europe and includes 7700 companies. The UK represents 21% of those companies. For UK accounting information VICO uses

the Amadeus database which sources its data from FAME as well so encounters the same issues. This means most of the operating data of the sample here is not available in public databases such as FAME or VICO as most of the companies are too small and get ‘Small Companies Exemption from filing accounts in the UK aa result of low levels of FTEs, assets or turnover (HM Government, 2018; Companies House, 2017b). This thus suggests the studies discussed in Chapter two are most likely more developed companies than those discussed here. It was to explore this idea further that the chapter includes a comparison of the company dataset used here with that in Grilli and Murtinu (2014a). Their study concluded that PVCs were not effective in delivering sales or employment growth and their median investment in a PVC was half the amount of this study. They used the VICO database which does not include small company data for the UK. It suggests further questions need to be asked of that study.

The secondary government data outlined in the chapter is the annual EIS and SEIS data for Scotland, national statistics on employment and GVA, industry GVA and macro-economic multiplier data from the IOTs and financial data from SE. The government data fulfilled one of two purposes. Firstly, the EIS/SEIS, GVA, Employment and SE Accounts data was used to evaluate the representativeness of the samples and results and, in some cases, provide context. The IOT data provided input variables for the DAA GVAIA and Jobs analysis in the form of economic multipliers and industry GVA statistics. Although a welcome tool kit to deploy, the industrial sectors included in the IOTs seem rather out-dated compared to the activities of early - stage companies and so it is expected this will affect the outcomes. In addition, the data to establish them is collected by survey from the entire economy, so it may be the case that the multipliers and numbers represented in the tables are not representative for new companies in that sector albeit so for established ones.

6 Chapter 6: FI policies for BAs and Companies in Scotland

6.1 Introduction

The analyses undertaken in this chapter look at the micro elements of this research. The chapter is in two sections. The first section considers the responses to the BA survey and the second considers the nature and growth of the sample investee companies.

The BA survey analyses consider five subjects. Firstly, the survey data is considered to explore the degree to which BAs were motivated to increase their supply of capital by the FIs. Secondly, their responses in relation to the larger strategic policy outcomes of job creation and economic growth are considered. Thirdly, the policy instrument questions are considered, and the results are used to ascertain an appropriate additionality adjustment for the DAA GVAIA and Jobs analysis for the EIS/SEIS and PVC data sets. Penultimately, the results are compared with conclusions drawn by Mason and Harrison (2002a) on the behaviour of angel investors and how that might have changed after sixteen years. Lastly, the results are considered in light of the research questions at the end of the second section. New policy areas explored in this section of the research are BAs attitudes to SEIS, their thoughts on the importance of PVCs and their form and how these factors may influence their continued provision of capital.

In the second section of the chapter the growth of the investee companies being the engine of connection between the investment by the BAs and the creation of economic and job growth at the macro level is considered and the intent of the EIS to enable a sufficient supply of finance for small firms into sustainable profitable businesses (HM Treasury, 2008). How sustainable are these businesses and how long does it take? This section of the chapter considers the length of time it took for turnover and job growth to happen for the sample companies. In Chapter Two the literature reviewed concluded

that EIS and PVC were ineffective policy tools and provided no benefit to the recipient companies, some of the time periods of the studies were short, however. The intention in this section is two-fold, one is to consider a longer time period and the level of turnover and jobs created in more detail, to gain insight into the growth trajectory of early-stage businesses. This analysis hopes to build on both EIS and PVC research, which considered short time periods such the work of Cowling et al. (2008), which did comment that the short time period could be an explanation for the negligible company benefits they found in their evaluation of EIS policy and in the PVC area; MWC (2016) and Hayton et al. (2008), whose studies were less than five years; Nightingale et al. (2009) findings of negative results with the use of a small concentrated data set. The second intention is to explore the data set skew, which is cited as rendering OLS econometric modelling ineffective with data sets such as these. With this analysis, it is hoped to build on the work of Nightingale and Coad (2013), who challenged the use of averages as being representative of the entrepreneurial firm particularly in econometric modelling due to data set skew.

Before the conclusion to the chapter, which summarises the findings of the analyses, the chapter ends by considering both sets of analysis in light of the research questions namely:

1. How effective have indirect FI policy tools, namely SEIS/EIS, been as economic development tools in Scotland during the period 2003-2017?

2. How effective have direct FI policy tools, namely PVCs, been as economic development tools in Scotland 2003-2017?

6.2 FI policies and BAs

In Scotland BAs interact with FI early-stage risk capital policies in two ways. Individually, they are frequent users of the EIS/SEIS tax incentives in their investment transactions, which related to the sums invested, gives them an up-front tax rebate on

tax paid, an exemption from capital gains tax if the investment is held for more than three years and makes a profit and the ability to write off losses against taxes if the investment is not successful. In addition, many of the Scottish BA syndicates are partners of the SCF, so BAs, who are members of those syndicates, benefit from additional policy money investing alongside them, which enables them to undertake a greater number of investments. Individual BAs can also request to have other Scottish PVCs invest alongside them. Both these policy tools have the direct intent of increasing the supply of capital to early-stage companies with growth potential and the indirect intent of contributing to the strategic economic goals of the UK and Scottish government of increased economic, productivity and job growth and innovation.

6.3 The Respondents and bias in their answers

This survey was prepared on Google Forms and sent out to LINC, who forwarded on the survey to all their members. In addition, the gatekeeper of the four BA syndicates, who offered to help with the research, received an online link to the survey, which they then forwarded to their members for completion. It is not known where the responses came from; they may be syndicate members, or they may not. Belonging to a syndicate or not is unlikely to change their views on the EIS or SEIS tool, unless being a syndicate member enables them to have access to more deals and, as was mentioned earlier, all four syndicates only undertake EIS/SEIS compliant deals, hence they have had greater exposure to the Schemes. To receive the incentive the investment execution must occur at the individual level, so they need to make the decision. Mason et al., (2016) discuss some of the operations of BA syndicates in Scotland, the only effect the operational model will have is on the investment opportunity set offered to the individual as the gatekeepers or internal committee, if there is one, undertake their prior screening. It is considered that all investors would prefer a tax rebate rather than not and so once they have been exposed to this policy tool it is expected that they would request all non-syndicate deals to seek to apply for that status and hence it is not expected that the numbers here are unrepresentative of BAs' general opinion on the EIS/SEIS policy tool. For the PVC answers, it is believed that the responses could

have an upward bias if the BA is in a syndicate as there is a chance, they may not know much about PVCs otherwise.

6.4 The results on policy tools and macroeconomic outcomes

The table below outlines the results on the policy tools and macroeconomic outcome questions. This work builds on the survey of Mason and Harrison (2002a) where there was a question on one policy tool – the EIS by exploring also their views on the importance of the SEIS. PVCs, the form of PVCs as well as economic development in general.

When I invest - the importance (*) of the following in my decision making is as follows:			
	very *	quite *	not *
Economic development			
I invest to create jobs	46	28	26
I invest to benefit from capital of the SIB	22	48	31
Importance of EIS/SEIS			
the size of my tax bill	10	27	63
The relevance of EIS to my investment	52	38	10
The relevance of SEIS to my investment	31	46	23
contribute to the growth of the economy	42	24	34
continuation of EIS is critical to me continuing	60	22	18
continuation of SEIS is critical to me continuing	35	44	21
tax incentives increase the returns on investment	62	29	9
Importance of the Public Venture Funds			
If the SIB funds take more discretion, I will invest less	15	50	35

Continued SIB fund participation critical for my continued investment	36	33	31
Co-investment funds are necessary	56	38	6

Table 6-1: Survey responses to policy questions

Applying the methodology, described in Chapter Four, to the survey answers to the questions on the FI policy tools, the results show that both the EIS and SEIS policy tools are important influencers of BAs' behaviour. 82% of the BAs said that EIS is important for them to continue to invest and 79% being the equivalent number for SEIS. In addition, the schemes are considered important to the BAs' current investment activities with 90% being scored for that answer with respect to EIS and 77% for SEIS.

For the PVCs, 94% of the Scottish BAs considered co–investment funds necessary, 70% of them believed they benefited from the government funds when they invested, and 69% said PVCs are required for their continued participation in investing activities with 65% investing less if the funds take more discretion. This suggests BAs see PVCs the importance of the funds and that a passive model is preferred for them to invest, suggesting the BAs prefer their own investment skill set or that of the private sector, to that of the government employees. These high numbers highlight the interconnectedness of the two policy tools and suggests that disaggregating separate effects may not be a meaningful exercise.

These numbers support the view that both FIs have instrumental in increasing the supply of capital. It also supports the view that EIS has become a more important policy tool since the earlier survey of Mason and Harrison (2002a) and the deepening of BA investing as discussed in Chapter Three. With respect to the Mason and Harrison (2002a) study, albeit geographically different, 30% of the answers have flipped from the EIS being considered 'not important' to being 'very important' as seen in Table 6.2 below outlines. Interestingly, however, their investment activity is not merely determined by their tax bill as only 37% said that consideration was important, whereas 63% said it was not important at all.

The survey results also show the Scottish BAs are conscious of the macroeconomic effects of their investment behaviour and the hope of producing positive effects as in job creation and economic growth are part of their investment decision-making criteria. 74% of those surveyed said they invested to create jobs and 66% to contribute to the growth of the economy. This suggests the use of these tools for economic development purposes has worked and investors' intentions are well aligned with the idea of regenerating the economy.

6.5 The policies' additionalities

An additionality factor needs to be considered in all evaluation of policy, which reflects the percentage of the measured outcome to be discounted, as it would have happened anyway, even if there had been no policy measures. The survey responses can be used to determine an appropriate additionality factor for the EIS/SEIS and PVC element of the macro analysis. Previous work evaluating the deadweight factor for the EIS policy tools are Boyns et al. (2003), Wiltbank (2009) and Pierrakis (2011). The first of these studies concluded with an additionality figure of 58%, based on the answers they received to the following question to EIS investors - when they made their first EIS investment, would they have considered investing in any other similar companies. They then gave them five options – 'Definitely', 'Probably', 'Possibly', 'Probably not', 'Definitely not' – and 58% was the score of the last two. Pierrakis (2011), further developed the data collected for Wiltbank (2009) and based on the question asked as to what deals the investors would not have undertaken in the last two years had the tax incentives not been there, he concluded this would have been 34% of the investments.

This study followed the approach adopted in Boyns et al (2003) and taking the first two important options from the three possible answer options in the survey – 'very important' and 'quite important' – additionality for the policy in this study was 82% and 79% for EIS and SEIS investors respectively in response to the question 'is the

EIS/SEIS critical for the continuing of their investment activities?' SEIS started in 2012 and was less than 10% of the total invested in 2017 so a conservative number to reflect both would be 80%. 80% is then the additionality figure used in the following sections which discuss the metrics for the EIS/SEIS incentives received.

For the PVC additionality previous studies on the SCF have had the results below

Publication	Estimated Additionality	Comments
Hayton et al. (2008)	23%-33%	relates to SCF
Centre for Strategy and Evaluation (2008)	90%	relates to SCF
MWC (2016)	86.5%	relates to SCF

Table 6-2: Previous SCF additionalities

If the same approach is followed for the PVC tool as was undertaken for the EIS tool above and consideration is given to the answers for the question 'Continued SIB fund participation critical for my continued investment' the additionality from this study for the PVC macro analysis comes out at 68.5%.

6.6 Updates on previous research

As has been mentioned the questions from the survey Mason and Harrison (2002a) was also included in the survey undertaken for this study. Given the deepening and broadening of BA investing over the last twenty years it was believed an opportunity to update the answers and the differences of those answers are outlined in Table 6-3 overleaf.

Differential between the 2002 and 2017 studies			
	very *	quite *	not *
To support the next generation of entrepreneurs	38	1	-39
Gain satisfaction involved in entrepreneurial businesses	2	-3	1
Potential for high capital appreciation	-24	27	-3
Help a friend/friends set up a business	9	17	-26
For current or future income - dividends or fees	-30	6	24
Support socially beneficial products or services	11	35	-46
A way of having fun with my money	3	10	-13
For positive recognition in the community	2	93	-95
For non-financial perks and benefits	6	1	-7
To make use of tax breaks e.g. EIS	29	0	-30

Table 6-3: Differential between this survey and the responses of (2002a)

Comparing the results of this survey to those obtained in Mason and Harrison (2002a) for the same questions, show much has changed. Interestingly, the hope of high capital returns and expectations of dividends or fees have diminished since the last study, which suggests now the greater experience in early-stage investing has caused BAs to realise that returns are less than previously thought. A greater understanding of the return potential from angel investing has also been supported by the work of Croce et al. (2019). Expecting lower income or fees may reflect a realisation that early - stage companies need all their cash to grow and so are unlikely to be distributing dividends.

The results of this survey communicate more generous BA investing than back in 2002. BAs are now more willing to support the next generation of entrepreneurs, help friends set up businesses and support socially beneficial products or services. They also less concerned about having a positive image in the community. An increased social awareness is a trend over this time period (Forbes, 2018a) and it may be too that the profile of the BA investors answering this survey is somewhat different from those

of the 2002 study as BA has become a more generalised investment activity (Tenca et al., 2018).

When I invest - the following is true	Yes	No	sometimes / maybe
I like the thrill of risky investments	54	29	17
tax incentives help de-risk the investment	81	11	8
I struggle to invest all the funds I have available	12	71	17
Determinants of investment			
	very *	quite *	not *
the number of good opportunities available	54	27	19
the amount of excess money I have to play with	60	22	18

Table 6-4: Other answers from the survey

The other questions above consider why BAs invest They say is not their tax bill, 82% the amount of their investments was determined by the amount of excess money they had at their disposal and 81% said their supply of capital is determined by the good opportunities available. Interestingly they are of the opinion that not only do tax incentives increase their returns but that they reduce the risk of their investments which suggests that due to the tax incentives releasing capital for them they are able to invest in more opportunities and hence diversify their risk.

6.7 Discussion on survey results

Aspects of the provision of BA capital have changed markedly over the past fifteen years, and it is clear now that the tax incentives are very important to angel investors. No doubt their increase in terms of rebates and maximum investment amounts permitted over this period is a contributing factor as well more EIS/SEIS investment occurring and the decline of other tax saving opportunities (Phoenix, Life, 2021,

Professional Pensions, 2016; Midven, 2018). A greater general awareness of BA investing has developed as can be noticed by the growing number of active BAs and increased investment flows. Investment has also occurred by the Scottish Government to encourage the growth and capability of the demand side through financing LINC to undertake the creation of new groups, network, build capacity and share best practice around Scotland (LINC, 2020).

The PVC responses in the survey suggest a realisation by the Scottish BAs that in a regional economy like Scotland, the investment market is thin as has been written about by Nightingale et al. (2009) and without this additional source of entrepreneurial capital, the eco-system would struggle to survive, which reflects very much the view of one of Scotland's Corporate Law Partners

> …without the Scottish Co-investment Fund, none of this would have happened.
>
> Interviewee E (2017)

and as was reflected in Harrison (2018). The BAs answers with respect to the criticalness of PVCs may well be related to this idea and reflect their understanding that without the funds being there, their investment options would be significantly diminished.

Reconsidering the main conclusion of Mason and Harrison (2002a) that all BA entrepreneurial capital could not be put to work due to the lack of investment ready ideas. This no longer is the case in Scotland with 71% of the respondents saying they do not struggle to invest all their funds. This statistic also refutes one of the points in Carpentier and Suret (2016) that the tax incentives inflate valuations due to the lack of supply of ideas and excess demand. The finding that the current environment provides enough ideas for most capital to be deployed reflects the development of the early-stage business and entrepreneurial sector in Scotland, since the last survey was undertaken. Not only has the supply of capital almost tripled during that period but the number of BA syndicate groups has increased more than fivefold, which gives

increased forums for companies to present their capital requirements and the economy has experienced fifteen years of perfecting the art of creating investment ready businesses. The number of new investment opportunities has grown too. The 2017 Global Entrepreneurship Monitor (GEM, 2017) records the total early-stage entrepreneurial activity for Scotland as 6.7% and a discussion in GEM (2014) refers to the 5.5% level of that year as being depressed perhaps by the independence vote and of a level comparable to the beginning of the 2000s. This suggests there has been an increase of 22% over the period of this report. Figure 6-1 below is taken from GEM (2017) and shows the development of the total early-stage entrepreneurial activity for the UK compared to other major companies.

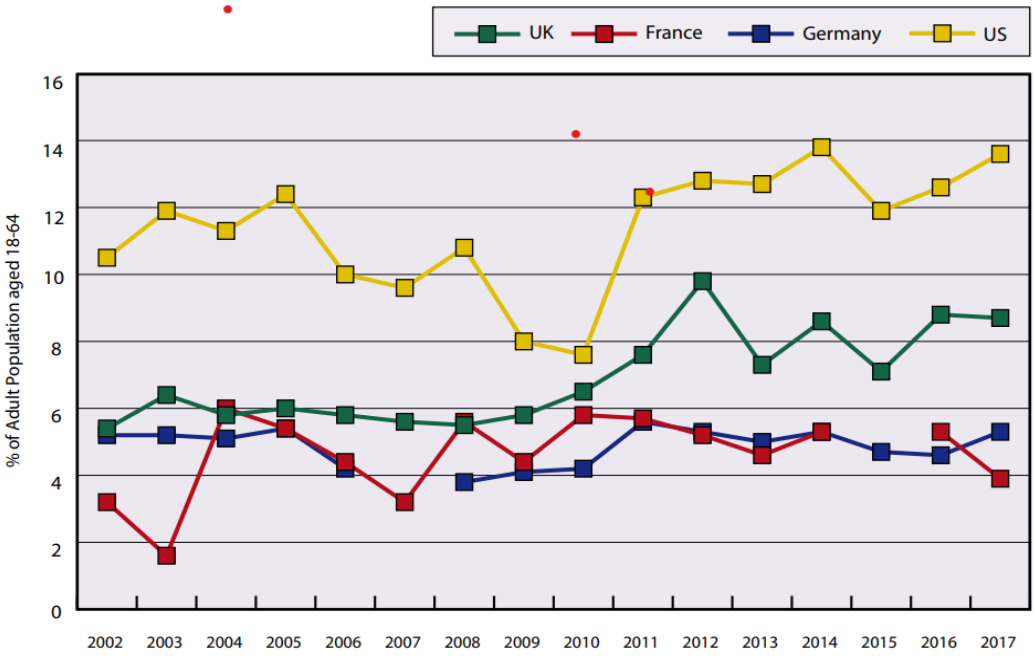

Figure 6-1: Comparison of total early stage entrepreneurial activity

Source: GEM (2017)

It may also be that more investment opportunities have stimulated an increased supply of capital as the survey shows that the supply of good opportunities is one of the determining factors in the supply of angel entrepreneurial capital which scored highly.

6.8 FI policies and companies

Growth of the investee companies is the engine of connection between the investment by the BAs and the creation of economic and job growth at the macro level and the intent of the EIS to enable a sufficient supply of finance for small firms into sustainable profitable businesses (HM Treasury, 2008).

Before looking at the data it is helpful to consider the typical company profile of the data this section will discuss. A company's growth journey can be split into seven phases (Natusch, 2003); OECD (2013); Wilson and Sylva, 2013). Seed, start-up and first stage are considered the early stage of the company's journey. The expansion phase also includes three stages those of scaling, standardisation or internationalisation and Pre-IPO and the latter stage deals with the company becoming public and delisting again. This diagram shows that early-stage companies are not generally expected to make profits, so research, which considers profitability metrics in the early stage of a company's life, other than to prove they are not there, does not seem appropriate (Nightingale et al., 2009; Cowling et al., 2008). This work does not consider profitability but rather turnover and turnover is a common gauge for company growth in this area of research. Turnover too, however, can take time to appear as the early years of a company's formation is spent developing a saleable product which takes time. The diagram considers sales come in the third phase of a company's growth journey, so it is no surprise that in research like this, the data sample will include pre-revenue companies and indeed Chapter Five highlighted that as turnover was used in this study, data points were lost due to pre-revenue non-revenue. 14% of the sample companies, which had sales data were pre-revenue at the end of the period and 30% at the time of the initial investment.

The figure shows that BA funding is often already there in these first two phases of growth and indeed Pierrakis (2011) confirmed this for the UK and Harrison et al. (2010) for Scotland. In his comparison of value invested in tax saving schemes for transactions less than GBP2m between 1997 and 2007, Pierrakis found that 48% more

was invested by BAs than PRVCs, a view supported by Boyns et al., (2003) who likewise analysed the schemes and found that BAs generally invest in smaller companies.

6.9 The Investee company Turnover and FTE data

Overleaf the sample data is presented. It covers the data for the 71 companies which had sales data and the 69 with employee data, The table tell us that one year after investment on a data set of 10 companies an average turnover of £55,000 was recorded and on a data set of nine companies after one year of investment on average they were employing nine people. Likewise in the second year after investment the nine companies with turnover data recorded average sales of around £191,000 average and the eight with two years employment data were employing four people. The table shows 20 years as the time period, rather than 15 of this study, as some companies were already in the syndicates' portfolio at the beginning of this research period. The sales and FTEs included in the average calculation are the highest annual recorded within the history of each company so may not in fact be that year of incident.

Years since investment	No. of companies in sales group	Average sales £	No of companies in FTE group	Average FTEs
1	10	55,033	9	9
2	9	191,228	8	4
3	7	107,806	6	15
4	7	363,329	8	4
5	3	173,698	4	15
6	8	330,995	8	24
7	4	376,112	4	15
8	6	362,703	6	25
9	0	n/a	1	120
10	3	220,286	2	20
11	2	672,349	2	28
12	1	5,056,109	1	45
13	2	9,325,668	2	88
14	5	26,971,354	4	93

15	2	11,857,851	2	89
16	0	n/a	0	n/a
17	0	n/a	0	n/a
18	0	n/a	0	n/a
19	0	n/a	0	n/a
20	2	12,735,522	2	84

Table 6-6: Average highest annual sales and FTEs from date of investment

There are four striking features in this table. Firstly, the length of time required for companies to get any sales traction. The average sales of companies in the sample did not exceed £1.0m until the twelfth year after investment. Secondly once sales were double digit, they remained so, which suggests that once companies have established their revenue stream, it is more consistent. This might suggest it takes over 10 years to reach the expansion phase. Thirdly, the higher number of employees when double digit sales are recorded. This suggests that the company is in the expansion phase, Lastly the increase in employees the couple of years before reaching double digit sales. This suggests resources are being built up, including labour, to support that growth.

This data supports the view that research studies seeking to evaluate policy effects on company growth through turnover of profit variables should use long time periods. It suggests even time periods of twenty years should be used, which adds to the current problems of lack of availability of data and ensuring consistency in datasets even more challenging than it seems now. The data also supports the view of Carpentier and Suret (2016), that perhaps other variables should be used when evaluating nascent businesses as large business metrics are not appropriate for gauging success. It certainly supports the conclusions of Cowling et al. (2008), with the average length of the data sets for the sample and control group in this paper of 3.3 and 4.4 years respectively, that

> It is the growth of capacity that is likely to be of more importance than the factors of profitability or productivity for young and growing businesses in the short term.
>
> Cowling et al. (2008, p. xvi)

It challenges the hypothesis of Nightingale et al. (2009) that profitability would be a good proxy for valuation, which they subsequently found out it was not. However, this research then suffers from their subsequent conclusions that averages need further refinement and may produce misleading results, which is accepted. Nightingale et al. (2009) deemed their model needed revision as products of the growth companies needed reconfigured due to a lack of financial support from the investigated PVCs and hence concluded the PVCs are not large enough. Further research is needed in this topic to conclude on the matter as this research has contradictory findings. A seasoned investor interviewed for this study believed it took a nascent business roughly three years to get the product market fit right and reconfiguration is a common occurrence in the early years of a business (Interviewee C, 2015). The growth of employees as companies age of this data shares a common profile with the Nightingale et al. (2009) that of being relatively stable in the 5-10 year period.

6.10 Turnover skew of small company datasets

Nightingale and Coad (2013) highlighted that entrepreneurial firm research which used methodologies focusing on average numbers was problematic due to the skew of the data sets and this is particularly so in statistical quantitative analysis. In Chapter five, in the discussion of data sources, the median sales of the sample are shown to be £560,000 with the mean being £3.5m. This gives an insight into the skew of this sample with the median being the mid-point of the data series when they are ranked in increasing order. The skew is large. In addition, of the 71 companies in the sample, only eight had turnover at any point greater than £2.0m and the table below outlines their highest sales level recorded and the year it occurred after the initial year of investment.

Company	Max. Turnover £m	Year after investment
A	3.6	8
B	3.7	13
C	4.3	15
D	10.3	14
E	15.0	13
F	23.3	14
G	23.7	20
H	36.2	14

Table 6-7: the largest sample companies highest recorded sales

Of these eight, which is just over 10% of the sample, the sales of the most successful company are over 12 times greater than the company seventh behind it. Evidence of a large skew is therefore present in this sample.

Evidence from this data set of the degree to which averages might not reflect the whole picture is shown by the following: - although the average of the highest sales in any one year did not exceed £1.0m before year twelve after investment as shown in Table 6-6, Table 6-7 shows, in fact, company A exceeded £3.0m in sales after year eight of investment but that is not evident form the average numbers. Another conclusion from the consideration of skew is support for the view that in any investment cohort, only one or two companies will be HGFs and that the overall profit will come from 10% or so of an investor's portfolio (Belsie, 1991).

6.11 Answering the research questions

When the BA survey data is considered in relation to the research questions below

1. How effective have indirect FI policy tools, namely SEIS/EIS, been as economic development tools in Scotland during the period 2003-2017?

2. How effective have direct FI policy tools, namely PVCs, been as economic development tools in Scotland 2003-2017?

the results of the survey to the questions on the EIS/SEIS policy tool show that the policies are effective in motivating BAs to invest capital in small high-risk businesses. The data suggests that much less capital would be supplied to the investee companies had these policies not be there. Table 6-5 below, summaries those relevant 'very important' and 'important' summary statistics

When I invest - the following is true	Survey stat
To make use of tax breaks e.g. EIS	89
The relevance of the EIS to my investments	90
The relevance of the SEIS to my investments	77
Continuation of the EIS is critical to me continuing	82
Continuation of the SEIS is critical to me continuing	79
I invest to benefit from capital of SIB	70
Continued SIB participation critical for my continued investment	69
Co-investment funds are necessary	94

Table 6-5: Policy tool summary statistics from the survey

Likewise, data from the survey and interviews suggest that the SCF and other PVCs run by SIB have been important economic development tools. 94% of the summary statistic responses considered co-investment funds necessary and 64% said such funds were required, illustrating the role these funds play. The importance of the PVC as economic development tools was further supported by some of the interviewee data where they were cited as having been indispensable to the development of the early-stage capital market and its eco-system in Scotland. Other signs that these tools may have been effective in contributing to the economic development goals of the UK and Scottish governments are the BAs responses around job creation and economic growth

were in both instances they recorded considering `their contribution to those macroeconomic outcomes in their investment activities.

With respect to the investee company analysis, this chapter does not explore aspects of the research questions directly, rather it puts another lens on some of the data inputs used in the macro evaluation in the next chapter to explore the effectiveness of the use of turnover and FTEs as variables in the evaluation of policy especially over short time periods and in econometric modelling. In particular, it shows that time is needed for companies to grow and the negative results of studies which were not long enough may have come to the wrong conclusion and that BA patient capital and PVC capacity building capital are good bed fellows.

6.12 Conclusion

This chapter was in two sections. The first section analysed the results of the BA survey and considered five things and the second section considered the length of time it takes for a company to grow and the skew of early-stage company data sets.

With respect to the five considerations from the BA data, firstly, it shows that the EIS/SEIS policy tools are important influencers of BAs' behaviour and have been instrumental in increasing the supply of informal capital. 82% of the BAs said that EIS is important for them to continue to invest with 79% being the equivalent number for SEIS. In addition, the schemes were considered important to the BAs' current investment activities with 90% being scored for that answer with respect to EIS and 77% for SEIS. With respect to the Mason and Harrison (2002a) study, albeit geographically different, 30% of the answers have flipped from the EIS being considered 'not important' to being 'very important'. This change may also be partially explained by less tax saving opportunities (Phoenix Life, 2021; Professional Pensions, 2016; Midven, 2018).

For the PVCs, 94% of the Scottish BAs considered co–investment funds necessary, 70% of them believed they benefited from the government funds when they invested, and 69% said PVCs are required for their continued participation in investing activities

with 65% investing less if the funds take more discretion. Not only does this underscore the importance of the funds to their investment activities but a passive model is preferred. Secondly the survey also showed the Scottish BAs are conscious of the macroeconomic effects of their investment behaviour and the hope of producing positive effects such as job creation and economic growth are part of their investment decision-making criteria. This suggests the use of these tools for economic development purposes has been effective and investors' intentions are well aligned with the idea of regenerating the economy.

The BA survey data was used to calculate the additionality factor to be applied in the macro analysis work in Chapter seven. Following the approach adopted in Boyns et al (2003), an 80% additionality factor was calculated for the EIS/SEIS macro analysis and 68.5% for the PVC work. Another focus of the BA survey was to up-date the findings of Mason and Harrison (2002a) and there were some notable differences. The hope of high capital returns and expectations of dividends or fees have diminished since the last study, which suggests now the greater experience in early-stage investing has caused BAs to realise that returns are less than previously thought. A greater understanding of the return potential from angel investing has also been supported by the work of Croce et al. (2019). Expecting lower income or fees may reflect a realisation that early-stage companies need all their cash to grow and so are unlikely to be distributing dividends. The comparison sees a more generous BA investing in 2017 than back in 2002. BAs are now more willing to support the next generation of entrepreneurs, help friends set up businesses and support socially beneficial products or services. They also less concerned about having a positive image in the community. An increased social awareness is a trend over this time-period (Forbes, 2018a) and it may be too that the profile of the BA investors answering this survey is somewhat different from those of the 2002 study as BA has become a more generalised investment activity (Tenca et al., 2018).

Some results from the BA survey also challenged claims in academic literature, one being the main conclusion of Mason and Harrison (2002a) that all BA entrepreneurial capital could not be put to work due to the lack of investment ready ideas. This no

longer is the case in Scotland with 71% of the respondents saying they do not struggle to invest all their funds. This statistic also refutes one of the points in Carpentier and Suret (2016) that the tax incentives inflate valuations due to the lack of supply of ideas and excess demand. The finding that the current environment provides enough ideas for most capital to be deployed reflects the development of the early-stage business and entrepreneurial sector in Scotland, since the last survey was undertaken. Not only has the supply of capital almost tripled during that period but the number of BA syndicate groups has increased more than fivefold, which gives increased forums for companies to present their capital requirements and the economy has experienced fifteen years of perfecting the art of creating investment ready businesses. The number of new entrepreneurial opportunities has grown too which increases the investment opportunity set.

The second section of the chapter considers the length of time is takes companies to grow and the skew of the early-stage business data sets. This is important as the growth of the investee companies is the engine of connection between the investment by the BAs and the creation of economic and job growth. Seed, start-up and first stage are considered the early stage of the company's journey. And early-stage companies are not generally expected to make profits, so research, which considers profitability metrics in the early stage of a company's life, other than to prove they are not there, does not seem appropriate (Nightingale et al., 2009; Cowling et al., 2008). This work does not consider profitability but rather turnover and turnover is a common gauge for company growth in this area of research. Turnover too, however, can take time to appear as the early years of a company's formation is spent developing a saleable product which takes time. It is no surprise that in research like this, the data sample will include pre-revenue companies. 14% of the sample companies, which had sales data were pre-revenue at the end of the period and 30% at the time of the initial investment.

In the analysis, which covers the data for the 71 companies which had sales data and the 69 with employee data four elements were noteworthy. Firstly, it takes a long time for companies to grow sales. The average sales of companies in the sample did not exceed £1.0m until the twelfth year after investment. Secondly once sales were double

digit, they remained so, which suggests that once companies have established their revenue stream, it is more consistent. This might suggest it takes over 10 years to reach the expansion phase. Thirdly, the higher number of employees when double digit sales are recorded. This suggests that the company is in the expansion phase, Lastly the increase in employees the couple of years before reaching double digit sales. This suggests resources are being built up, including labour, to support that growth.

This data supports the view that research studies seeking to evaluate policy effects on company growth through turnover of profit variables should use long time periods. It suggests even time periods of twenty years should be used, which adds to the current problems of lack of availability of data and ensuring consistency in datasets even more challenging than it seems now. The data also supports the view of Carpentier and Suret (2016), that perhaps other variables should be used when evaluating nascent businesses as large business metrics are not appropriate for gauging success. It certainly supports the conclusions of Cowling et al. (2008), with the average length of the data sets for the sample and control group in this paper of 3.3 and 4.4 years respectively, that growing capacity is more important in young and growing businesses than profitability or productivity.

Skew of the data sets is also considered in this chapter and an example given which supports the view of Nightingale and Coad (2013) that any work which seeks to discuss the average firm or uses statistical methodologies which relate to averages will give misleading results. The data set skew here had median sample turnover of £560,00 and a mean of £3.5m which demonstrates the point. This part of the analysis also provide evidence that in any cohort of early-stage businesses most likely only 10% will go on to become HGFs.

Finally, with respect to the research questions of this thesis, the BA survey results show that the EIS/SEIS and PVC policy tools are effective in motivating BAs to invest capital in small high-risk businesses. The data suggests that much less capital would be supplied to the investee companies had these policies not be there. Likewise, data from the survey that the SCF and other PVCs run by SIB have been important

economic development tools. Other signs that these tools may have been effective in contributing to the economic development goals of the UK and Scottish governments are the BAs responses to the questions on job creation and economic growth, where in both instances they recorded considering their contribution to those macroeconomic outcomes in their investment activities.

The consideration of the length of time it takes early-stage companies to grow put a new lens on some data inputs often used in the macro evaluation, such as in the next chapter. It explores the effectiveness of the use of turnover and FTEs as variables in evaluation of policy, especially over short time periods and in econometric modelling. These results support the view that using short time periods and choosing variables such as turnover or profits to gauge effectiveness will most likely not result in positive results. This analysis builds on the work of Cowling et al. (2008), which did comment that the short time period could be an explanation for the negligible company benefits they found in their evaluation of EIS policy and in the PVC area; MWC (2016) and Hayton et al. (2008), whose studies were less than five years and Nightingale et al. (2009), who found initial negative findings with the use of a small, concentrated data set.

7 Chapter 7: The macroeconomic contributions of FI policies in Scotland

7.1 Introduction

In the first two decades of the twenty-first century in Scotland, there were two main early-stage risk FI policies. These were the EIS/SEIS administered by the UK government and the direct tools of PVCs administered by SIB. Both policies have remained in place in Scotland with minor revisions during the 15 years of this study. Both these policy tools have the direct intent of increasing the capital supply to early-stage companies and the indirect intent of contributing to the success of strategic economic goals of the UK and Scottish government of increased economic, job and productivity growth and innovation.

Research joining the micro economic decision makers to their macroeconomic outcomes remains underdeveloped and is the area where this thesis aims to make its largest contribution. Through the multi methods and DAA GVAIA and jobs analysis it connects the micro BA data in terms of their motivations to invest and their actual investment transactions to macroeconomic outputs. In addition, it seeks to likewise link the micro investments made by the SCF to macroeconomic outputs. Extant research which focuses on macroeconomic variables generally consider one variable in isolation such as additional investment flows generated by EIS (Pierrakis, 2011, Boyns et al, 2003) and the macro effect of the SCF, in a manner similar to this thesis, but over very short time periods and survey data (MWC, 2016, Hayton et al., 2008).

It is that indirect policy intent considered in this chapter, seeking to answer the research questions below:

1. How effective have indirect FI policy tools, namely SEIS/EIS, been as economic development tools in Scotland during the period 2003-2017?

2. How effective have direct FI policy tools, namely PVCs, been as economic development tools in Scotland 2003-2017?

This chapter pulls many of the previous chapters together. It applies the DAA GVAIA and jobs analysis methodology, outlined in Chapter Four, to the primary and secondary data inputs, outlined in Chapter Five, and deploys the EIS/SEIS policy additionality figure of 80% and PVC additionality of 68.5% derived from the chapter six survey results. This chapter looks at the value of GVA created per one pound of policy money spent and the cost of each new job created for each of the policy tools over the research period 2003-2017, to respond to the research questions and undertakes other analyses to expand on these results. As discussed in the methodology section in Chapter Four, the results are presented as averages which is a useful summary statistic but can camouflage a wide dispersion of data. In this case though, the interest is not in the average entrepreneurial firm, and each turnover and FTE number is linked back to the investment data that created it.

The series of DAA GVAIA and jobs analyses conducted in this chapter are as follows: the two metrics for each of the policy tools individually, then, for them combined and then, after a discussion on VC cyclicality and its effects, the combined results are considered in the context of superposition of policy, as discussed in Chapter Three and lastly within the context oof the Scottish national economy. The first analysis looks at the cost per job and value of GVA created per one pound of policy money spent in SEIS/EIS tax incentives. This is followed by the same two metrics calculated for the money invested by the PVCs in the sample companies. The third DAA GVAIA and Job analysis considers both policy tools together. This dual analysis presents a truer picture for Scotland as both these policies do operate together and are heavily interconnected due to the BA being partners of the PVC funds (Interviewee B, 2015, Interviewee D, 2015). The next analyses consider contextual issues and includes a discussion of the effect of VC cyclicality, an analysis of policy superposition by considering addition monies dispersed by SE following the methodology outlined in Chapter four, followed by a contextualisation of the results within the Scottish economy as a whole. Finally, the degree to which the tools lever other funds is then considered

7.2 The first research question

This section considers the research question

> How effective have indirect FI policy tools, namely SEIS/EIS, been as economic development tools in Scotland during the period 2003-2017?

Where economic development has been defined as GVA created per one pound of policy money spent and the cost of each new job. Table 7-1 outlines the annual jobs results from the 209 annual companies in the EIS/SEIS tax rebate jobs sample. 8,333 is the total annual number of jobs created by the companies which received EIS/SEIS - qualifying BA investment. The total tax rebate included in the model is £76.4m. Calculating the average cost of a job by taking the average of the annual numbers as outlined in Chapter Five, result each job costing £8,317 on a gross basis.

Year	No of jobs	No of cos. in SEIS/EIS jobs sample	Total EIS/SEIS rebate received by sample £m	Average cost per job £	Average age of the cos.
2003	234	5	3.11	13,299	5
2004	285	6	3.73	13,099	5
2005	441	9	4.06	9,213	4
2006	454	8	4.10	9,037	6
2007	283	7	1.37	4,847	5
2008	579	7	1.86	3,208	5
2009	580	6	1.36	2,346	7
2010	618	5	1.42	2,292	8
2011	592	5	1.67	2,816	9
2012	515	6	2.25	4,374	9
2013	447	11	2.72	6,094	6
2014	518	12	3.3	6,375	6
2015	765	30	8.97	11,723	5
2016	966	44	16.71	17,297	5
2017	1056	48	19.78	18,729	5

Table 7-1: Results of EIS/SEIS rebate gross annual cost per job

In this analysis the gross cost per job is below £10,000 for 10 of the 15 years and in fact gets as low almost £2,300. These numbers indicate this policy tool been very efficient in terms of the cost of job creation. Even when adjusted for the 80% additionality number the average cost is £10,396.

The EIS/SEIS GVA analysis results show that the tax rebate of £65.6m for the 261 investee company data points generated £831.4m of GVA, which after the necessary adjustments, produced a GVA of £11.67 for every one pound of policy money spent. Table 7-2 below depicts the outcomes of the analysis and situates the results in the context of Scottish total EIS/SEIS data, which results in the sample rebate on average being 14% of the EIS/SEIS rebate for Scotland which indicates a degree of representativeness of the sample. This is the figure used for pro-rata adjustments in the later sections of this chapter.

	This analysis				Scotland				
Year	EIS/SEIS No of cos. in GVA sample	Total GVA from SEIS/EIS sample £m	Total SEIS/EIS GVA sample rebate received £m	GVA per £ tax rebate EIS/SEIS sample	Total no. of companies EIS/SEIS Scotland.	Sample GVA cos. as % of total EIS/SEIS cos.	Total amount invested EIS/SEIS £m	Total tax rebate SEIS/EIS £m	Sample rebate % total rebate
2003	6	21.39	3.06	6.99	168	3.6	44	8.8	8%
2004	8	29.66	3.54	8.38	180	4.4	45	9.0	12%
2005	11	47.86	3.91	12.24	176	6.3	46	9.2	11%
2006	11	62.68	4.21	14.89	160	6.9	44	8.8	8%
2007	10	41.71	1.73	24.11	165	6.1	51	10.2	14%
2008	12	36.12	2.03	17.79	150	8.0	38	7.6	21%
2009	12	48.69	2.19	22.23	124	9.7	31	6.2	17%
2010	14	56.48	3.11	18.16	139	10.1	30	8.25	14%
2011	16	62.03	2.99	20.75	153	10.5	34	10.2	15%
2012	17	62.13	3.16	19.66	190	8.9	48	14.4	14%
2013	22	62.11	4.01	15.49	208	10.6	48	14.4	14%
2014	28	70.72	6.81	10.38	251	11.2	75	22.5	12%
2015	30	78.45	7.83	10.02	243	12.3	68	20.4	15%
2016	33	74.49	8.78	8.48	261	12.6	83	24.9	13%
2017	31	76.91	8.22	9.36	274	11.3	80	24.0	23%

Table 7-2: Results of the EIS/SEIS GVA analysis & Scottish data

These descriptive results show the EIS/SEIS policy tools have been effective as economic development tools in Scotland during the period 2003-2017. The analysis produces a cost per job of £10,396, which is an impressive number and for each pound of policy money invested the analysis resulted in an outcome of £11.67.

7.3 The second research question

This section considers the second research question:

> How effective have direct FI policy tools, namely PVCs, been as economic development tools in Scotland 2003-2017?

by considering the same metrics as the previous section. Tables 7-3 and 7-4 below present the cost per job and value of GVA created per one pound of policy money invested by the PVCs managed by SIB. 5065 is the total annual number of jobs created by the 163 sample companies, on receiving £109.7m of investment over the period, which after the necessary adjustments result in an average cost per job of £25,478.

Year	No of cos. in PVC jobs sample	Total sample PVC invested £m	Average cost per job £	Average age of the cos.
2003	2	0.22	5,025	12
2004	3	0.55	12,001	9
2005	4	2.07	16,697	9
2006	4	1.54	13,514	11
2007	4	1.69	14,095	8
2008	5	3.11	7,021	7
2009	4	3.04	6,640	9
2010	3	2.96	6,411	13
2011	3	3.70	8,256	14
2012	4	4.77	13,133	13
2013	7	5.47	19,805	9
2014	10	5.71	18,612	7
2015	28	17.17	31,696	5
2016	38	26.97	38,579	6
2017	42	30.72	49,157	6

Table 7-3: Results of gross annual cost per job for the PVC funds invested

As the PVC monies are investments, there is the hope that these funds will be recouped later, when the investee company conducts a share buy-back, trade sale or IPO. Should all the monies be recouped, the cost of this contribution to GVA and jobs created would only be the cost of the time value of money, which would be little given low interest rates of the research period.

Year	Total PVC sample GVA £m	PVC No of cos. in GVA sample	Total sample PVC invested £m	GVA per sample PVC £ invested
2003	0.08	1	0.12	0.64
2004	3.10	3	0.42	7.67
2005	6.95	4	1.38	5.03
2006	16.70	6	1.88	8.88
2007	19.07	6	2.33	8.19
2008	18.11	7	3.41	5.31
2009	33.22	7	3.84	8.65
2010	37.23	11	5.70	6.53
2011	41.07	13	7.58	5.42
2012	40.81	15	7.94	5.14
2013	38.52	17	9.63	4.00
2014	43.20	26	13.57	3.18
2015	47.53	27	15.56	3.05
2016	41.80	31	18.49	2.26
2017	42.95	29	17.61	2.44

Table 7-4: Results of GVA per £ PVC invested monies

In this instance, the PVC DAA GVAIA and jobs analysis shows that over the 15-year study period, the 203 sample investee companies received total PVC invested monies of £108.9m resulting in a £3.47 of GVA per one pound of policy money created before policy costs. These results show the PVC policy tool has been effective as an economic development tool in Scotland during the period 2003-2017. The analysis produces a cost per job of £25,478 and for each pound of policy money invested an outcome of £3.47 of GVA.

7.4 Joint analysis of the FIs

These results of the separate EIS/SEIS and PVC samples are interconnected. Consideration of the policy tools in isolation is incorrect due to their interconnectedness. Chapter three outlined the degree to which the BAs and PVCs worked together especially at the early stage of the risk capital market. It is, thus, appropriate to consider the GVA produced or cost per job, whilst accounting for all the policy monies known, as they all work together and to isolate effects would be meaningless. Chapter six outlined that 94% of the Scottish angels surveyed thought the co-investment funds were necessary. In the opinions of some, it is only because of the existence of the PVCs, that the EIS/SEIS results are as they are, due to the role the PVCs played in building up the infrastructure (Harrison, 2018; Interviewee E, 2017). In the analysis to answer the first research question with respect to the EIS/SEIS, the PVC component is not accounted for as policy money - it is nevertheless there. This is the analysis done here, both tools together.

The following two tables outline the results when the policy tools are implemented together:

Year	No of jobs	No of cos. in SEIS/EIS jobs sample	Total EIS/SEIS rebate received by sample £m	Total PVC invested £m	Average cost per job £
2003	234	5	3.11	0.22	14222
2004	285	6	3.73	0.55	15036
2005	441	9	4.06	2.0	13741
2006	454	8	4.10	1.47	13748
2007	283	7	1.37	1.27	9345
2008	579	7	1.86	2.69	7857
2009	580	6	1.36	2.42	6515
2010	618	5	1.42	2.34	6076
2011	592	5	1.67	3.07	8010
2012	515	6	2.25	4.14	12420
2013	447	11	2.72	4.84	16927
2014	518	12	3.3	5.09	16202
2015	765	30	8.97	15.48	31956
2016	966	44	16.71	24.93	43849
2017	1056	48	19.78	26.78	44766

Table 7-5: Cost per job results for both FIs

Year	Total GVA £m	No of cos. in SEIS/EIS GVA sample	Total EIS/SEIS rebate received by sample £m	Total PVC invested £m	GVA Per £ spent on SEIS/EIS rebates and PVC
2003	21.39	6	0.13	0.22	6.09
2004	29.66	8	0.43	0.55	7.46
2005	47.86	11	1.09	2.07	9.57
2006	62.68	11	1.38	1.54	11.22
2007	41.71	10	1.77	1.69	11.91
2008	36.12	12	2.91	3.11	7.31
2009	48.69	12	3.34	3.04	8.81
2010	56.48	14	5.00	2.96	6.96
2011	62.03	16	6.88	3.7	6.32
2012	62.13	17	7.24	4.77	5.97
2013	62.11	22	8.35	5.47	5.03
2014	70.72	28	12.87	5.71	3.59
2015	78.45	30	14.86	17.2	3.46
2016	74.49	33	17.79	27	2.80
2017	76.91	31	16.96	30.7	3.05
Total			101		

Table 7-6: GVA results for both FIs

As expected, both metrics become less favourable when both policy monies are included, the cost per job rises to £23,452 and the GVA per one pound of policy money reduces to £4.92. These, however, remain very favourable numbers.

7.5 Summary of the Results

The table below provides a summary of the results, which are discussed in more detail in the next section considering the context of the Scottish Capital Risk Market and economy with only summary points made here.

Policy	Public money attributed to FI £m	% of total invested	Total gross GVA £m	net[3] cost per job £	net GVA per £ pre- costs on annual nos.	No. of cos.	Total invested £m	Additionality Adjustment
EIS/SEIS	76.4	15.0		10,396		224	512.9	80%
EIS/SEIS	65.6	10.6	831.4		11.7	261	747.0	80%
PVC	109.7	24.9		25,478		163	440.8	68.5%
PVC	108.9	25.2	430.3		3.47	203	431.3	68.5%
JOINT	175.1	34.1		23,452		224	512.9	74.1%
JOINT	176.4	24.4	831.4		4.92	261	747.0	74.1%

Table 7-7 Summary statistics of research questions

These results suggest that each of the FI policies did contribute to economic development and have been effective economic development tools. They are effective both individually and operating together in the Scottish economy. The results show jobs were created by each of the tools in their own right and jointly with varying cost levels. These numbers show the EIS tool produced a job at a cost of £10,396 the PVC tool at £25,476 and jointly at £23,452. Likewise, the results show that each of the tools were facilitators of economic growth with the EIS, PVC and joint tools creating respectively £11.70, £3.47, and £4.92 of GVA for each one pound of government money spent respectively. These results are extremely positive and imply an effective outcome.

[3] Net here means before the policy costs associated with creating the jobs or GVA

7.6 Results in the Context

Chapter three provided a discussion on key contextual issues relating to the Scottish Risk Capital market, namely the growth of institutionalism, SME Capital risk policies, the importance of economic cycles in the supply of VC capital, the deepening and widening of BA investing, the retreat of PRVCs from early-stage investing and some macro trends, which resulted in an increasingly competitive environment, where many benefits of innovation were unable to be monetised and the financialisation trend increasingly benefitting those with wealth. These will be discussed here as well as further analyses undertaken to situate the results within an environment of policy superposition as was discussed in Chapter three. In addition, the results will be considered in the context of the Scottish economy overall.

Of the contextual aspects outlined in Chapter three, those expected to contribute positively to these results are the deepening and broadening of BA activity, which allowed an increased number and a greater size of investment opportunities to be funded. The patient and generous supportive nature of BA funding, with BAs now financing 35% of the Scottish private equity market, the early creation of SCF as a co-investment fund, such that it was able to step into the funding gap as the PRVCs retreated and offered support to the early stage companies, where financial returns are less evident, rather seeking economic success The numbers provide evidence of the patient capital of the BAs who continued funding their investee companies during the GFC. As occurred in the dot com boom, PRVCs most likely would have closed challenged companies down, rather than provide more capital. It is expected the macro trends too would have benefited the results to the research questions. Company valuations would have been lower than if innovation benefits were priced in and also the BAs are expected to have been beneficiaries of the financialisation trend and have more money to invest. It should be noted these comments are hypotheses and further research is needed to validate them.

7.6.1 VC Cyclicality

The cyclicality of the VC markets is also a topic discussed in Chapter three and this is evident in the results and the point has been made that in any research the economic backdrop needs to be considered. A couple of examples are cited here to support that point. The 15-year period of this study covers 3 mini cycles – growth to 2008, decline 2008-2010, growth 2012-2017. Interestingly, although the amounts invested by BAs in Scotland flatlined to 2016, aside from the large decline during the GFC, investee companies created jobs and GVA with the rate of change, which followed the macroeconomic cyclical pattern. In all the jobs analyses, which are outlined in Tables 8.1, 8.3 and 8.5, the job costs are lower in the GFC period 2008-2011 and much more expensive towards the end of the period when economies were stronger and more newer companies are a greater proportion of the sample.

The importance of cyclicality and how it interacts with the length of research studies can also be seen by this example. Table 7-7 below considers the joint £GVA numbers per pound of policy money spent with two other Scottish studies

Focus of analysis	Previous Work	Result of previous work per £ invested	Equivalent result of this work	Additionality %. Previous work/this work	
PVC- SCFI	Hayton et al (2008)	£3.71	£3.47	28	68.5
PVC-SCFII	MWC (2016)	£1.50	£3.47	86.5	68.5 68.5

Table 7-7: Comparisons of GVA outcomes of this work with previous work

[b] – adjusted to be comparable

Source: MWC, 2016; MacKenzie and Coughtrie, 2015, Hayton et al., 2008.

Considering the numbers of SCFII in light of this analysis, although the average GVA contribution per £ spent is £3.47 in this work, it does vary over the three time periods of SCFI, SCFII and SCFIII, due to the differing contexts, as discussed previously. Ironically, the period in this work with the highest GVA contribution corresponds to the period which records the lowest results for MWC (2016). The last period in this work records the lowest value which has previously been suggested might result from the higher valuations for new investments towards the end of the period. The most likely reason for this discrepancy is the timing of the policies and the length of the research period. In this analysis, during the recessionary, or low economic growth, years of 2007-2010 the appetite for new investments did dry up but investors did continue, in many cases, to fund companies their investee companies. It is expected investing in these recessionary benefitted company values later in this study. This is only possible because of the length of the study and the shorter study of MWC (2016) would not be able to pick up such dynamics, which is why long-term studies are best. This, however, is a hypothesis and requires validation. The chart overleaf of Scottish GVA at the national level shows little growth between 2007 and 2010 and the MWC (2016) report picked up investments from q2 2009 to q4 2013 so the 3.75 years covered a large part of that recessionary period.

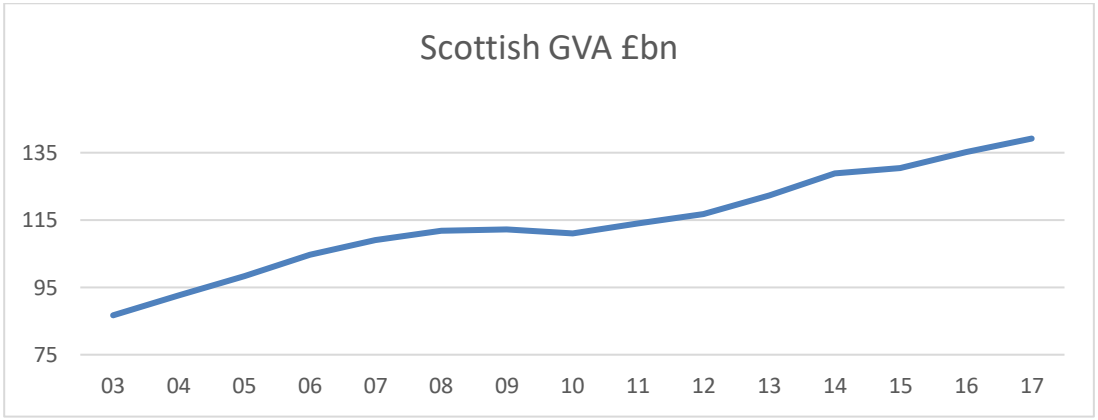

Figure 7-1: Scottish GVA, 2003-2017

Source: Office for National Statistics (2018)

Again evidence, which validates the importance of considering the context where a study is situated in the economic cycle. This point is also evident by the different outcomes of Hayton et al. (2008) and MWC (2016). Despite the differing methodologies and the consideration of a greater accountability for policy superposition of MWC (2016), logic would say value add is generated in times of growth over times of stagnation and the Hayton et al. (2008) study covered a period of growth.

7.6.2 Superposition of policy

Another topic mentioned in the Scottish Capital market context discussion in Chapter three is the support these policies received of a well-functioning operational institutional background, where a proactive government was broking and seeking progressive change with their many collaborators, to engender endogenous economic improvements, which one would expect would be a positive influence on the results. The market also experienced a stable policy background, with many other policy initiatives alongside the two that are the subject of the research questions of this thesis, such as capital demand and supply readiness programmes and attempts to increase efficiencies through the promotion of BANs. There were, thus, many policies operational in the Scottish Risk Capital market and the effects of policy superposition other than in the joint numbers is not reflected in these results. The expectation would be that as more policy sums were added to the denominator of the analysis the perceived economic development benefits would diminish. To explore that topic, an analysis of the addition of SE expenditure for one calendar year, as outlined in chapters four and five, was undertaken to produce the results in the table overleaf

Policy	Public money attributed to the FI £m	% of total invested money	Total gross GVA £m	net[4] cost per job £	net GVA per pre-costs on annual nos.	No. of cos.	Total invested by all parties £m	Additionality Adjustment
JOINT	175.1	34.1		23,452		224	512.9	74.1%
JOINT	176.4	24.4	831.4		4.92	261	747.0	74.1%
JOINT + SE expenditure money	183.9	35.9		24,577			512.9	74.1%
JOINT + SE expenditure money	185.2	25.7	831.4		4.69		747.0	74.1%

Table 7-8: Results comparison including an additional policy tool

Such a consideration reduces the GVA per pound invested from £4.92 to £4.69 and cost per job rises from £23,452 to £24,577 which suggests the policies are still adding value. The outcomes of the different analysis are consolidated in Table 7-9 above.

This shows that other policy monies are an important consideration. General information on other policy disbursements is included in Scottish Enterprise (2007). In that fiscal year, 12 projects were funded for proof-of-concept work at a cost of £2.15m and since 1999, £39m had been funded for this purpose. There was no indication of the number of beneficiary companies, but that does result in an annual average of £3.5m, which is another double-digit percentage addition to the monies considered here. Scottish Enterprise (2007) also outlines that 9000 start-ups received advice and 1700 businesses received business and workforce development support worth £62.7m. To put this into context, our sample companies were on average 14% of the EIS/SEIS rebate; if 14% of these two sums were taken, as additional annual policy money, the total would be £9.3m and this compares with the average annual tax incentive policy money spent and SCF investment of £4.3m and £6.73m respectively – so significantly more.

[4] Net here means before the policy costs associated with creating the jobs or GVA

There can be no doubt Scottish Government departments are also allocating other monies; for example, there are (soon to be 'were') monies from Europe, such as Horizon 2020. European Commission (2017) outlines that in 2016, €11.6bn was awarded to the UK from the Horizon2020. If Scotland was allocated a percentage of that value based on its 2016 GDP ratio to that of the UK, this would result in an allocation of £532.0m, which seems incredible and totally dwarfs the sums considered in this thesis, even if it is adjusted for the 14% representativeness number. It seems fair to conclude that other policies need to be considered and there are strong signs that these numbers are inflated on the positive side. It should be noted that other works do not account for policy superposition, however, Cowling et al. (2008) believed their outcomes had an upward bias due to that effect. This author agrees there is sure to be upward bias to results, which exclude relevant policy monies which are affecting outcomes.

7.6.3 In the context of the Scottish economy

The last part of the analysis seeks to put the results in the context of the Scottish economy as outlined in Chapter four.

Year	GVA £bn current	Sample gross GVA produced £m	Sample GVA as % Total Scottish GVA	Sample EIS rebate % of total Scottish SEIS/EIS rebate value	Overall % of Scottish GVA produced by SEIS/EIS investments
2003	86.7	21.4	0.02%	8%	0.32%
2004	92.7	29.7	0.03%	12%	0.27%
2005	98.3	47.9	0.05%	11%	0.43%
2006	105.0	62.7	0.06%	8%	0.77%
2007	109.0	41.7	0.04%	14%	0.28%
2008	112.0	36.1	0.03%	21%	0.15%
2009	112.0	48.7	0.04%	17%	0.25%
2010	111.0	56.5	0.05%	14%	0.36%
2011	114.0	62.0	0.05%	15%	0.36%

2012	117.0	62.1	0.05%	14%	0.39%
2013	122.0	62.1	0.05%	14%	0.37%
2014	129.0	70.7	0.05%	12%	0.46%
2015	130.0	78.4	0.06%	15%	0.41%
2016	135.0	74.5	0.06%	13%	0.42%
2017	139.0	76.9	0.06%	23%	0.24%

Table 7-9: Sample GVA in the context of the Scottish economy

Source: Table constructed from results and Office for National Statistics (2018)

Table 7-10 above provides annual data on Scottish GVA and the GVA produced by the EIS/SEIS sample companies. Column 4 in the table outlines that the sample on average reflects 14% of the tax rebates received in Scotland under the EIS/SEIS scheme. Column 3 shows the percentage the GVA produced by the sample companies as a percentage of total Scottish GVA and the last column is the percentage when that number is grossed up to reflect the rebate total of the SEIS/EIS investments in Scotland. If the assumption is base these numbers are representative of the population, they show that on average 0.37% of the nation's GVA was produced by these policies. A similar exercise for employment did not result in any impact when expressed to two decimal places. This analysis shows that these policies do have a small impact on GVA of 0.37% at the Scottish national economy level but nothing noteworthy in terms of employment impact. Although small these policies have not used much government money to create their effect and so this is laudable.

7.7 Levering other monies

Table 7-11 below looks at the amount of other money that was levered to invest in the sample companies, relative to the policy money used. It shows that the two polices are very effective in levering other money, in particular, up until 2014. Even a couple of years in the times series record leverage of over nine times and the time period on average records a leverage ratio in excess of 6.5 times. The fall-off in the last three years is interesting as there were also many new companies that joined the sample in those years. Most of the BA syndicates will self-fund in the initial years of investing

in a company and external funds are generally sought in later deals which may explain these figures (Interviewee B, 2015; Interviewee D, 2015). This history of leverage is impressive and shows that this is very successful policy mix.

Year	Total sample tax rebate £m	Total PVC invested £m	Total public money £m	Total other money £m	Total invested £m	Leverage ratio
2003	3.11	0.22	3.33	28.4	31.7	8.5
2004	3.73	0.55	4.28	35.5	39.8	8.3
2005	4.06	2.0	4.26	38.8	43.1	9.1
2006	4.10	1.47	5.57	43.1	48.7	7.7
2007	1.37	1.27	2.64	24.7	27.3	9.3
2008	1.86	2.69	4.55	28.8	33.4	6.3
2009	1.36	2.42	3.78	31.2	34.9	8.2
2010	1.42	2.34	3.76	37.3	41.1	9.9
2011	1.67	3.07	4.74	43.7	48.4	9.2
2012	2.25	4.14	6.39	39.4	45.8	6.2
2013	2.72	4.84	7.56	41.0	48.5	5.4
2014	3.3	5.09	8.39	57	65.4	6.8
2015	8.97	15.48	24.45	50.3	74.6	2.1
2016	16.71	24.93	41.64	43.4	85.0	1.0
2017	19.78	26.78	46.56	32.6	79.2	0.7

Table 7-10: Sources of investment funds

7.8 Discussion

As previously outlined, the early-stage eco-system in Scotland is a myriad of complex relationships and any attempt at determining causality is sure to fail. It is difficult to identify all the variables, which are affecting any defined relationships, never mind the relationships themselves. In light of that, this study is not attempting to address causality, but rather attempt to lift the lid of a system underpinned by the assumption in the literature that there is an equity gap, due to market failure in early-stage risk financing and government action is required for improvement. Aside from that,

academic literature, regardless of whether it is the entrepreneurial finance stream, role of government stream or economic development stream, provide few insights into the effectiveness of these policies and this is the main contribution of this research. This work is essentially a case study, which seeks to gain insight into an area where little research has been undertaken. It does not seek to make causality or correlation claims but reflect historical facts using an enhanced public sector prescribed methodology. Nevertheless, these numbers suggest that the EIS/SEIS and PVC policies have been very effective policy tools in Scotland in contributing to GVA, creating jobs and leveraging private funds for the economic development purposes during a time when activity in VC investing was flat and PRVC's were retreating and those with available funds were subject to the trend of financialisation, which gave them more to deploy.

The indirect FI policy tools studied in this thesis have the intent of increasing the risk capital supply to early-stage companies and contributing to the success of strategic economic goals of the UK and Scottish government in terms of increased economic, job and productivity growth and innovation. Aligning with SE's success metrics, this chapter considered the £GVA created per one pound of policy money spent and the cost of each job, as the chosen measures of economic development, to answer the research questions guiding the thesis.

The results of the application of the DAA GVAIA and Jobs analysis methodology, outlined in Chapter four, to the data primary and secondary inputs, outlined in Chapter five, and adjusting for the EIS additionality adjustment calculated in Chapter six, gave a positive result for each of the policy tools' contribution to economic growth and job creation and showed these policies were effective as economic development tools in Scotland during this period. The EIS/SEIS policy tools have produced jobs at an annual cost of £10,396 per job and for each pound of policy money invested the analysis resulted in an outcome of £11.67 of GVA being produced. For the second research question of whether the PVC policy tool have been effective as economic development tools in Scotland during the period 2003-2017, the analysis produced a cost per job of £25,478 and for each pound of policy money invested the analysis resulted in an outcome of £3.47 of GVA being produced. Again, providing an affirmative answer. The other DAA GVAIA and jobs analyses conducted were one of the two policy tools

combined and then, the combined results are considered in the context of the Scottish economy looking at the superposition of one policy.

This dual analysis presents a truer picture for Scotland as both these policies do operate together and are heavily interconnected due to the BA being partners of the PVC funds and requiring all investments to be EIS/SEIS compliant (Interviewee B, 2015; Interviewee D, 2015). Consideration of the policy tools in isolation is incorrect due to their interconnectedness. Chapter three outlined the degree to which the BAs and PVCs worked together especially at the early stage of the risk capital market. Chapter six outlined that 94% of the Scottish angels surveyed thought the co-investment funds were necessary.

The joint and policy superposition analyses both registered lower economic benefits with the cost per job being higher and the £GVA per one pound policy money being spent lower. This is no surprise as more policy money was being applied to the same outcome, but perhaps it would have been appropriate to identify other economic development benefits from SE's expenditure. The results show both tools produced jobs at a cost of £23,452 and £GVA for each one pound of government money spent of £4.92. These results are extremely positive and imply an effective outcome and when the superposition of other SE expenditures were considered the cost per job rose to £24,547 and the £GVA per one pound of policy money was £4.69 Again, a very effective outcome. In addition, a relative analysis was conducted comparing the results to the private sector, to gauge whether these numbers would be noticeable at the national level. Indeed, they were! The results showed that the GVA created by the joint policies had added on average 0.37% to national GVA, which is very satisfactory result. In the case of employment, however, no impact was recorded at the national level.

The superposition of policy was one of the contextual subjects discussed in Chapter three in this chapter an analysis was undertaken to try and get a glimpse of how the numbers might be affected by one other policy. It was not surprising the policy effect diminished a result as more policy money was allocated to the same situation, however

perhaps the analysis should have involved additional benefits. Considering the sums involved and potential other sums not included in the analysis, the point was made that, no doubt further adjustments would be required, as many of the policy tools were unaccounted for, some of which deliver very large amounts of funding such as the Horizon2020 programme, leading to the conclusion that most likely was an upward bias in the numbers.

It believed there are other contextual happenings of the research period, which would be mostly very beneficial to the results due to: the deepening and broadening of BA activity, enabling more supply of capital and larger opportunities to be funded; the patient and generous supportive nature of BA funding, shown by them now funding 35% of the Scottish private equity market and, as the numbers show, them funding their investee companies during the GFC; the creation of SCF as a co-investment fund, years in advance of consensus, such that it was able to step into the funding gap as the PRVCs retreated and offer support to the early stage companies, where financial returns are less evident, and happy to fulfil their economic success metrics. It is expected the global macro trends were also beneficial as company valuations would have been lower than if innovation benefits were priced in and also the BAs are expected to have been beneficiaries of the financialisation trend. It should be noted these comments are hypotheses and further research is needed to validate them. In contrast, evidence was provided to show that studies with short timeframes (especially for data) can lead to erroneous findings due to the cycle effects with the conclusion that long research periods which consider contexts are best, as has been the approach in this work. Finally, the last analysis considered the leverage that both policy tools had provided to the Scottish informal capital market resulting in an average leverage ratio of 6.5x overall, with a couple of years in the times series recording a leverage of over nine times. These are clear results and suggest that the FIs considered have had positive impact.

Despite all these positive findings, it’s to be remembered that the early-stage eco-system in Scotland is a myriad of complex relationships and any attempt at determining causality is sure to fail. It is difficult to identify all the variables, which

are affecting any defined relationships, never mind the relationships themselves. In light of that, this study is not attempting to address causality, but rather attempt to lift the lid of a system, underpinned by the assumption in the literature that there is an equity gap, due to market failure in early-stage risk financing and government action is required for improvement. The hope is to contribute to the underdeveloped area of literature considering the effectiveness of policy and this is the main contribution of this research.

8 Chapter 8: Discussion and Conclusion

8.1 Introduction

On the discovery of BAs as potential large providers of informal capital, especially for early-stage companies, the UK and Scottish governments have implemented policies to encourage this capital flow to enable small companies to grow and contribute to their strategic economic development ambitions. Included in these policies are fiscal incentives for individual investors, the encouragement of BANs, capacity building programmes on both the buying and selling sides of the capital market and establishment of co-investment funds to provide additional leverage (Mason, 2009a, Mason and Harrison, 2004). With constrained government budgets, risk capital FI policy tools with private sector participation have been increasingly deployed at the expense of other FI policy tools such as grants (European Commission, 2014a; Michie and Wishdale, 2011; Interviewee A, 2015). In the first two decades of the twenty-first century in Scotland, there were two main such early-stage risk FI policies. These were the EIS/SEIS administered by the UK government and the direct tools of PVCs administered by SIB. Both policies have remained in place in Scotland with minor revisions during the 15 years of this study.

Research on the success of such policy tools is underdeveloped. Most extant research has been sponsored by government departments which, in general, has had a uni-dimensional focus on the one particular policy tool of interest and, at most, considered two of the economic strata of micro, intermediate and macro, but mostly just one. Most cover short time periods, disregard the importance of the economic background and context in the timing of the policy, which can materially affect results. Although these tools both have a direct aim of increasing the supply of capital to early-stage companies they are also part of strategic government ambitions of economic development. To date little research has considered them in this context.

This thesis is a historically informed piece of work and uses real data derived from special access to angel investment portfolios to evaluate the success of early-stage risk capital FI policies deployed in the Scottish economy as economic development tools over the period 2003-2017. It used this data to answer the following questions:

1. How effective have indirect FI policy tools, namely SEIS/EIS, been as economic development tools in Scotland during the period 2003-2017?

2. How effective have direct FI policy tools, namely PVCs, been as economic development tools in Scotland 2003-2017?

The thesis linked micro investment and policy data to macroeconomic outcomes to consider these questions; it undertook a mixed methods approach which is described in Chapter four and as described in Chapter five collected primary micro data through a survey of BAs, interviews and on their investee companies, considered at length the context of the research period and through an enhancement of the recommended GVAIA application tool for Scottish policy research linked the micro data collected to macroeconomic outcomes. This chapter discusses the contributions of this study to each of the following areas – theory, empirical, and methodology. It outlines the extant research on which it builds.

8.2 Theoretical, empirical, and methodological contributions

8.2.1 Theoretical contributions

The literature review reveals that most research on these and similar policy tools has generally focused on one policy tool in isolation and its success in one economic stratum or at most two- either the micro, intermediate, or the macroeconomic level. In addition, the economic back drop, the policy implementation context, and the existence of other policies are rarely discussed, and are often subject to short timeframes which affected results. Research has considered the EIS/SEIS policy tools at the micro and intermediate level, and their effectiveness in stimulating additional investment from

BAs and BAs motivations to invest (Wiltbank, 2009; Pierrakis, 2011; Boyns et al, 2003; Mason and Harrison, 2002a; Mason and Harrison 2000b). Micro company level effects of the EIS have also been considered such as beneficial operational or financial outcomes for the investee companies when compared to non-EIS funded control groups (Cowling et al, 2008). The intermediate extent of turnover growth at the investee companies as a result of the policy money has been another consideration (Boyns et al., 2003).

Research joining the micro economic decision makers to their macroeconomic outcomes therefore remains underdeveloped and is the area where this thesis makes its largest contribution. The work herein has sought to connect the micro BA data in terms of their motivations to invest and their actual investment transactions to macroeconomic outputs. In addition, it seeks to likewise link the micro investments made by the SCF to macroeconomic outputs. Extant research which focuses on macroeconomic variables generally consider one variable in isolation such as additional investment flows generated by EIS (Pierrakis, 2011, Boyns et al, 2003) and the macro effect of the SCF, in a manner similar to this thesis, but over very short time periods and survey data (MWC, 2016, Hayton et al., 2008 These topics are discussed in more detail below.

1. Connecting micro motivations and actions to macroeconomic outcomes

This thesis has a contribution to knowledge in linking BA micro motivations to macroeconomic outcomes, as it presents EIS policy outcomes at each level of the economy and uses the additionality numbers established at the micro level as the adjustment for the policy outcome ensuring consistency. EIS/SEIS policies have individual agents as their targeted audiences i.e. BA investors and evidence of success of these policies can be captured at that micro level by capturing their motivation to use the policy with validation from investment data (Boyns et al, 2003, Mason and Harrison, 2002b, Mason and Harrison, 2000a). Positive results from such research validates the design and implementation success of the policies as they achieved their direct aim – an increased supply of informal capital. Such analyses do not provide evidence, however, of the creation of real economic value or achievement of the

strategic priorities of the governments. Aiming to address this, this thesis explored beyond the effect of closing the equity gap, as to whether some of the strategic goals of the government of economic, job, productivity growth and innovation (HM Treasury, 2008).

Evidence of micro success can also be explored at the investee company level such as the previously mentioned work of Cowling et al (2008) or Boyns et al. (2003), but as outlined in the HM Treasury (2008), the ambitions of the policy are greater economic and job growth, increased productivity, and innovation. In this thesis, the actual data of investee companies is linked to macroeconomic outcomes by considering both the direct and indirect effects of those companies on the economy allowing us to better understand the relationships between policy, private capital, SMEs, and economic development.

2. Connecting PVC investments to macroeconomic outcomes

This thesis makes a theoretical contribution to the area of PVC research by presenting outcomes at each conceptual level of the economy – macro, intermediate and micro - with real data over a long time period. Extant studies in this research area generally focus on one or two economic dimensions with GVA and employment being the only macro variables considered together (MWC, 2016, Hayton et al, 2008), employment is sometimes covered as one macro dimension (Standaert and Manigart, 2017; Grilli and Murtinu, 2014a; National Audit, 2012) and sometimes a macro and intermediate variable is considered such as sales and employment (Owen (Baldock) and Mason, 2017; Baldock, 2016; Baldock and Mason, 2015; Grilli and Murtinu, 2014; Nightingale et al. 2009) and other times just an intermediate variable such as investee companies' sales growth (Alperovych et al., 2015). This study aims to give a glimpse at all three economic levels and hopes to add to extant literature by considering a longer time period, which avoids erroneous results resulting from short studies or no consideration of the context.

3. Context and the timing of policy.

This contribution highlights the importance of the economic context to the timing of policy measures. The 15-year period of this study covers three mini cycles – growth to 2008, decline 2008-2010, growth 2012 to 2017. Interestingly, although the amounts invested by BAs in Scotland flat-lined to 2016, aside from the large decline during the GFC, investee companies created jobs and GVA with the rate of change following the macroeconomic cyclical pattern.

The timing of the implementation of the policy, the length of the researched effectiveness period and the evaluation methodology are critical to the results achieved as were discussed in the Chapter two SCFI and SCFII comparison in Chapter two (MWC, 2016; Hayton et al., 2008). Likewise, the importance of the length of the effective research period and its economic backdrop was discussed in Chapter seven. The timing and context of any policy needs to be considered. It cannot be assumed that the policy design and implementation is best suited to that context. On timing, history has shown the government has little skill in the discernment of economic cycles and macro trends and comments by some academics likewise display that tendency. Examples of cycle ignorance on the part of the government are the privatisation of SEP in 2000, in the belief that Scotland had sufficient VC capacity, only for the VC markets to totally dry up in the next five years. Likewise, it was erroneous for the HM Treasury (2017) to cite the successful Israeli Yozma programme (Erlich, 2004), spawned in the buoyant VC time of the 1990s, as an example of a successful programme in post - Brexit UK, where there was little traction in VC funding. An example of academics ignoring the critical nature of timing is Avdeitchikova (2009), who concludes that BAs and their finances are not adding value in regional areas and the period considered is the slow growth period of 2000-2006.

This thesis shows the importance of context – the social fabric and history behind the numerically recorded outcomes in any research considering policy. Other aspects of the context such as in the VC cycle and the timing of the policy have already been touched upon. It is questionable, whether the policies considered in this study would have been successful, if at the beginning of the thesis' research period, Scotland had

not already established many foundations, for successful early stage investing. There was already the experience of a hybrid PVC, an experienced active BA community, who had convinced SE that BA syndicates should be partners of the, about to be launched, SCF, hence permitting a longevity to the Fund as PRVCs retreated up the risk curve over the following decade, away from early stage investing. These experienced BAs were also willing to share their knowledge with new groups as they developed, helping facilitate the growth in BA syndicates and a deepening a widening of their expertise, to offer more support to new companies. In addition, BAs benefitted from the financialisation trend which increased their wealth and lower barriers to them investing, with changes in the 'sophisticated investor' rules.

Another beneficial factor in this context is the stability of the Scottish institutional framework which worked well and policy initiatives with only marginal improvements at the edges. A consideration of other UK studies undertaken (Baldock, 2016; National Audit Office, 2009) support the view that consistency of policy is a key variable of success. The commitment of the Scottish government to listen, refine and implement revisions, thereby reducing the transaction costs of the investment decision and thereby enhancing the returns, is laudable. This is evident by their response to feedback and the creation of the High Growth Unit within SE and a focus on scaling companies once that was understood to be important. The importance of persistency of policy was one of the conclusions in Christensen (2011) where he compared the BAN policies in Denmark and Wales. Comparable stability of the direct FI programmes have not the case in England as discussed in Chapter three and may well be one reason why their effectiveness has yet to be proved.

4. The superposition of policy

The final theoretical contribution from this thesis is the consideration of policy superposition. It considered the outcomes that may have been generated when the direct and indirect FIs are considered together alongside the monies disbursed by SE. Many other initiatives were not considered but the thesis gave a glimpse of how those outcomes might change. The registered macroeconomic outcomes for one policy tool are unsurprisingly diminished as more layers are added and that is what was evident

here with only two additional layers being considered. In Chapter seven when the EIS tool was considered on its own the results suggested £11.70 of gross GVA was generated for every £1.00 of policy money spent, a figure which diminished to £4.90 when the PVC money was added and £4.69 when other recipients of SE monies were considered. Yet the monies for capacity building on both sides of the investment transactions as well employment subsidies would have yet another impact.

Research on these policy tools remains an underdeveloped area in academia as does research which focuses on macroeconomic outcomes with most of the discussion occurring in policy circles. This thesis has thus introduced the topic, provided tools of analysis and a multi-layered analysis, which hopefully will promote further development and discussion within academic circles.

8.2.2 Empirical contributions

In empirically examining the FI policy outcomes at both the micro and macro level in Scotland in Chapters six and seven, this work built on a number of prior analyses. Mason (2009a) where he made a call for methodologies to enable the evaluation, analysis and discussion of BA policies. Mason and Harrison (2002a, 2000b) who found in their Scottish study that front-end tax incentives and low capital gain tax, such as the benefits of the EIS, were the most influential factors in enticing the flow of BA capital. Lehner (1998), who challenged the benefit of policies targeting BAs citing BAs lacked focus, were less skilled in managing information and he did not believe allocating small amounts of money to many small companies would add value. Boyns et al (2003), Wiltbank (2009) and Pierrakis (2011) who applied a methodology to their survey data to determine additionality statistics for the EIS/SEIS policies at the UK level. Both Boyns et al. (2003) and Cowling et al. (2008) who evaluated the effectiveness of EIS/SEIS policies at the company level. MWC (2016), Harrison (2018), and Hayton et al. (2008) who found the SCF had been a large contributor to the success of early-stage investment in Scotland at the macroeconomic level and in encouraging the leverage of additional funds. The findings of Boyns et al. (2003) that showed the EIS policy did lever additional capital to invest in early stage businesses,

create turnover growth and jobs. Carpentier and Suret (2016), who raised the following points as challenges within this field of research – the superposition of policy, data access, short studies and little consideration of the economic backdrop. Finally, the work of the Pechard et al (2017), National Audit Office (2009), Coopey (2005), who emphasise the importance of context.

This thesis has sought to build on and go beyond the work of those researchers in in five main ways:

1. an extension of the parameters of the research so more policy tools and greater economic depth were incorporated and considered,
2. conducting the research over a longer period,
3. considering the role of government and
4. the economic backdrop and
5. using real data rather than surveys or hypothesised data.

Firstly, with respect to the BA research, this work responded to the plea articulated in Mason (2009a) for the provision of methodologies to enable the evaluation, analysis and discussion of BA policies. Second the analysis expands on the examination of BA motivations undertaken in Mason and Harrison (2002a, 2000b). These research articles focused the BAs' motivations with respect to their view of the importance of one policy tool – the EIS. In contrast this thesis also explores BAs attitudes to SEIS, their thoughts on the provision of PVC money, on its form and on its importance to their continued provision of capital. Other extensions of previous research covered in this thesis explore the degree to which the BAs are motivated by the economic outcome of those policy tools such as creating jobs or economic growth and the creation of a policy additionality statistic to enable the macroeconomic analysis of the policy. Finally, this thesis expands the outcomes of the research outlined in Lerner (1998) by showing that contrary to his conclusions, BAs are able to add value by contributing small amounts of money to many small deals.

The thesis also extended previous research on policy in numerous ways. Firstly, at both the company level and macroeconomic level, the consideration of a longer time

series and presenting the context of the economic backdrop offer extensions to the research conducted by Cowling et al. (2008), Nightingale et al. (2009), Hayton et al. (2008) and MWC (2016). Longer time periods of course are better, and results of such studies have produced better outcomes (Cumming and Johan, 2016, MacKenzie and Coughtrie, 2015). Cowling et al (2008) did recognise that their data set was too short to determine the dynamic relationships, when they researched the effect EIS has had on the operational or financial efficiency of investee companies, particularly for the small ones. The studies on the SCF by Hayton et al. (2008) and MWC (2016) researched the economic contribution of the Fund, but again over short different time periods and subject to different economic backdrops.

Secondly at the company level, the thesis was able to extend the work of Boyns et al. (2003), where they found £1.0m of policy money had generated £3.3m of turnover. The work herein considered not just the turnover growth of the sample in aggregate, but disaggregated the data to give insight into the development of a company's growth over time after receiving investment. This built on the work of Nightingale et Coad, (2013) and Nightingale et al., (2009), who commented on the use of averages in enterprise research to represent the average entrepreneurial firm and how that was misleading and could result in erroneous results as the data sets have a large skew and showing how that was the case with this dataset. Thirdly the thesis aimed to extend the macroeconomic research that had been done on the SCF policy tool by MWC (2016) and Hayton et al. (2008) in two ways. One is to consider the fund as whole in a longer time period, in contrast to each of the studies dealing singularly with different tranches of money within the fund over short periods of time and secondly by using real company historical data rather than data collected by surveys. The analysis in this thesis researched the SCF over a longer time period covering a range of macroeconomic backdrops and two economic cycles and undertook a similar analysis for the EIS/SEIS policy tools. Lastly, the thesis attempted to go beyond previous research that had been undertaken at the macroeconomic level on the EIS and SCF policy tools (MCW, 2016, Hayton et al. 2008, Harrison, 2018, Pierrakis, (2011), Wiltbank, (2009), Cowling et al. (2008), Boyns et. al, (2003) by considering the success of the policies operating together as they do with the consideration of further

policy superposition.

In addition, the thesis updated previous research and so the empirical contribution is not only expanding previous work but providing updates. In particular, the Mason and Harrison work (Mason and Harrison, 2000b, 2002a) was done before the SCF was formed and when BA investment much less developed and new data was needed to continue the discussion. Likewise with Lerner (1998) such thoughts were shared a long time ago, when the Scottish BA market was more fragmented and before the economies of scale of the syndicates.

One of the main empirical contributions results from the fact that real BA and PVC transaction and investee company data was used. The challenge of obtaining data is an overarching one in this field of research and has resulted in amended research approaches for some (Brander et al., 2014), become a subject of lament for others (Mason, 2009a), or has just become an imperfect tool for others (Cowling et al., 2008). The data this work is based on has avoided the problems of some other studies, where only surveys have been used to estimate future impacts which can only lead to erroneous conclusions due so the well-known optimism in the entrepreneurial area (MCW, 2016, Hayton et al. 2008; Trevelyan, 2008). In fact, MCW (2016) outlines of the companies that SCF funded only 10% beat their estimates and over 50% were well behind the estimates presented at the time of investment. Quantitative econometric studies, likewise, have their weaknesses as their focus is to estimate relationships and frequently, they suffer from low R^2s, which means the model's predictive power is poor (The Minitab Blog, 2014). Another concern with such quantitative approaches is a lack of reader comprehension and this 'black box' approach does not allow the reader to fully engage with the outcomes. The granularity and accuracy of the BA and PVC transaction and investee company data used in this thesis mitigates the biggest problems outlined with extant research in this area and offers a more accurate understanding of the research aims.

8.2.3 Methodological contributions

By employing a mixed method research strategy and creating the DAA GVAIA and Jobs Analysis as a new methodology, this thesis makes a methodological contribution to knowledge. The introduction of this new methodology is important for two reasons. Firstly, it enhances an evaluation tool already in use in policy circles and introduces it to the academic realm. Secondly, these novel enhancements enable a greater productivity of data through its accommodation of broken time series of data, which often need to be excluded from other methodologies. Including broken data series is a great benefit in the area of small company research where data is difficult to access.

This tool expands current research in two ways. Firstly, it expands the EIS policy research conducted by Boyns et al. (2003) as it provides a macroeconomic success outcome. The work of Boyns et al. (2003) provided investment flows at the national economic level offering insight into how well the policy was functioning. As such it provided insight for monitoring the policy rather than the economic outcomes achieved (Storey, 2000). Secondly, it provides a methodology to the researchers, who have been calling for a methodology to begin the policy discussion in academia (Carpentier and Suret, 2016; Mason, 2009a).

The mixed methods approach to data collection enabled a richness of data and various triangulation opportunities, which were required due the lack of consistent data definitions and inclusion parameters such as the lack of data on the value of the SCF portfolio or its investee company types, or the amount of Scottish BA investments over the period with different sources having different numbers. It also provided a greater information depth and knowledge of the subject matter which meant the context around the subject matter could be better interrogated and detailed. This was very helpful as often in regional work data is not so readily available. The main benefit using mixed methods brought to this work was the compensating roles that various data sources play, when there are weaknesses in one data set, which there definitely was in this piece of research, so other complimentary multiple sources were invaluable.

8.3 Limitations

Due to the nature and development of BA investment in the UK and Scotland, a number of limitations apply to this work. BA investment was in its early stages in Scotland an informal activity, with some investors saying it was illegal to share business plans in the early 90s when they started. Legality considerations aside, the informal nature of BA support and early-stage entrepreneurship makes data access challenging at times. In seeking to connect micro-level activities such as investment with macro level economic development, the research for this thesis met a number of challenges. The original intention was to access data from official sources to assess the policy efficacy of the SCF and related FIs, but access to this was denied. The approach then turned to accessing BA datasets to ascertain how much the SCF and EIS/SEIS supported the economic development during this time. However, this is not the whole BA population as we know that a) not all those using SEIS/EIS are registered in BA consortiums, b) not all BA consortiums responded to the request for data meaning it is a sample presented here, c) the data accessed therein is a longitudinal snapshot that is necessarily incomplete picture but the best estimate available.

Data access issues aside, the completeness of the data has been discussed throughout the thesis and addressed in the methodology, outcomes, and discussion sections. BA investment and data are difficult activities to analyse from data perspectives due to well-documented shortcomings, but this thesis has sought to mitigate these issues where possible to shine light on a number of different aspects and connections to economic development that were previously only guessed at, even at policy levels where data tends to be more comprehensive though still lacking in the granularity provided in this work. Thus, although the limitations herein are clear, it represents a more detailed analysis of the connections between BA investment practices and economic development outcomes than has previously been reported.

As the BA sample were angels taken from syndicates the views reflected in the survey are those of syndicated BAs and not individual investors. As the value of their transactions represented 14% on average of the value of the EIS/SEIS transactions during the period and they came from four of the twenty plus BA syndicates in

Scotland, one might like to conclude that they are representative of all Scottish BAs. There is, however, a chance that they are not and hence the survey results may not be representative of general BA opinion. This is important as those results have been used to calculate the additionality numbers for both policy tools and hence perhaps there are biases in those numbers. The investee company data likewise presents some limitations 30% of the annual sales data was missing and likewise 46% of the employment data. Further, for the EIS/SEIS policies, the additionality was calculated following a previously used methodology (Pierrakis, 2011; Wiltbank, 2009; Boyns et. al, 2003). It may however be the case that this methodology is not representative of the true additionality of these policies. If only the 'very important' response had been taken only this would have substantially reduced the additionality of the EIS policies from 80% to 58% and hence the GVA numbers per pound of policy money spent and the cost per job numbers would likewise deflate and inflate accordingly.

The GVAIA was a welcome tool for this research as no control group was necessary to create a counterfactual analysis. Its application works better for some subject matters than others. In this application on nascent companies, there are aspects of the methodology, which may impact results. Firstly, the GVAIA model excludes capital and finance, which is the main independent variable in this work. Subsequently, the dynamism and the growth, which one expects capital to produce is dealt with in a statistic way – from equilibrium to equilibrium. The DAA GVAIA compensates little for that by dealing with each calendar year on a discrete basis, with the accomplishments for that calendar year recognised, given the capital that was invested to achieve them. Nevertheless, the capital deployed is not captured in any way and this may have an impact on results. Secondly, one of the key variables in the model is turnover. It can take time for new companies to generate revenue and indeed 14% of the sample companies were pre-revenue, which meant they could not be included in the analysis. Thirdly, the industrial sectors included in the IOTs seem rather out-dated compared to the activities of early-stage companies. In addition, the data is collected by survey from the entire economy so it may be the case that the multipliers and numbers represented in the tables are not representative for new companies in that sector albeit so for established ones. So, this too may provide some limitations.

Fourthly, if the assumptions in the analysis that there were no leakage, displacement or substitution effects are incorrect and there were indeed some, the results would have an upward bias.

Whilst recognising the superposition of policy is a contribution, is also a limitation. Steps were taken in this thesis to account for three of the active policies during the research period. However as discussed in Chapter three, there was other policy money not accounted for and this may mean the results have an upward bias. The exclusion of policy costs from the analysis is further limitation as these can be seen to affect results materially (Boyns et al., 2003). Despite these limitations, the work herein represents a more holistic perspective than currently exists on the connections between private capital, policy, SMEs, and economic development to date

8.4 Summary of research findings

Given the complexity of the preceding work, including the range of analysis, data composition, contributions, and limitations, a summary of the research findings is presented below.

8.4.1 EIS/SEIS as economic development tools in Scotland 2003-2017

The consideration of this policy tool's contribution to economic development in isolation records a phenomenal success in achieving economic growth and creating jobs. For each one pound of policy money spent, £11.67 of GVA was created and each new job was created at a cost of £10,396. In addition, the EIS/SEIS policies have had success in achieving their direct aim of attracting early-stage risk capital. The value of EIS investments in Scotland rose to £80m in 2017 from £44m in 2003, which will include not only the increased demand due a successful policy but also due to an improving economic backdrop and contextual positive changes during the time period.

The success of the policy can be seen from the increased policy additionality over time. In this study an 80% additionality was recorded, whereas in 2003 the average number was 58% (Boyns et al., 2003). It is also evident in the BAs' responses in the survey

conducted for this study that tax incentives were very important to them and yet only of secondary interest in Mason and Harrison (2002a). In many respects this is not surprising as BA investing has become better known, access to HNW individuals had become easier, the financialisation trend has made the rich richer and tax incentives for this policy tool has increased over the research period whereas the tax attractiveness of other tax shelters has diminished (Phoenix Life, 2021; Professional Pensions, 2016; Midven, 2018). The success of those policies was particularly helpful at a time when the PRVCs were retrenching and the demand for such capital was rising. Their success is also validated by more recent direct FI policy initiatives, where recent fund launches in England have been to work alongside BA capital rather than subcontracting the management of the funds to PRVC players, as they had done historically.

The value add of BA money has been one of the reasons for its popularity from the beginning amongst policy makers and politicians. Boyns et al. (2003) found that half of the companies in their EIS study, using the scheme, had benefited from their BA investors. The results of this study challenge the view that BAs are unskilled in managing the information challenges and unfocused resulting in a lack of depth compared to VCs and that allocating small amounts of money to many small companies would add much value Lerner (1998). This works shows that not only PRVCs add value to their investee companies, but PVCs led by BA partners and BAs themselves also do. These benefits are evidence that BA capital is indeed smart money, where they help their companies and create something bigger and perhaps the cheapness of the angel money compared to other sources of high-risk finance is a contributing factor.

The value of BA money has been visible in other ways during this research period. Firstly, the fact that BA protagonists convinced the government to allow BA partners to co-invest alongside the SCF was probably one of the most important outcomes in this time of history and the key to the success of these policies in Scotland. From marginal players in the SCF at the beginning to become accountable for over half of the investments (Harrison, 2018; Hayton et al., 2008). With the retrenchment of PRVC

money Scotland was very fortunate to have an established BA base which during that time got even stronger through the formation of groups and syndicates and was very much able to expand with the growing demand for informal capital.

8.4.2 Effectiveness of the PVCs in economic development 2003-2017

The consideration of PVCs contribution to economic development in isolation also records success in achieving economic growth and creating jobs. It shows each job was created at a cost of £25,478 and for each pound of policy money invested the analysis resulted in £3.47 of GVA being produced. It is clear from the numbers that the governments' actions did increase the supply of BA capital and shift the supply curve out which was the direct intent of the policies. The survey supports these findings as 70% invest to benefit from SIB's capital. On the PVCs themselves 94% believed PVCs were necessary in the market and 69% said they needed to remain as market participants for them to continue investing. It is believed much of the trend of BA syndicate and group formation in the Scottish market has been because of the existence of the SCF. In thin markets it would appear such a policy is necessary and indeed many of the companies and SCF partners have attributed their existence, largely, to the presence of the Fund (Harrison, 2018, Interviewee E, 2017).

8.4.3 Both policy tools together

There is no doubt that the EIS/SEIS and Scottish PVC policy initiatives have been catalysts to increase the supply of early-stage risk capital in Scotland, in line with their policy intent, and the evidence presented of both tools operating jointly and producing jobs at a cost of £23,452 and £4.92 of GVA for each pound of policy money spent. Together they levered monies in excess of 6.5 times their policy spend, hence successfully pulling in the private sector to help develop the government's economic agenda with their finance and skills and knowledge hence enabling a transfer of skills from the experienced to the inexperienced and mitigating the possible negative outcome were the civil servants be in charge.

For such positive results in job and GVA creation to be accomplished as a time when global macro trends were largely flowing in the opposite direction is a major accomplishment. These policy monies, thus, brought an even greater benefit at a time when middle management jobs are being replaced by IT and labour, as an entity, was being devalued. This economic value is amplified as elsewhere in the production chain there is little evidence of other benefits of innovation, such as pricing power or increased margins (Forbes, 2018b)

8.5 Implications for policy rationale, design, and delivery

Any attempt to produce policy recommendations in this area must consider the complexity of the environment being addressed and the challengers of defining appropriate variables and determining causality. There are, however, four points and these may be the main contributions for policymakers. Firstly, in implementing and evaluating any policy, it is of utmost importance to consider the economic timing of its implementation and over which economic backdrop it may run. This is necessary and will most likely be the main determinant of whether it is a successful policy or not. If the requisite skills lack in-house, it is recommenced external help is sought, and the expected policy outcomes considered with an analysis of many economic scenarios. Secondly, the context of the policy is important. Much BA academic literature has looked at the regional geographic differences in BA investing within the UK. These are important as these are the contexts in which the policies are operated and no doubt with very different results. The policies were seen to be successful in this work, but this work does not determine the real reason why. Was it the SCF which enabled a BA market to develop? This is not evident with the ECF and ACF (Baldock and Mason, 2015). Was it the existence of a well-established BA syndicate, who coached other nascent BA groups? Is it because there were many other supportive policies at play? Perhaps all of these things are necessary for success. Thirdly, consideration should be given to the length of time it takes for success in such polices so a recommendation for policymakers would be to build longer timelines into their policy making. Fourthly, it is recommended that the policy makers aim for the greatest consistency and stability of policy throughout that time as possible. This thesis shows success with these

policies in Scotland, whereas in England, where the environment has been subject to much change, this is not the case. BA and PVCs working together provide a complimentary partnership at the early stage of a company's journey, due the BAs providing smart patient capital and the PVCs being interested in economic success, willing to help young companies develop. The success of this combination of BA and PVC investing suggests it should be replicated as indeed it has in New Zealand and now with the ACF in England.

8.6 Future Research

This thesis revealed several research questions that could be addressed in future studies. Firstly, there remain government policies supporting economic development, and little is known of their efficacy. These policies present an opportunity for development and further application of the DAA GVAI and Job analysis, presented here, to validate its efficacy as a methodology and to offer refinement opportunities. Establishing the GVAIA and jobs impact from other policies in this area by applying the same methodology would deliver a greater understanding of the interplay between the policy measures and their effects entrepreneurship, and economic development. Secondly, consideration could be giving to the development of a dynamic version, which accommodates growth and capital with different growth trajectories and investment drawdowns. Thirdly, as the IOT does not have much granularity to reflect early-stage businesses, some research could be undertaken to update the IOT or to create a sub-category for innovative businesses. In addition, a more granular break-down of technology businesses would be a welcome. For instance, in the Scottish 1998 Input Output Table (Scottish Government, 2015) although 'leather goods' and 'paints, varnishes and inks etc.' are less than 0.07% of intermediate consumption, they are still classified as separate sectors and the sector 'computers, electronics & opticals' is more than 10%. Many of the new companies are in the latter sector, so one must question whether the GVA Type II multiplier is the appropriate for these new diverse businesses and whether a greater degree of granularity would be more appropriate.

Another topic which could be addressed in future research is the superposition of policy. The philosophical stance taken in this thesis embraced the idea that attributing true efficacy of policy is impossible in a multi variate world. Having said that it was clear many policies are contributing to the outcomes in this research and hence one of the reasons for the social constructionist stance as they are. Fourthly, consideration of the costs of policies would be welcome, as it is only when those variables are known and understood that an estimate at the real effect of the policy tools can be ascertained. Fifthly, this study has identified and isolated two of the policy tools and, in a very brief manner, attempted to consider how a third source of policy money may be relevant to the policy outcomes, but there are more unaccounted policies and additional policy superposition effects may dilute the identified leverage numbers more so further research on this matter would be interesting.

Penultimately, more thought should be given as to appropriate variables to measure the success of early-stage companies. In their early years it has been shown the main outcome is capacity building rather than any financial success, so the question remains of how that should be measured. Finally, consideration could be given to other possible economic returns that are produced by growing early stage companies such as the impact of increased R&D, increased knowledge, knowledge spill-overs, a greater motivated and happier labour resource, increased productivity, wealth redistribution from the investors to the new entrepreneurs (who likely will generate a higher return on capital invested), restructuring of industry, and ways to continue supporting early stage risk capital as an economic development tool.

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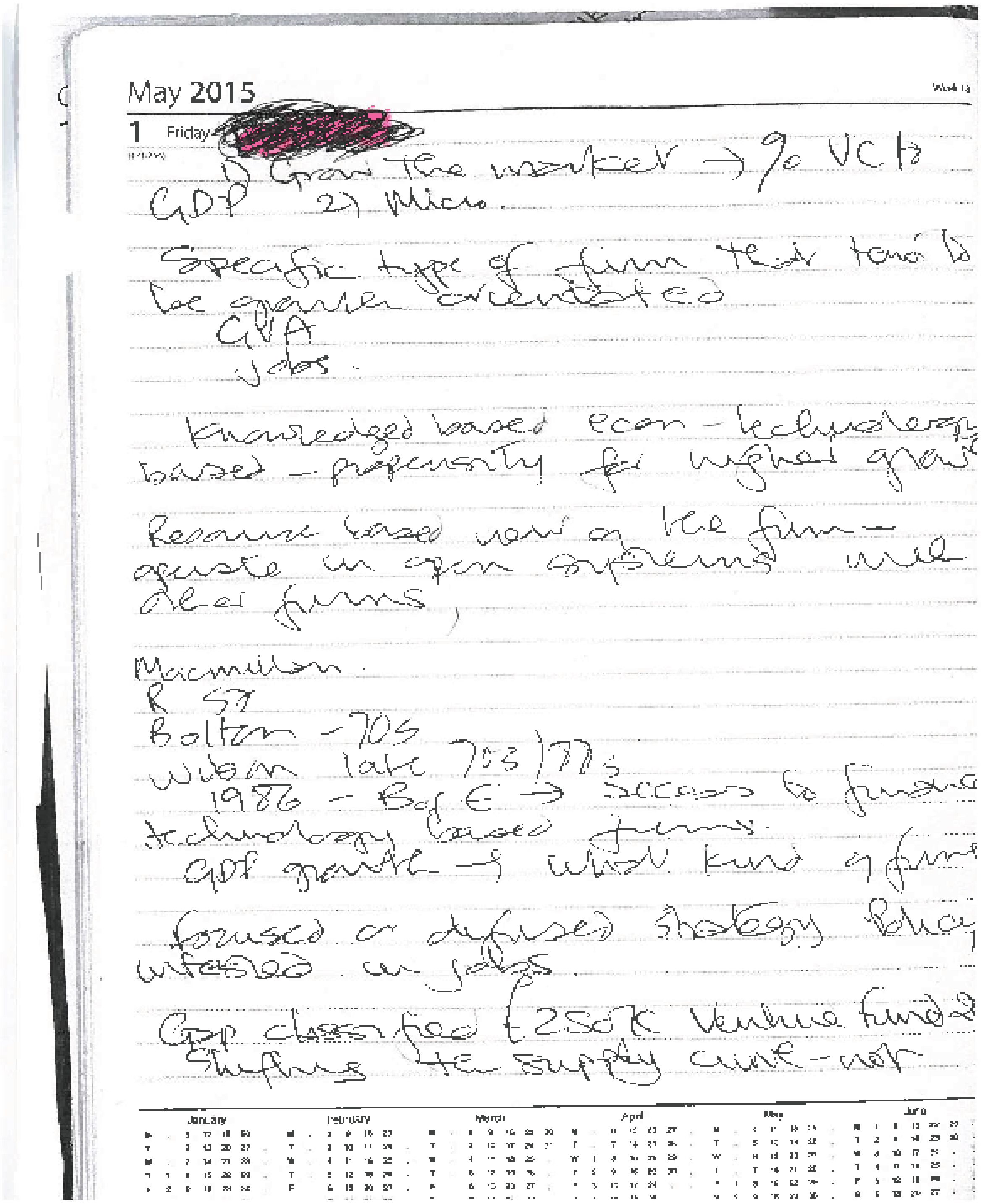
10 Appendix 1 – Example of interviewee Notes



May 2015

1 Friday [redacted]

1) Grow the market → % VCs

GDP 2) Micro.

Specific type of firm that tend to be growth orientated

GVA

jobs.

Knowledged based econ – technology based – propensity for higher growth

Resource based view of the firm – operate in open systems with other firms

Macmillan

R 57

Bolton – 70s

Wilson late 70s/77s

1986 – B of E → access to finance technology based firms.

GDP growth → what kind of firm

focused or diffused strategy Policy focused on jobs.

Gap classified £250k Venture funds

Shifting the supply curve – not

May 2015

Saturday 2
(122-243)

about micro measurement of growth
Develope the ecosystem
Conduct — many related is getting
Structure — no of players ↓
Performance
better developed

Prog.
Resource allocation framework →
taking away questions annually
1) Application _ process
2) ERDF was tested + how managed

Resource

Sunday 3
(123-242)

General level - Scotland
not optimism the European money
Had no evidence — on transactions
20 EU
~~40~~ 27 Scotland
{ UK that hadn't been there

Created risk capital guidelines
Matching issue
Additionality
3 year

~~Access to finance~~ 94-97
Secondment
Access to finance

	July	August	September	October	November	December
[illegible]						

May 2015

4 Monday (124-241) SEP → mkt had Δed — Early Spring Bank Holiday (England...)

was would do better ... world

cyclical Δ not structural Δ

Proof of Concept
Business S Growth fund.

Innovation funding + Gerard.

Not chose
displacement (crowding
mkt distortion
-12 transac

→ in-house team
→ one fund
→ for , - invest - ...
to invest in.

Bridging the gap — RDF
B12 → well done

AIM consultation

all banks — consultation
success
Albion Ventures
Rentec

January						
M		5	12	19	26	
T		6	13	20	27	
W		7	14	21	28	
T	1	8	15	22	29	
F	2	9	16	23	30	
S	3	10	17	24	31	
S	4	11	18	25		

February					
M		2	9	16	23
T		3	10	17	24
W		4	11	18	25
T		5	12	19	26
F		6	13	20	27
S		7	14	21	28
S	1	8	15	22	

March						
M		2	9	16	23	30
T		3	10	17	24	31
W		4	11	18	25	
T		5	12	19	26	
F		6	13	20	27	
S		7	14	21	28	
S	1	8	15	22	29	

April					
M		6	13	20	27
T		7	14	21	28
W	1	8	15	22	29
T	2	9	16	23	30
F	3	10	17	24	
S	4	11	18	25	
S	5	12	19	26	

May					
M		4	11	18	25
T		5	12	19	26
W		6	13	20	27
T		7	14	21	28
F	1	8	15	22	29
S	2	9	16	23	30
S	3	10	17	24	31

June					
M	1	8	15	22	
T	2	9	16	23	
W	3	10	17	24	
T	4	11	18	25	
F	5	12	19	26	
S	6	13	20	27	
S	7	14	21	28	

[redacted]

Scottish Financial Enterprise –
Aman

[redacted] – British Investment Bank
General
Co-Investment Agreement
Charlie Young.

Small money squared
→ policy + an investor
approach to econ devel.
by addressing systemic
issues
institutional setting

[redacted]

Holding Funds [redacted] Seed 0.5m
↓ 40m Early Stage 2.0m
D&E 2-10m

Funds that 4m 6m

Early

	July	August	September	October	November	December
M	6 13 20 27	3 10 17 24 31	7 14 21 28	5 12 19 26	2 9 16 23 30	7 14 21 28
T	7 14 21 28	4 11 18 25	1 8 15 22 29	6 13 20 27	3 10 17 24	1 8 15 22 29
W	1 8 15 22 29	5 12 19 26	2 9 16 23 30	7 14 21 28	4 11 18 25	2 9 16 23 30
T	2 9 16 23 30	6 13 20 27	3 10 17 24	1 8 15 22 29	5 12 19 26	3 10 17 24 31
F	3 10 17 24 31	7 14 21 28	4 11 18 25	2 9 16 23 30	6 13 20 27	4 11 18 25
S	4 11 18 25	1 8 15 22 29	5 12 19 26	3 10 17 24 31	7 14 21 28	5 12 19 26
S	5 12 19 26	2 9 16 23 30	6 13 20 27	4 11 18 25	1 8 15 22 29	6 13 20 27
Wk	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

6 Wednesday (126-239)

Boris Johnson — £25m over 3 years
funding London

Scottish Enterprise Investments
SEI.

£20m – Europe. £20 → £5.00 £3.0

Recapitalised 2008 — 40% ERDF
£7.0m LUX
5.0m HIE

2000 – 2006 — Cofinance
was private money
£20 – public
used co-investment partner
agreement
Managing Authority –
Scottish Government Structural
Funds Division
→ Managing Authority

14 – 2020 — never has been
SG – suggested Access to finance
in mths – ago – competitive

January

M	.	5	12	19	26
T	.	6	13	20	27
W	.	7	14	21	28
T	1	8	15	22	29
F	2	9	16	23	30
S	3	10	17	24	31

February

M	.	2	9	16	23
T	.	3	10	17	24
W	.	4	11	18	25
T	.	5	12	19	26
F	.	6	13	20	27
S	.	7	14	21	28

March

M	.	2	9	16	23	30
T	.	3	10	17	24	31
W	.	4	11	18	25	.
T	.	5	12	19	26	.
F	.	6	13	20	27	.
S	.	7	14	21	28	.

April

M	.	6	13	20	27
T	.	7	14	21	28
W	1	8	15	22	29
T	2	9	16	23	30
F	3	10	17	24	.
S	4	11	18	25	.

May

M	.	4	11	18	25
T	.	5	12	19	26
W	.	6	13	20	27
T	.	7	14	21	28
F	1	8	15	22	29
S	2	9	16	23	30

June

M	1	8	15	22	29
T	2	9	16	23	30
W	3	10	17	24	.
T	4	11	18	25	.
F	5	12	19	26	.
S	6	13	20	27	.

Influenced Europe

May 2015

Thursday 7

(127-238)

innovation + jobs
– investment in SMEs.
fiscal Glazer

94-99 > only 2 managing authorities ~~only~~ in whole Europe used structural funds to fund financial instruments. – Italy Spain

Thought on appropriate use of structural funds – FI in SME – multiple hits

everyone else using grants only used for grants.

15% of budget FI

Scottish Government Business Directorate – Access to finance Policy team
SG – formulate
SE – implement

Economic Growth + FI in SME in growth / x potential evidence SMEs

July	August	September	October	November	December
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

8 Friday

~~contribution of~~
make a disproportionate
diff Why passive?
Involvement in market failure
most likely to complement +
enhance private sector

high levels of additionality
as only brought in when
needed
funding allows them to
extend their reach

HM Treasury – RDAs really
dimming early 2000s

SCF 100k – 2m
Venture 2 – 10m
Edge – SCT grant money.

Portfolio fund + block of cash
continue to follow our
money
on average £350m

May 2015

Saturday 9

REIF – renewable energy investment fund

£ 103m. marine, community district heating

young innovative companies

Patience [redacted]

Strathclyde European Partnership
→ SME bus development
→ used FI for ancillary

Strathclyde Investment Fund
ERDF

Lanarkshire Development A. Managing investment fund
European Officials.

Sunday 10

Gerard → Morton, Andrea, BV

Gamekeeper, Poacher.

Scottish Enterprise
30 – FI – 105 → 35

SIB within → 3 teams

Portfolio
Funds team
15 — 40-45%, reporting F.I. Devel, MbL
Portfolio area

July August September October November December

11 Appendix 2 – Ethics approval

Ethics Application Form

Please answer all questions

1. Title of the investigation
Scottish angel investment and state support
Please state the title on the PIS and Consent Form, if different: N/A

2. Chief Investigator (must be at least a Grade 7 member of staff or equivalent)
Name: ☐ Professor ☐ Reader ☐ Senior Lecturer ☒ Lecturer ☐ Senior Teaching Fellow ☐ Teaching Fellow Department: The Hunter Centre for Entrepreneurship Telephone: +44 141 548 3482 E-mail: niall.mackenzie@strath.ac.uk

3. Other Strathclyde investigator(s)
Name: Margaret Coughtrie Status (e.g. lecturer, post-/undergraduate): Postgraduate Student Department: The Hunter Centre for Entrepreneurship Telephone: =44 (0)141 548 3482 E-mail: Margaret.coughtrie@strath.ac.uk
Name: Professor Martin Hughes Status (e.g. lecturer, post-/undergraduate): Department: The Hunter Centre for Entrepreneurship Telephone: +44 (0)141 548 3482 E-mail: martin.hughes@strath.ac.uk

4. Non-Strathclyde collaborating investigator(s) (where applicable)

Name:

Status (e.g. lecturer, post-/undergraduate):

Department/Institution:

If student(s), name of supervisor:

Telephone:

E-mail:

Please provide details for all investigators involved in the study:

5. Overseas Supervisor(s) (where applicable)

Name(s):

Status:

Department/Institution:

Telephone:

Email:

I can confirm that the local supervisor has obtained a copy of the Code of Practice: Yes ☐ No ☐

Please provide details for all supervisors involved in the study:

6. Location of the investigation

At what place(s) will the investigation be conducted

Scotland with angel investors

If this is not on University of Strathclyde premises, how have you satisfied yourself that adequate Health and Safety arrangements are in place to prevent injury or harm?

N/A

7. Duration of the investigation

Duration(years/months) : 2 years 3 months

Start date (expected): 30 / 06 / 15 Completion date (expected): 30 / 09 / 17

8. Sponsor

Please note that this is not the funder; refer to Section C and Annexes 1 and 3 of the Code of Practice for a definition and the key responsibilities of the sponsor.

Will the sponsor be the University of Strathclyde: Yes ☒ No ☐

If not, please specify who is the sponsor:

9. Funding body or proposed funding body (if applicable)

N/A

Name of funding body:

Status of proposal – if seeking funding (please click appropriate box):

☐ In preparation

☐ Submitted

☐ Accepted

Date of submission of proposal: / / Date of start of funding: / /

10. Ethical issues

Describe the main ethical issues and how you propose to address them:

There are no known ethical issues involved.

11. Objectives of investigation (including the academic rationale and justification for the investigation) Please use plain English.

- To investigate Scottish angel investment activities and their economic impact.
- To understand state support for such activities

While the literature on angel investment has grown in recent years, there remains a lack of understanding of what the economic impact is of these activities and how state support affects them. This thesis is intended to investigate this more fully to offer a better understanding of both.

12. Participants

Please detail the nature of the participants:

Scottish angel investors located in Glasgow and Edinburgh principally.

13. Nature of the participants

Please note that investigations governed by the Code of Practice that involve any of the types of participants listed in B1(b) must be submitted to the University Ethics Committee (UEC) rather than DEC/SEC for approval.

Do any of the participants fall into a category listed in Section B1(b) (participant considerations) applicable in this investigation?: Yes ☐ No ☒

If yes, please detail which category (and submit this application to the UEC):

14. Method of recruitment

Describe the method of recruitment (see section B4 of the Code of Practice), providing information on any payments, expenses or other incentives.

Invitation. No financial incentives offered.

15. Participant consent

Please state the groups from whom consent/assent will be sought (please refer to the Guidance Document). The PIS and Consent Form(s) to be used should be attached to this application form.

Consent will be sought from all participants.

16. Methodology

Investigations governed by the Code of Practice which involve any of the types of projects listed in B1(a) must be submitted to the University Ethics Committee rather than DEC/SEC for approval.

Are any of the categories mentioned in the Code of Practice Section B1(a) (project considerations) applicable in this investigation? ☐ Yes ☒ No

If 'yes' please detail:

Describe the research methodology and procedure, providing a timeline of activities where possible. Please use plain English.

An open approach to interviews will be carried out. The interviews will be exploratory in nature. Secondary research using existing publications will also be undertaken.

What specific techniques will be employed and what exactly is asked of the participants? Please identify any non-validated scale or measure and include any scale and measures charts as an Appendix to this application. Please include questionnaires, interview schedules or any other non-standardised method of data collection as appendices to this application.

The interviews are to be exploratory given the nature of angel investment and its high levels of commercial sensitivity. They will be open ended.

Where an independent reviewer is not used, then the UEC, DEC or SEC reserves the right to scrutinise the methodology. Has this methodology been subject to independent scrutiny? Yes ☐ No ☒

If yes, please provide the name and contact details of the independent reviewer:

17. Previous experience of the investigator(s) with the procedures involved.

Experience should demonstrate an ability to carry out the proposed research in accordance with the written methodology.

The PhD researcher is an active angel investor and has participated in research projects as a respondent in the past.

18. Data collection, storage and security

How and where are data handled? Please specify whether it will be fully anonymous (i.e. the identity unknown even to the researchers) or pseudo-anonymised (i.e. the raw data is anonymised and given a code name, with the key for code names being stored in a separate location from the raw data) - if neither please justify.

Pseudo-anonoymised on password protected University hardware at two different locations.

Explain how and where it will be stored, who has access to it, how long it will be stored and whether it will be securely destroyed after use:

It will be stored on password protected university computers. Only the researcher has access to it. It will be stored for the duration of the thesis, and any publications arising from this.

Will anyone other than the named investigators have access to the data? Yes ☐ No ☒

If 'yes' please explain:

19. Potential risks or hazards

Describe the potential risks and hazards associated with the investigation:

No envisaged risks.

Has a specific Risk Assessment been completed for the research in accordance with the University's Risk Management Framework (http://www.strath.ac.uk/safetyservices/aboutus/riskmanagement/)? Yes ☐ No ☐

If yes, please attach risk form (S20) to your ethics application. If 'no', please explain why not:

20. What method will you use to communicate the outcomes and any additional relevant details of the study to the participants?

Post transcription, each interview will be sent to participants to check for any misunderstandings or mistakes. Participants have the opportunity to adjust interview transcriptions pre-analysis in order to ensure that the data

collected is accurate. Following this, all data will be anonymised, and participants will receive the final, also anonymised, copies of the thesis.

21. How will the outcomes of the study be disseminated (e.g. will you seek to publish the results and, if relevant, how will you protect the identities of your participants in said dissemination)?

If possible, publication of results will be sought. As with the thesis itself, all data will be anonymised and participants will be given the opportunity to check to see if there are any signs which could give away their identity pre-submission.

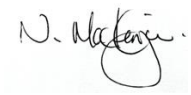
Checklist	**Enclosed**	**N/A**
Participant Information Sheet(s)	☒	☐
Consent Form(s)	☒	☐
Sample questionnaire(s)	☐	☐
Sample interview format(s)	☒	☐
Sample advertisement(s)	☐	☒
Any other documents (please specify below)		
	☐	☐
	☐	☐
	☐	☐
	☐	☐
	☐	☐

22. Chief Investigator and Head of Department Declaration

Please note that unsigned applications will not be accepted and both signatures are required

I have read the University's Code of Practice on Investigations involving Human Beings and have completed this application accordingly. By signing below, I acknowledge that I am aware of and accept my responsibilities as Chief Investigator under Clauses 3.11 –

3.13 of the Research Governance Framework and that this investigation cannot proceed before all approvals required have been obtained.

Signature of Chief Investigator 

Please also type name here: Niall MacKenzie

I confirm I have read this application, I am happy that the study is consistent with departmental strategy, that the staff and/or students involved have the appropriate expertise to undertake the study and that adequate arrangements are in place to supervise any students that might be acting as investigators, that the study has access to the resources needed to conduct the proposed research successfully, and that there are no other departmental-specific issues relating to the study of which I am aware.

Signature of Head of Department

Please also type name here Eleanor Shaw

Date: / /

23. Only for University sponsored projects under the remit of the DEC/SEC, with no external funding and no NHS involvement

Head of Department statement on Sponsorship

This application requires the University to sponsor the investigation. This is done by the Head of Department for all DEC applications with exception of those that are externally funded and those which are connected to the NHS (those exceptions should be submitted to R&KES). I am aware of the implications of University sponsorship of the investigation and have assessed this investigation with respect to sponsorship and management risk. As this particular investigation is within the remit of the DEC and has no external funding and no NHS involvement, I agree on behalf of the University that the University is the appropriate sponsor of the investigation and there are no management risks posed by the investigation.

If not applicable, tick here ☐

Signature of Head of Department	
Please also type name here	
Date: / /	

For applications to the University Ethics Committee, the completed form should be sent to ethics@strath.ac.uk with the relevant electronic signatures.

24. Insurance

The questionnaire below must be completed and included in your submission to the UEC/DEC/SEC:

Is the proposed research an investigation or series of investigations conducted on any person for a Medicinal Purpose? Medicinal Purpose means: ▪ treating or preventing disease or diagnosing disease or ▪ ascertaining the existence degree of or extent of a physiological condition or ▪ assisting with or altering in any way the process of conception or ▪ investigating or participating in methods of contraception or ▪ inducing anaesthesia or ▪ otherwise preventing or interfering with the normal operation of a physiological function or ▪ altering the administration of prescribed medication.	Yes / No

If "**Yes**" please go to **Section A (Clinical Trials)** – all questions must be completed

If "**No**" please go to **Section B (Public Liability)** – all questions must be completed

Section A (Clinical Trials)

Does the proposed research involve subjects who are either: i. under the age of 5 years at the time of the trial; ii. known to be pregnant at the time of the trial	Yes / No

*If "**Yes**" the UEC should refer to Finance*

Is the proposed research limited to: iii. Questionnaires, interviews, psychological activity including CBT; iv. Venepuncture (withdrawal of blood); v. Muscle biopsy; vi. Measurements or monitoring of physiological processes including scanning; vii. Collections of body secretions by non-invasive methods; viii. Intake of foods or nutrients or variation of diet (excluding administration of drugs).	Yes / No

*If "**No**" the UEC should refer to Finance*

Will the proposed research take place within the UK?	Yes / N

*If "**No**" the UEC should refer to Finance*

Title of Research	
Chief Investigator	
Sponsoring Organisation	

Does the proposed research involve:	
a) investigating or participating in methods of contraception?	Yes / No
b) assisting with or altering the process of conception?	Yes / No
c) the use of drugs?	Yes / No
d) the use of surgery (other than biopsy)?	Yes / No
e) genetic engineering?	Yes / No
f) participants under 5 years of age(other than activities i-vi above)?	Yes / No
g) participants known to be pregnant (other than activities i-vi above)?	Yes / No
h) pharmaceutical product/appliance designed or manufactured by the institution?	Yes / No
i) work outside the United Kingdom?	Yes / No

If **"YES"** to **any** of the questions a-i please also complete the **Employee Activity Form** (attached).

If **"YES"** to **any** of the questions a-i, and this is a follow-on phase, please provide details of SUSARs on a separate sheet.

*If "**Yes**" to any of the questions a-i then the UEC/DEC/SEC should refer to Finance (aileen.stevenson@strath.ac.uk).*

Section B (Public Liability)

Does the proposed research involve :	
a) aircraft or any aerial device	Yes / No
b) hovercraft or any water borne craft	Yes / No
c) ionising radiation	Yes / No
d) asbestos	Yes / No
e) participants under 5 years of age	Yes / No
f) participants known to be pregnant	Yes / No
g) pharmaceutical product/appliance designed or manufactured by the institution?	Yes / No
h) work outside the United Kingdom?	Yes / No

*If **"YES"** to any of the questions the UEC/DEC/SEC should refer to Finance(aileen.stevenson@strath.ac.uk).*

For NHS applications only - Employee Activity Form

Has NHS Indemnity been provided?	Yes / No
Are Medical Practitioners involved in the project?	Yes / No
If YES, will Medical Practitioners be covered by the MDU or other body?	Yes / No

This section aims to identify the staff involved, their employment contract and the extent of their involvement in the research (in some cases it may be more appropriate to refer to a group of persons rather than individuals).

Chief Investigator		
Name	**Employer**	**NHS Honorary Contract?**
		Yes / No
Others		
Name	**Employer**	**NHS Honorary Contract?**
		Yes / No
		Yes / No
		Yes / No
		Yes / No

Please provide any further relevant information here:

Participant Information Sheet

Name of department: Hunter Centre for Entrepreneurship, Strathclyde Business School

Title of the study: Scottish Angel investment and state support.

Introduction

Ms Margaret Coughtrie is a PhD candidate in the Hunter Centre for Entrepreneurship, Strathclyde Business School. In her research, she investigates angel investment activities in Scotland and their economic impact. The following participant information sheet has been designed to provide you with more information about her study.

What is the purpose of this investigation?

The main goal of this investigation is to gain better understanding of the levels of state support for angel investment in Scotland, the economic development outcomes of such activities, and .

Do you have to take part?

You are invited to take part in the investigation. Your participation is voluntary. You can refuse to participate or withdraw participation at any time without detriment.

What will you do in the project?

The researcher will conduct a series of open ended interviews with you. All interviews will be conducted separately and each of them should last for approximately 60 minutes. The main subjects of the interview are: angel investment in Scotland, state support for investment, economic development outcomes.

If you are agreeable I would like to record the interview to avoid the need to take detailed notes.

The interviews will be scheduled according to your time and venue preferences in the period from the **1st July 2015 till the 1st of June 2017.**

Why have you been invited to take part?

In this investigation, we are looking to speak to active angel investors in Scotland about their activities, motivations, engagement with state support for investment, and economic development outcomes.

What are the potential risks to you in taking part?

There is no risk involved in this investigation.

What happens to the information in the project?

The confidentiality and anonymity of individuals will be maintained. The data will be reported in an aggregate format (case study). The information received will be used for research purposes and will be presented at project reports, conferences, papers, articles, and in other academic formats. The data gathered will be securely stored.

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 be involved in the project, we will ask you to sign a consent form to confirm this.

If you do not want to be involved in the project, then we appreciate and respect your decision. We are grateful for taking time to get acquainted with the project.

Once you are interested in the results, we will send you the summary of the findings on their completion.

Researcher contact details:

Margaret Coughtrie
PhD candidate
Hunter Centre for Entrepreneurship
131 Rottenrow, Glasgow, G4 0NG, UK
University of Strathclyde
margaret.coughtrie@strath.ac.uk

Chief Investigator details:

Dr Niall MacKenzie
Hunter Centre for Entrepreneurship,
Sir William Duncan Building, 130 Rottenrow, Glasgow, G4 0GE, UK
University of Strathclyde Business School,
niall.mackenzie@strath.ac.uk

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: Hunter Centre for Entrepreneurship

Title of the study: Scottish Angel investment and state support

- 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 and video recorded as part of the project [delete which is not being used] Yes/ No

(PRINT NAME)	
Signature of Participant:	Date: