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Angel diversity – studying the decision making criteria

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Submitted in fulfilment of the requirements for the Degree of
Doctor of Philosophy

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Abstract

Business angels are widely acknowledged as being a key source of risk finance for growth-oriented enterprises. Their importance has become even more significant since the onset of the financial crisis. Research on business angels goes back some 30 years, focusing primarily on two themes: (i) their characteristics and (ii) the investment process.

It has become clear that business angels are not a homogeneous population. Various studies have sought to develop typologies of business angels based on their personal characteristics, competence, motivations, investment approach and types of investment made. However, this stream of research remains limited and has not progressed beyond establishing typologies. Moreover, the possibility that typologies are dynamic, with angels shifting between categories over time remains largely unexplored. Neither has it been considered how different types of business angels approach the process of making investment decisions or managing the post-investment relationship. The aim of this research is to further develop this line of research on angel typologies to explore differences between types of angel investors in terms of their approach to investment, looking in particular, at their decision-making criteria.

This dissertation starts by questioning the methodologies used in research on business angel decision making. In particular, how comparable are results that arise from different methodologies. Using a sample of 51 business angels (21 gatekeepers and 30 individual investors), the findings indicate that the results are methodologically dependent. The next stage used data collected through an online survey with 472 investment decisions made by 238 angel investors. These data were used in the subsequent analysis. Firstly, a two-step cluster analysis procedure was conducted to cluster the investment decisions by the criteria weights. Three clusters were identified. The investment experience and the level of influence of others are both helpful in explaining the differences across groups. Secondly, the cluster membership was used to evaluate if angel investors change their investment criteria. A

logistic model was developed. The results indicate that the likelihood of a business angel's change the investment criteria depend on three key areas: investment specific area (ISA), angel specific area (ASA) and group specific area (GSA).

Keywords: Entrepreneurial finance, business angels, investment decision making, investment criteria, heterogeneity, typology,

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List of papers and publications associated with the thesis

1. Botelho, T and Mason, C. (2013) Methodologies for examining the investment criteria of business angels: A comparative approach. In: Paper presented at Entrepreneurship Summer University (ESU) on Entrepreneurship 2013, Lisbon, August.
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4. Botelho, T. and Mason, C. (2014) Methodologies for examining the investment criteria of business angels: A comparative approach. In: Paper presented at International Council for Small Business (ICSB), Dublin, June.
5. Botelho, T. Mason, C. and Tagg, S. (2015) Can we group business angels who have the same investment criteria. In: Paper presented at 2015 ISBE conference, Glasgow, November.
6. Botelho, T. Mason, C. and Tagg, S. (2015) Do business angels change their investment criteria? In: Paper presented at 2015 ISBE conference, Glasgow, November.
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Norwich, January 2017

Tiago Botelho

Author's declaration

I declare that, except where explicit reference is made to the contribution of others, that this dissertation is the result of my own work and has not been submitted for any other degree at the University of Glasgow or any other institution.

Signature: 

Printed name: Tiago dos Santos Botelho

Chapter 1. Introduction – sources of entrepreneurial finance

Ever since Wetzel's (1981) pioneering study put business angels on the scholarly 'map' the topic has been the target of scholars' attention. The aim of this chapter is to set the context for the study that will follow. First, the discussion will take a step back and look at the entire funding agents in the entrepreneurial finance context. Then the debate will divide the funding environment in two groups: (i) non-business angels (ii) business angels. This will help to set the focus on business angels. Thenceforth, definitional and measurement issues will be raised. The focus of this section is to evaluate if the conventional definition of a business angels is still valid. The subsequent subsection will focus on identifying trends in the angel market and highlighting the importance of these changes in terms of research. A brief review of the initial business angels' studies is then presented with a specific focus on the decision making literature. This will help to direct the discussion to the specific area of the thesis. The final sections will review the overall purpose of the thesis and provide an overview of the succeeding chapters.

1.1 The relevance of entrepreneurial finance

Understanding external finance is extremely important to any entrepreneur attempting to exploit an opportunity. Developing a venture from a simple idea to a growing business needs time and resources. Most likely, at different stages of development, entrepreneurs will need to obtain financial resources from various set of investors. This journey is classically known as the "funding escalator" (Harding and Cowling, 2006; Mason et al., 2013). Harrison (2013) describes a pre-2008 version of the funding escalator, including the: 5F's (family, friends, founders, fans and fools), grants, bank loans, business angels, venture capital and private equity. However, this understanding has changed over the years. The period post 2008 brought other sources of finance into the market which require to be incorporated to

the model, e.g. accelerators, crowdfunding and so on. Additionally, scholars have identified variations in the funding escalator across geographic regions (Gregson et al., 2013). Neck et al. (2004) highlight the importance of capital sources as a necessary element for the development of an entrepreneurial ecosystem. However, this literature does not ask if all sources of capital are equally important, neither will this research. Nevertheless it is important to define an entrepreneurial ecosystem to help in the contextualization of this thesis. Stam and Spigel (2016, pag 1) define entrepreneurial ecosystem as:

"a set of interdependent actors and factors coordinated in such a way that they enable productive entrepreneurship within a particular territory".

Much of the research conducted to evaluate the importance of different sources of capital has taken a supply side perspective. Two key reasons can be offered to justify this approach. First, these source of capital are not suitable to all firms looking for funding (Mitter and Kraus, 2011). Second, there is no directory that allows scholars to easily identify firms that have used a specific external sources of funding. However, the research conducted on the demand side provides clear evidence on the key source of capital for SMEs. These studies conclude that, in the UK, the most significant external source of funding for SMEs are banks, in particular overdrafts (Harvey et al., 2012; Hughes, 1997). Other studies have shown that not all SMEs receive external finance, with the intention of high growth playing an important role on the likelihood of using external finance (Heffernan, 2006; Riding et al., 2012; Vos et al., 2007). However, the 2008 economic recession had important implications in terms of the accessibility of bank finance for SMEs (Jones-Evans, 2015).

The studies that focused on the supply of finance have highlighted the importance of business angels as the key source of external capital at seed and early stage (some examples: Mason and Harrison, 2000a; Sohl, 2003b; Van Osnabrugge and Robinson, 2000; Wiltbank

et al., 2009). This significance is not just a UK phenomenon: research in the USA, Canada, Sweden, Germany, Norway, amongst others (Brettel, 2002; Landström, 1993; Månsson and Landström, 2006; Reitan and Sorheim, 2000; Riding, 2005; Sohl, 2012a) also shown the importance of business angels. As a result, this has prompted, policy makers across the world (OECD, 2011) to focus their attention on designing policies to increase the levels of angel investing (Mason, 2009; OECD, 2011). However, business angels are not the only source of equity available to entrepreneurs. Hence, it is important to review two other key sources: (i) crowdfunding and (ii) venture capital. The following subsection will present a review of the significance of these sources of capital in the alternative finance market.

1.2 Crowdfunding

Crowdfunding is not a new phenomenon. It has been used at different moments in time. An early example of such a practice can be found in the summer of 1885 - the funding of granite plinth for the statue of liberty (Cumming and Johan, 2013). However, the financial constraints generated by the post global financial crises and the technological opportunities opened up by the internet have contributed to the rise of crowdfunding as a popular source of external capital (Harrison, 2013). Mollick (2014) defines crowdfunding as a distinctive type of capital source which derives directly from concepts such as crowdsourcing and micro-finance. But what is crowdfunding? The definition of crowdfunding has evolved from crowdsourcing (Schwienbacher and Larralde, 2012) to reflect the financial nature of the activity. Belleflamme et al. (2010, p. 5) define crowdfunding as:

“an open call, essentially through the Internet, for the provision of financial resources either in form of donation or in exchange for some form of reward and/or voting rights”.

This definition highlights a particularity of crowdfunding – the different types of “compensations” received by investors. There are several variations within the crowdfunding business models. De Buysere et al. (2012) suggest that it is possible to represent the different business models into four types of crowdfunding: donation, reward, lending and equity. These four types are different on a range of dimensions: investment motivations, amount invested, type of funding, etc. (Agrawal et al., 2014). To benchmark crowdfunding to business angels as sources of capital it is necessary to use class of investments. With this in mind, the comparison will evaluate the importance of equity crowdfunding. Two arguments can support this decision. First, the investor motivations/form of return differs across the four types of crowdfunding (Collins and Pierrakis, 2012). In terms of returns, Kirby and Worner (2014) propose that the four models could be grouped by the nature of the expected return: community crowdfunding (donation and reward) and financial return crowdfunding (lending and equity). The returns in the community crowdfunding represent more intangible benefit and/or products while in the financial return crowdfunding are associated to capital gains or interest. Hence, the choice should rely on looking to financial return crowdfunding (lending and equity). Second, what is the type of instrument used in the investment? Angel investors provide loans to their investee companies (Prowse, 1998) although the most typical type of investment is in the form of equity – notably common stocks (Morrissette, 2007). For these reasons, the type of crowdfunding chosen to evaluate its importance is the equity model since it is the most similar to business angels.

The size of the equity crowdfunding market and its importance varies across countries. Much of these differences have been the result of regulatory issues that have delayed the introduction of such mechanisms. An example of this is the equity crowdfunding market in the USA. When compared with Ireland, UK, France the USA market showed lower volumes

than its European counterparts due to the late approval of legislation allowing the use of such a financial instrument (Ahlers et al., 2015). The UK has been recognized as the leading country in terms of level of practices and instruments used (Wardrop et al., 2015). It also leads in terms of levels of amount raised. In 2014, the UK equity crowdfunding market raised more funds than all other European countries¹ combined (Wardrop et al., 2015).

In the UK, from all the different types of crowdfunding, the equity market is the model with the highest average growth (410%) in the period of 2012 to 2014 (Baeck et al., 2014). This represents a growing trend when compared with the average for the period between 2011 and 2013 of 371% (Collins et al., 2013). However, recent figures show that there has been a decline of the growth rate. In 2015, the growth rate has decreased to 295% with the amount invested totalizing £331.64 million with 720 business being funded through equity crowdfunding (Zhang et al., 2016). Similar growth can also be found in terms of average deal size. In 2014, the average deal size was of £199,095 (Baeck et al., 2014) while in 2015 this value increased to £523,987 (Zhang et al., 2016) which represents a growth of 163%. In 2014, 46% of the firms that successfully raised this type of external capital were at seed stage or early stage (Baeck et al., 2014). Therefore, it is possible to understand that in 2014, equity crowdfunding contributed to seed and early stage with £38.64 million. The relative importance of this source of external capital has also increased through time. The weight of equity crowdfunding deals in the overall number of funded opportunities has increased from 0.3% in 2011 to 15.6% in 2015, representing an average growth rate of 236% in the period (Zhang et al., 2016). Hence, equity crowdfunding is of growing significance for UK entrepreneurs in their venture's early stages.

¹ 111 million euros in the UK while the remaining European countries raised 82.6 million euros

1.3 Venture Capital

Another very important source of external equity is venture capital funds. Although there is some evidence to challenge their importance (Rosenbusch et al., 2013), typically, scholars have recognized their financial and non-financial contributions as vital to enhance the entrepreneurial process (for example: Amit et al., 1998; Colombo and Grilli, 2010; Cumming et al., 2007; Faber et al., 2016; Kong et al., 2016). Contrary to what has happened in the crowdfunding industry, the leading country for venture capital funds has been the USA. This is a very established industry with the first example of a venture capital firm, the American Research and Development founded in 1946 (Gompers and Lerner, 2001). Cumming (2012, p. 70) defines venture capital funds as:

“Pools of capital established to make early to late stage investments in private equity...VC funds invest in small private entrepreneurial companies with the expectation of capital gains after an exit outcome such as an IPO or acquisition, often carried out within three to five years after the initial investment.”

Typically, in the USA, venture capital firms just invest a small amount of their funds in seed, start-up and early stage (Parhankangas, 2012). In 2015, expansion (37%) and later stage (27%) were the key stages chosen by USA venture capital firms (Thomson Reuters, 2016). Similar results can be found in the UK (Mason and Harrison, 2002b). Scholars have acknowledged that the existence of a venture capital market is fundamental to the entrepreneurial ecosystem (Cohen, 2006; Malecki, 1997). Their investment in firms like Apple, Google, Microsoft, Starbucks among several others impact the everyday life of the great majority of world population (Kedrosky, 2009). This type of investor is typically concentrated in a small number of financial centres and technologically driven regions (Mason, 2007b). However, this does not necessarily represent a significant problem since

much of the investments are not constraint by geographic proximity (Griffith et al., 2007; Mäkelä and Maula, 2005). For example, in 2012 only 47% of the investments conducted by UK venture capital funds were within national borders (BVCA, 2013). A very similar result can be found across other European countries. An European Private Equity and Venture Capital Association (EVCA) report (2015) shows that European venture capital firms invested €1.102 billion cross-border (within and outside Europe) versus the €2.473 billion of domestic investments. A slightly different situation occurs in the USA market where the vast majority of funds invest within the nation's borders (Thomson Reuters, 2016). Cross border differences in the venture capital industry do not come as a surprise. One could state that this is a normal pattern with alternative sources of funding, as the crowdfunding industry can easily illustrate (for example: Bertoni et al., 2015; Bottazzi and Da Rin, 2002; Ooghe et al., 1991). Hence, to evaluate the importance of such source of capital it will be necessary to focus in a single country. As in the Crowdfunding example the UK market will be taken as the benchmark for the analysis.

The UK is the second most significant venture capital market in the world, behind the USA (Denny, 2000). In terms of importance, venture capital has played a key role in the development of new ventures in the UK (Mason and Harrison, 2002b; Mason and Pierrakis, 2013). Mason and Pierrakis (2013) noticed that, in the UK, since the technological crash of 2000, venture capital investments in early stage has been highly volatile. The authors highlight the recovery in terms of amounts invested by venture capitalists in early stages, albeit a decrease of the weight of this type of investments in the total portfolio. Recent figures show even smaller levels of early stage investments have been made by venture capital firms. Table 1-1 shows a decreasing trend in terms of amount invested in early stages and the weight of this type of investments in the whole portfolio. Three key points can be highlighted. First, the amount invested by venture capital in early stage investments has

decreased from £703 million to £293 million. Second, over the period, early stage investments do not count for more than 11% of the venture capital portfolio. Third, the average number of ventures receiving venture capital funding in the early stages is 422. This indicates that although venture capital firms are investing smaller amounts in early stage these resources are still covering a reasonable amount of ventures. In the period from 2011 to 2014, in the UK, venture capital firms have invested £1.281billion in early stage² investments versus just £117.6 million by equity crowdfunding platforms (Zhang et al., 2016). However, this trend might change in a near future with two factors strongly contributing to this transformation. First, is the decline of the venture capital industry which is seen by the smaller amounts invested at early stages. Second, is the fast growth of equity crowdfunding (Salomon, 2016). But without a shadow of a doubt, venture capital funds have been an important driver for new ventures in the UK and across the globe.

Table 1-1: UK venture capital early stage investments, 2000 to 2014

	Total early stage (£, millions)	Total early stage (n)	Average size of early stage investment (£, thousands)	% of early stage investment in the portfolio
2000	703	409	1719	11.00%
2001	390	408	956	8.20%
2002	295	398	741	6.60%
2003	263	427	616	6.50%
2004	284	454	626	4.20%
2005	382	493	775	5.60%
2006	946	500	1892	9.30%
2007	434	502	865	3.60%
2008	359	455	789	4.10%
2009	454	365	1244	9.48%
2010	313	397	788	3.76%
2011	347	405	857	5.30%
2012	343	431	796	5.95%
2013	298	375	795	7.07%
2014	293	320	916	6.21%

² BVCA classification of early stage includes: Seed, Start-up, Early Stage and Later stage VC.

1.4 Business Angels

Business angel investors are a further possible funding sources for early stage new businesses, with their importance in the seed and start-up stage being commonly acknowledged by the academic and practitioner community (Sohl, 2015b). In the USA business angels are recognized as the key source of early stage capital making ten times more investments than venture capital funds (Sohl, 2012a). The recent financial crisis has created greater credit constraints for entrepreneurs. The business angel community has shown clear signals of being less sensitive to economic cycles, increasing the levels of investment activity since the global financial crisis (European Business Angels Network (EBAN), 2016; Mason and Harrison, 2015; National Angel Capital Organization (NACO), 2015; Sohl, 2012b). Therefore the scarcity of resources associated with a crisis makes it crucial for entrepreneurs to engage with the angel community in the best way possible.

1.4.1 Defining a Business Angel

But who are these business angels? In recent years several definitions have been presented. Wetzel (1981) offered the first definition of business angels:

“Investors who provide risk capital other than small business investment corporations, venture capital, other institutional investors, and public equity markets; those with high net worth and financially sophisticated; excludes family, friends and debt instruments”.

From this point onwards the definition has been the subject of debate and change. The first concern is the time frame. Some authors restrict the definition to a period of time. So, for example, only active investors who had at least completed one investment in say the last three years should be considered to be a business angel (Fiet, 1995a; Van Osnabrugge, 1998a). Second, family and friend investments were included in some definitions (Gaston,

1989; Haar et al., 1988; Lumme et al., 1996; Tymes and Krasner, 1983). Third, some of the subsequent research included a broader set of financial instruments. The authors of these studies (Aram, 1989; Sullivan and Miller, 1990) added the possibility of investments through debt not only done with equity. The definition that will be used throughout this research builds up on the one presented by (Mason, 2007a).

Business angels are high net worth individuals who invest their own resources, financial and non-financial, in unquoted companies in which they have no close relation, motivated by the possible financial return resulting from value added activities.

Looking in detail at this definition six points need to be highlighted. The first is high net worth individuals. Gaston (1989, p. 14) observes that “the median net worth of the typical Angel is \$750,000”. Coveney and Moore (1998) identify that UK business angels invest on average £113,000. To be able to invest and bear the risk associated with these early ventures, angel investors need to have large amounts of available financial resources. This is consistent with the definition of Decreasing Absolute Risk Aversion (Friend and Blume, 1975), that is, agents are willing to take more risk as their level of wealth is higher. Secondly, the investment of financial resources is made using personal assets, contrary to venture capital funds which invest other people’s money. Even though governments have been more actively involved in the creation of incentive schemes (Aernoudt, 2005; Mason, 2009), business angels always have to invest their own finance and bear the corresponding risk.

Thirdly, angel investing includes the investment of non-financial resources, this comprises all non-monetary resources that a business angel can provide to an investment, e.g., time, energy, knowledge, contacts, etc. However, these resources are not always invested in every investment, particularly in the case of investments done within syndicates where angels can

have a more passive role. Although some of these resources can also be provided by consultants and mentors, business angels have a much more important role. Previous research has showed that angel investors had an extended involvement in the activities of the invested venture and serving as mentors to the entrepreneurs (Amatucci and Sohl, 2004; Mason and Harrison, 1996a). Politis (2008) identifies ‘four different value added roles’ angels can have. Mentoring is just one of four roles that they can undertake³.

Fourthly, business angels do not invest in publicly traded companies. Rather they choose to make investments in unquoted companies that will be illiquid for several years. Why do they prefer this liquidity constraint instead of investing in the stock market? Several scholars have presented empirical evidence that business angels are former successful entrepreneurs or at least have some entrepreneurial experience (Brettel, 2003; Gaston, 1989; Hindle and Lee, 2002; Landström, 1993; Mason et al., 1991; Suomi and Lumme, 1994; Tashiro, 1999; Wetzel, 1981). They use angel investing to derive psychic income by experiencing the emotions of being involved in an entrepreneurial context. Additionally, business angels consider their investment as a very specific asset class that has a unique risk/return combination.

Fifthly, typically, business angels invest motivated by the possibility of financial gains unlike family and friends who want to support a loved one. Helping relatives and friends was not very significant for angel investors (Brettel, 2003). Hence, investments in ventures from which the investee has a close relation with the entrepreneur are not considered business angels investments. Lastly, angels expect to be able to influence the value of their

³ Sounding board/strategic role, supervision and monitoring role, resource acquisition role and mentoring role.

investments as a result of their value added activities. Several authors (Ardichvili et al., 2002; Freear et al., 1995; Harrison and Mason, 1992b; Lumme et al., 1998; Mason and Harrison, 1996a; Stevenson and Coveney, 1994; Tashiro, 1999) show that angel investors add value via the numerous roles they can undertake in a venture.

This discussion has contributed to an evaluation of the suitability of the suggested definition of business angels. However, two points should be added to the debate. First, the alternative finance industry has changed since the 2008 crisis forcing business angels to adapt (Mason and Harrison, 2015). But how does this change impacts the definition of business angels? Similarly, to ask, is this definition still valid? How up to date is this characterization? Second, the angel population is known by its lack of homogeneity (for example: Avdeitchikova, 2008) which can have significant repercussions on the appropriateness of the definition. Do all angels fit this definition? The next two subsections will address these two issues.

1.4.2 Has the definition stood the test of time?

This thesis is suggesting a definition of business angels. However, the financial markets are constantly evolving, especially following the financial crisis. The next two subsections will identify recent trends within the angel market and then evaluate the importance of business angels as an external source of capital. The overall purpose of these subsections is to evaluate if alterations in the marketplace could represent significant implications in terms of the way business angels are defined.

1.4.2.1 Trends

Since Wetzel's (1981) early studies, the angel market has changed considerably across the world. From a very individualistic and under the radar approach to a more collective and visible style, business angels have changed the way they are seen (some examples: Gregson et al., 2013; May, 2002; May and O'Halloran, 2003; Preston, 2011). Would Wetzel envisage business angels to be so popular that they would have a television show focusing on their investment activity, e.g. Dragon's Den or Shark Tail? Most likely, the pioneer of angel research would not have expected this outcome. However, the trends in the angel market go beyond the rise of groups. Issues of market size and scale as well as investment practices (such as: yield rates, exits, sectors and so on) should also be discussed to provide a clear view of trends in the angel market. This discussion is important to help evaluate if business angels still behave in the same way. However, this is not the only reason to have this debate. The evolution of the angel market adds new dimensions to angel research creating new questions to be addressed by scholars. This subsection will focus on the first part of the discussion.

The original angel groups were founded in the early 1990s. The first record of an angel group is Archangels, which was founded in 1992 in Scotland (Gregson et al., 2013). In the USA, California angel group (Sohl, 2012a) represents the oldest group in the country. However, angel groups are not the only form of collective behaviour of informal investors. Sohl (2007) defines six types of angel portals: (1) matching networks; (2) facilitators; (3) informal angel groups; (4) formal angel alliances; (5) electronic networks; and (6) collection of individual angels. The author highlights that the six types of angel portals are quite diverse in terms of process, visibility, objectives, etc. Figure 1-1 depicts the two extremes in terms of formality, size, goals and effectiveness.

Figure 1-1: Angel portals

Low 1 Individualistic	<i>Formality</i> <i>Size</i> <i>Goals</i>	High 3 up to 300 Collectivistic
Low	<i>Effectiveness</i>	High
Individuals	Facilitators	Formal angel alliances - Angel groups
	Informal collections of business angels	
	Matching networks	
	Electronic networks	

This has been a global phenomenon with similar examples in Europe, Australia and so on (OECD, 2011). Three immediate questions that can be raised about this market development: (i) Why did business angels started to invest within groups? (2) What are the implications of this trend? (3) What is the impact on the definition? The discussion will look at angel groups specifically, since all the data collected in this thesis had the support of such organizations.

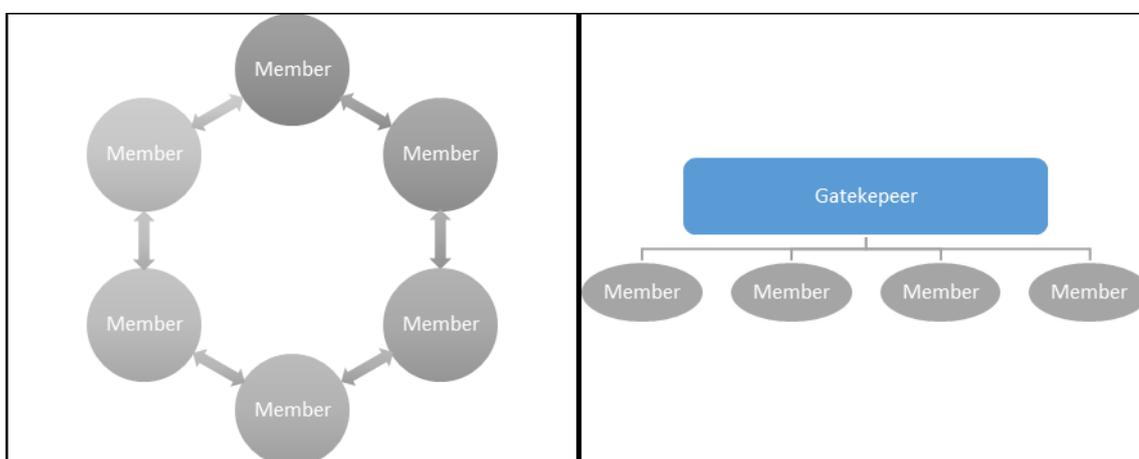
The most significant type of portal are angel groups. Five reasons can justify the proliferation of angel groups across the world. Firstly, they have deeper pockets (Gregson et al., 2013). By investing together business angels are able to raise bigger amounts than if they were investing individually. Secondly, they can undertake better due-diligence (Paul et al., 2007). Angel groups allow members to have access to opportunities that have been reviewed by several investors – enhancing sector specific expertise. Thirdly, angel groups have reduced costs (Mason et al., 2013). By investing together, business angels are able to enjoy economies of scale that otherwise would not be possible. This is particularly true in terms of contracting. Fourthly, groups attract enhanced deal follow (Mason and Harrison, 2002a). On the one hand, the visibility of angel groups facilitates entrepreneurs to make their opportunity noticed. On the other hand, angel investors have their own network, which generates

investment opportunities. Being part of an angel group enables investors to share these opportunities across the group. Lastly, groups offer the ability to share risk through greater diversification (Paul et al., 2007). When investing as part of a group, business angels can spread their finance across different opportunities resulting in a greater portfolio diversification. All of these factors have largely contributed to the proliferation of angel groups as the most common type of angel portal.

The emergence of angel groups has definitional repercussions. The first, is the appearance of a new player, the gatekeeper. Paul and Whittam (2010, pag 252) define the gatekeeper as: *“The key individuals who operate at the core of angel syndicates and link the internal resources of the syndicate to its external environment”*.

Paul and Whittam (2010) notice that there are two types of gatekeepers: member gatekeepers and manager gatekeepers. Figure 1-2 depicts the typical organizational structure associated to these types of gatekeepers. The authors relate these two types of gatekeepers with the stage of development of the angel group. While the member gatekeepers are associated with earlier stages of the angel group, the manager gatekeepers are linked to later and more demanding stages of the group development.

Figure 1-2: Types of gatekeepers (member and manager gatekeepers)



Typically, the decision of allowing entrepreneurs to have access to the group will come as an outcome of the gatekeeper's screening (Mason et al., 2013). The group members then make their own evaluation (Paul and Whittam, 2010). The existence of a gatekeeper therefore does not seem to affect the suggested definition of a business angel. The roles undertaken by the gatekeeper do not change the nature of angel investing. The gatekeeper can be seen as an additional screening layer in the investment process. Second, typically, at the post-investment stage angel groups nominate one of their members to be a non-executive director on the board of the invested venture (Paul and Whittam, 2010). However, the gatekeeper can also take this role to facilitate the communication between the venture and members of the group. At the first glance, this seems to have implications to Mason's (2007a) definition in terms of the value added activities. Although, not all investors will be able to contribute with value added activities, there is at least one group member that will provide non-monetary support. Hence, it is possible to state that market trends do not impact Mason's (2007a) business angel definition which means it is still valid.

However, this does not mean that the emergence of angel groups has no research implications. The contextual change involving the rise of angel groups might be expected to add a collective dimension to angel investing. On one hand, it is probable that this market transition will have a direct impact on the investment process, particularly in terms of investment decision making. On the other hand, it could be envisaged that the interactions between group members to have an impact on individual behaviour. Hence, it is important to outline the possible impacts of recent market trend which can go beyond definitional implications.

Starting at the macro level, that is, at the group level, investing with others might generate a feeling of group identity from which can emerge common practices arising from the shared interests and investment motivations. This in turn can generate: (i) mutual engagement between members; (ii) a feeling of joint enterprise and (iii) a shared repertoire. Wenger (1998) defines these three sources of practice as the pillars of a community. Hence, a possible outcome of the rise of angels groups is the origination of communities of practice. Lave and Wenger (1991, p. 98) define community of practice, as:

“A system of relationships between people, activities, and the world; developing with time, and in relation to other tangential and overlapping communities of practice”.

Also at a macro level, it is possible that angel groups will have a considerable impact in terms of group thinking. Wenger (1998, page 125) noticed that one of the characteristics of communities of practice is the “shared discourse reflecting a certain perspective on the world”. This shared view can be associated with a common way of thinking. Angel groups will provide its members with the opportunity to work together sharing their ideas allowing collective thinking to occur. Ringer (2007, page 135) defines collective thinking as:

“The meeting of minds where each person retains his/her individuality and at the same time contributes to a lively and diverse group-level conversation”.

Mason and Botelho (2014) observed that the size of angel groups in the UK varies from 3 members to a couple of hundred investors. Additionally, the authors highlighted that under this settings, personal differences can occurs within an angels group. In particular, it might allow for situations where strong characters can impact other investors with repercussions to the group dynamics. Wenger (1998) noticed that in communities of practice, members can have harmonious or conflictual relationships. This can create situations where some

individuals will be more susceptible to be influenced by others, specifically in terms of the investment decision. Hence, at the micro level, that is, at the individual level, investment decisions might be influenced by others when investing alongside others. This has been defined in the finance literature as herd behaviour (Cont and Bouchaud, 2000). Gale (1996, page 618) defines herd behaviour as the action that occurs when:

“Agents ‘ignore’ their own information and imitate the behaviour of other, supposedly better informed, agents”.

Therefore, scholars need to acknowledge that the context of angel investing has changed, which opens the field to a new body of theory that includes the effect of others. Theory needs to reflect this new context by allowing external influence, beyond the entrepreneur, to impact the investment decision of a business angel, notably the gatekeeper or others investors. One of the aims of this thesis is therefore to evaluate to which these theoretical frameworks have become important to represent the investment decision making of business angels. With this in mind, the discussion can move to the how important are angel investors in the alternative finance context.

1.4.2.2 Importance

Since it first attracted their attention, scholars have sought to understand the importance of business angels. This has been challenging because of data limitations. Estimating the size of the angel market is not an easy task. However, the lack of precise data has not stopped scholars from seeking to evaluate how relevant business angels are to the entrepreneurial ecosystem. Some of these attempts have looked at what is known from the visible market (i.e. portals) and then tried to extrapolate the size of the invisible market assuming a fixed

relation between both (Mason and Harrison, 2000a). However, qualitative evaluations can also help us to understand the importance of business angels. First is the popularization of the concept. In the last decade business angel activity has attracted growing interest from the media with the extreme example of this being television shows such as Dragon's Den and Shark Tail. Second, policy makers have focused their attention on creating incentives to increase the number of angel investors across the world (some examples: Lerner, 1998; Mason and Harrison, 2002a; Morrissette, 2007; OECD, 2011). In the UK a very renowned example of such type of intervention is the Enterprise Investment Scheme (EIS)⁴ (Gregson et al., 2013; Mason and Pierrakis, 2013). Another perceptible example of government efforts are the public sector co-investment schemes (Harrison et al., 2010a; Mason, 2009). These qualitative observations are helpful to signal the importance, however, a review of quantitative approaches is fundamental to allow for a better evaluation of the importance of angel investors.

Without a shadow of a doubt, business angels play a very important role in the financing of new ventures. There are two quantitative approaches that can be taken to evaluate this importance. The first compares business angels with other sources of funding, e.g. venture capital funds or crowdfunding platforms. Although it is impossible to precisely define the values invested by business angels there is a body of literature that has sought to compare the importance of different investors. Numerous studies have highlighted the importance of business angels when compared with venture capital firms (Pierrakis and Mason, 2008; Sohl, 2008). In the USA it is believed that almost 80% of seed and start-up investments in high tech firms are made by business angels (Sohl et al., 2000). Their significance is not exclusive to the USA. Studies in the UK have noticed a very similar relation between the angel market

⁴ Another tax-incentive is the Seed Enterprise Investment Scheme (SEIS), it was implemented to complement the existent Enterprise Investment Scheme (EIS).

and the venture capital industry. It has been estimated that business angels annually invest between two to five times more than venture capital firms (Wiltbank, 2009; Don and Harrison, 2006). The differences can also be noticed in terms of the number of companies funded. A USA study stated an even higher relationship: for each venture capital backed opportunity there were six financed by angel investors (Fenn and Liang, 1998). In the UK, in 2014 venture capital firms supported 320 ventures while the visible angel market supported 535 ventures (EBAN, 2016). This significance can also be noticed in terms of the number of jobs created. For example, in the USA, in 2007 it is estimated that two hundred thousand new jobs were created as a result of angel investments (Sohl, 2008).

The second indicator evaluates the total amounts invested by the angel market. As previously mentioned this does not come without limitations. However, this approach provides an objective measure of the financial commitment of business angels. An OECD report (2011) estimated the size of the angel market in four different regions (see table 1-2 for more details). Although these figures can be seen as out of date, they help to illustrate that in terms of size, the angel market is much in line with venture capital funds. The 2015 figures on the USA show a total market size of \$24.6 billion, which represents a yearly growth of 1.9% (Sohl, 2015a). The most recent statistics compendium from EBAN estimated that the total size of the angel market in Europe to be €6,1 billion (EBAN, 2016). The same report highlighted that the total size of the European early stage investment was €8,6 billion. This indicates that in Europe, business angels are responsible for 71% of the total early stage finance, with the UK being the leading country in terms of amount invested (€960 million). Although these values should be questioned, there are no other reliable alternatives to these estimations. Hence, it is clear that no matter what is the relative position business angels play in terms of the funding escalator, they are a very important source of external capital for new ventures.

Table 1-2: Total size of the angel and venture capital market.

USD millions

	Estimated size of the total angel market	Total venture capital market in 2009
United States	17,700	18,275
Europe	5,557	5,309
United Kingdom	624	1087
Canada	388	393

Source: OECD (2011).

1.4.3 Are business angels homogenous?

Angel research has a number of well acknowledged limitations. However, one of the least explored is the heterogeneous nature of the angel population (Mason and Harrison, 2002a). This lack of homogeneity is reflected in a set of dimensions where angel investors differ, e.g. levels of familiarity with techniques of investing to the entrepreneurial experience or even the motivation to invest. One solution for this last limitation is to apply a cluster analysis, also known as market segmentation. This technique is largely used in the field of marketing and consists of creating homogeneous subsets of a bigger heterogeneous set. Peter and Olson (1987) used this method to divide similar consumers in a particular market. This practice is particularly robust and can be used with a wide range of units of analysis/criteria, i.e. demographic, age, gender, volume and so on.

From Gaston's (1989) early study onwards, a series of articles have categorized business angels using different units of analysis (investor, investments) and distinctive clustering rules (investment experience, investment motivations, contributions to the project, time

spent with the opportunity and so on) (some examples: Avdeitchikova, 2008; Lahti, 2011; Sullivan and Miller, 1996). This will be further developed in the fifth chapter of this thesis with a discussion of this body of literature. But at this point it is imperative to highlight the heterogeneity of business angels and consider the definitional implications of such characteristic. Scholars have put their best efforts to understanding the relevance of this problem and to reach to an analysis that satisfactorily explains the differences in the angel population. However, as scholars change the units of analysis, new classifications appear, adding novel questions. Hence, it is urgent to have a robust answer that could unify all of these previous works and bring a more suitable answer to this problem.

Previous categorization studies reinforce two key ideas. The first is that scholars cannot assume that business angels can be seen as a whole one population without any discrepancies between them. The second is that a business angel definition needs to be broad enough to incorporate all of these subsets of the angel population. Hence, the suggested definition can be considered as comprehensive since it does not try to explain the variations across the angel population.

This last subsection provides an answer to the second question, evaluating how comprehensive the definition suggested in this thesis is. With this, the debate on the definition of a business angels is closed, which allows the thesis to move to debate what is known about business angels and then how they make their investment decisions. These two sections should enable the reader to understand the evolution of this area of research as well as understand the position of this thesis within two bodies of literature: (i) investment decision; (ii) categorization studies.

1.4.4 What do we know about Business Angels?

The next two sections will review the literature on: (i) first and second generation of business angel research; (ii) investment decision making process. The aim of these two sections is to provide a very general overview of what is known about business angels and how they make investment decisions. These short reviews of the literature will take a chronological perspective to illustrate how angel research has developed and to help to position the thesis in terms of the gaps identified in the literature.

1.4.4.1 First and second generation studies

To understand business angel research we have to go back to the early 1980s, to the first ABC-study (attitudes, behaviours, characteristics) conducted by Wetzel (1983) in New England. This work offered the first insights about business angels. Subsequent research has sought to broaden the perspective, conducting efforts internationally; studies were taken in: UK (Mason et al., 1991), Canada (Riding and Short, 1988), Sweden (Landström, 1993), Germany (Brettel, 2003; Stedler and Peters, 2003), among others. These studies were classified as first generation studies. Their focus was on the demographic aspects of business angels (Mason and Harrison, 2000b). This could instead be defined as the ‘profiles of private investors’. The focus of these studies was to determine the characteristics of business angels and to identify their activities and roles.

The great majority of business angels are male. Although the proportion changes among studies (some present less than 95% of men whilst others reaching 95% of the business angels being men (Gaston, 1989) there is a common view that women represent just a small part of the business angel population. The lack of women with experience in senior business

positions and lack of entrepreneurial expertise can justify this point. In terms of age, the representative business angel is middle aged in the 45-60 years age group. Gaston (1989, p. 17) states that the median value is 47 years old. He defends that “angels are generally about 20 years older than the entrepreneurs they finance.” This is justifiable because business angels need to accumulate resources, financial and non-financial, which takes time. Although the length of time required to generate this stock of resources is not constant among business angels, it is clear that it is a ‘necessary evil’. This length is not constant and it can depend on external factors, e.g., country where business angels are based (Landström, 1993).

Gaston (1989) emphasizes the fact that 83% of the business angels had entrepreneurial experience. Bygrave (2009, p. 172) also supports this idea “Most of them are wealthy entrepreneurs; some are still running their businesses, while others are retired.” This entrepreneurial experience is what makes angel investors almost a unique tool for entrepreneurs. Freear et al. (1992) reinforce this idea stating that the expertise gathered by them in previous ventures as entrepreneurs makes them aware of how to assess the strengths and weaknesses of an investment and how to add value to these investments. Most of the time, personal friends and business acquaintances are the first source to point to potential investment opportunities (Gaston, 1989; Riding and Short, 1988). Business angels think that they are the most reliable information source and as a result they are also the most frequently used reference.

These studies were very important because they called attention to these risk taking agents (business angels) and enabled scholars to establish the fundamental foundations for what would come next. Hence, this first generation of angel research can be understood as fundamental – without it scholars would be still clueless about this type of investor. Second

generation studies could rely on the previous work and aim to clarify the missing pieces. Now scholars could put their efforts on going beyond understanding business angels, with more rigorous research designs that sought to improve the quality of the data collected using more robust methodologies that would enable more valid and reliable results.

Second generation studies of business angels shifted the attention in the direction of how the informal venture capital market operates. This new collection of studies looked deeper into the investment process and the topics under discussion became broader. After the first generation of research it was time to move onwards and understand their process in detail.

Mason and Harrison (2000a) suggest that these studies can be separated into three distinctive groups. The first collection of papers reports on a new series of topics trying to identify the practical processes of the informal venture capital market. The second group concentrated on policy issues, that is, how governments could help the informal venture market to grow. The last set of papers introduced a new theoretical perception to the field. The first group of papers looked into business angels' investment process. It is possible to segment these studies by the following areas: personal portfolio allocation (Mason and Harrison, 2000a), the investment decision making process (Clark, 2008; Feeney et al., 1999; Haines et al., 2003; Landström, 1998; Mason and Harrison, 1996a, 2003; Mason and Rogers, 1996, 1997; Mason and Stark, 2004; Paul et al., 2007; Riding et al., 1993; Sullivan, 1994; Van Osnabrugge, 2000), negotiation and contracting (Kelly and Hay, 2003; Mason and Harrison, 1996b), post investment relationships (Avdeitchikova, 2008; Ehrlich et al., 1994; Freear et al., 1995; Harrison and Mason, 1992b; Kelly and Hay, 2003; Landström, 1992; Madill et al., 2005; Mason and Harrison, 1996b), returns (Lumme et al., 1996, 1998; Mason and Harrison, 2002b, 2004) and a more general area (Freear et al., 1995; Mason and Harrison, 1996b,

2002a). The emphasis of these papers was to understand the what, the why and the how business angels made their investment decisions. One point from these works should be highlighted. For example, in the initial stage of the investment decision making process, scholars identified a high rate of rejection of investment proposals being considered. The reasons for these can range from the inability of the entrepreneur to sell him/her and their project. Clearly, from all of the five stages (Haines et al., 2003; Riding et al., 1993) of the investment process the initial stage was the one that got the most attention from scholars.

In the second group of papers, policy issues, some areas can be underlined, e.g., incentive policy options (Lumme et al., 1998; Mason and Harrison, 1995; Wetzel, 1987; Wetzel and Freear, 1996), business angels networks (Blatt and Riding, 1996; Harrison and Mason, 1996a, 1996b). Kelly (2007) noticed that policy literature helped governments to understand that they should use tax reliefs as a tool to incentivize angel investments. The author noted that this was particularly the UK case with the work of Harrison and Mason. These articles depict a positive outcome to business angels from networking that would improve substantially the informal venture capital market. Another very interesting result is that although governments encourage business angel's investments it seems that it has low effect since the problem is on the demand-side with a majority of low quality opportunities.

The last group of papers brought a theoretical approach that was not common in this research area. Until this innovative cohort of articles just a few scholars had presented theoretic support to their research. All of these papers tried to explain the relation between the entrepreneur and the business angel. It is important to notice that some authors explored this relationship from different theoretical viewpoints, e.g., conceptual decision making process, agency theory, social capital and signalling theory. The first theoretical viewpoint was

discussed by Landström (1995) that defined a set of hypotheses applying elements of decision theory to explain the decision making process. Feeney et al.'s (1999) work follows the same theoretical viewpoint but looking in detail at the acceptance and rejection criteria used by business angels.

The main approach has been the application of agency theory to explain the relation between the angel investor and the entrepreneur. For this it is important to bear in mind that contracts are incomplete and are structured in a world with asymmetric information. This economic theory focuses on the relationship between a principal (angel investor) and the agent (the entrepreneur) and how they both will act rationally, each trying to maximize their own utility function. The principal will have to align incentives to ensure that the agent will act in the principals' best interest and for this he/she will incur agency costs.

Landström (1992, 1993) tested this theoretical approach with firms that had received angel investment. Constructing a set of hypothesis the author reaches the conclusion that agency theory is not the best approach to explain this association. He defends this result with the lack of capacity that this approach has to explain trust based relations and proximity between agents. Fiet (1995a, 1995b) analysed both agency risk and market risk, comparing venture capitalists and business angels. The author concludes that venture capitalists and business angels rank these risks in different ways. Venture capitalists are more concerned about market risk whilst angel investors rely on the entrepreneur to minimize this risk. Consequently, business angels will be more concerned with agency risk since they depend on the entrepreneur for the success of the venture. This result can be explained by the different levels of control that each type of investor requires. Fiet (1995a) noticed that venture capital funds have gained the experience in designing contractual obligations that

can protect them from agency risks while angels cannot. Van Osnabrugge (2000) calls attention to the fact that contracts are incomplete implying a higher involvement from the business angel. This level of involvement will help align the agent interests to those of the principal. Kelly and Hay (2003) surveyed 106 UK-based business angels with completed deals and conclude that agency theory is relevant. The authors emphasize the positive relation between the amounts of resources invested and how concerned will be the investor. The authors also support Landström (1992) evidence that interpersonal ties and trust can offset the economic reasons.

The next set of articles present social capital as the theoretical framework. This framework has clear links with this research area. Both entrepreneurs and business angels have to create and maintain their network. This will make them better professionals enabling them to develop their venture and investments correspondingly the best way possible. Kelly and Hay (2000) discuss the nature of the search process for an investor and how they rely on their network to find the best investments. This paper emphasizes how important is the network for an investor eager for a good deal.

Politis and Landström (2002) look at the business angel's career. The first stage of this career would be as an entrepreneur. This stage would allow the future potential business angel to start developing the necessary expertise and network needed in the future. Sørheim (2003) disaggregates social capital into its structural, relational and cognitive dimensions. This paper analyses the pre-investment behaviour of experienced business angels in Norway. The author concludes that the business angel's track record will define the ways he/she operates in the market. This is clear when looking geographically. Typically a business angel will invest in a region where they have acquired most of their experience. Based on the interviews

done with five angel investors Sørheim suggests that business angels think it is fundamental to create a 'common ground' with the entrepreneur. This 'common ground' is fundamental to create trust that consequently will help to build long term relation.

Sætre (2003) underlines the importance of previous experience and network that the business angel has to the investee venture. This research looks from the entrepreneur perspective and suggests the use of the term 'relevant' capital. This concept defines the 'added value' capital that a business angel can deliver to the venture that received his/her investment. Carter et al. (2003) use this theoretical structure to explain the likelihood of raising equity. This study highlights the importance of a social network for a female entrepreneur.

An alternative theoretical approach was offered by Prasad et al. (2000). This paper explores the idea that both the entrepreneur and the business angel will provide signals. These signals will provide the counterparty with information. This information could be about the entrepreneur or about the project. The authors discuss the signal that the entrepreneur can provide to the business angel given the proportion of his wealth invested in the venture. This signal will inform the business angel about the commitment of the entrepreneur and the quality of the project.

The claims for the use of strong theoretical frameworks made by scholars assume that the first two generations of angel research were able to depict a clear picture of the investors and of the investment procedures. However, this is a very simplistic view since it ignores the market dynamics and the transformations that can occur in the marketplace. Moreover, the early studies always looked at the investor in a static way not allowing for any alteration in partners and behaviours. Hence, it is important to acknowledge that although some areas of

angel research are fully developed and have less propensity to generate new knowledge, there are others that are more likely to change with the market dynamics, notably the investment decision making process. The next subsection will review this body of literature.

1.4.4.2 Initial thoughts on investment decision making of business angels

There is a substantial body of literature that has tried to understand the decision-making process and the criteria used by angels. It is fundamental to comprehend the process and the reasons ‘why’ angel investors decide to support a particular venture. The decision whether to invest or not is based on a specific set of investment criteria. Angel investors invest their own money on their own behalf facing the full consequence of these decisions. A key focus for research has been to understand the criteria used by angel investors. Studies with this particular focus can be organized into three groups: process studies, criteria studies and comparative studies with other types of investors.

Several models have described the investment process both for business angels (Haines et al., 2003; Riding et al., 1993) and for venture capital funds (Fried and Hisrich, 1994; Tyebjee and Bruno, 1984) as being a five or six stage process model. Although the models are relatively similar, Van Osnabrugge (2000) highlights that the investment models of these two types of investors should not be seen as equal. The second chapter will review this literature in detail highlighting the differences. Applying agency theory the author shows the differences between them. Supported by these differences the author concludes that the decision-making process and the criteria are most likely to be different. These decision making models defend that both types of investors make their decisions through several

stages of the process. This brings into question the possibility of the decision-making process changing during the process.

The first stage of the investment process is Deal Origination where the business angel becomes aware of the investment opportunity. According to the model suggested by Riding et al. (2007), business angels make a quick assessment of the opportunity, what is seen as an initial screening. The typical outcome of these initial stages is not positive for the entrepreneur. Riding et al. (1993) show that the average rate of rejection in this first stage is of 70%. One of the reasons for high rejection rate is how the angel got to know this investment opportunity. There are several ways business angels can reach out to these business proposals. Van Osnabrugge and Robinson (2000) present ten possible ways for entrepreneurs to find business angels. As mentioned before, business angels trust some sources of information more than others (Gaston, 1989; Riding and Short, 1988). Therefore, business angels will be more receptive to proposals from some sources. Riding et al. (1997) show that proposals referred by 'better' sources of information have lower rejection rates. Rejection seems to be the most common outcome in this process Riding et al. (1993) documented that Canadian private investors had high rejection rates, with approximately 90% of the projects rejected by business angels when analysing the first two stages of the investment process. These two initial stages are the ones that were deeply researched and are the ones with the highest rejections rates.

Angels are very sceptical when they start assessing a business proposal. The first consideration is to test how much the proposal suits their investment criteria. Mason and Rogers (1997) stress some of the possible factors that will be taken into account by business angels, i.e., location, nature of the business, amount needed and so on. The authors also

emphasize that business angels will want to know if they know the industry, market or technology and if they can add value to the project. Hence, business proposals will have to satisfy a set of conditions. Mason and Rogers (1996, 1997) define this approach as ‘three strikes and you are out’. This is a clear sign that angel investors are looking for reasons to reject the business proposition instead of looking for its strengths. Moreover, the authors identify that business angels evaluate business proposals with a ‘negative mind set’. This was corroborated by Mason and Harrison (1994) researching an investor syndicate which rejected the majority of investment proposals; only two were not rejected after the syndicate conducted its own evaluation. All of these studies support the conclusion that usually investment proposals are rejected at an early stage due to a cumulative number of deficiencies.

By this point it becomes clear that business angels have a very negative approach in the first stages of the investment decision process. But, do they use the same criteria to reject and to accept? And is there any variability of criteria as the investment process develops? The first question is answered by Mason and Harrison (1996a, 1996b) research. Their research provide some evidence that the criteria are not the same. On the one hand, in their 1996b work, they reached to the conclusion that business angels looked in detail at the characteristics of the entrepreneur and the market-product aspects of the business to finance a project. On the other hand, in their 1996a article they noted that ‘the most common deal rejection factors are associated with entrepreneur/management team, marketing and finance⁵, hence it seems that the rejection factors are broader than the acceptance factors. Feeney et al. (1999) explored this discussion in more depth. First, they confirmed that the overall business opportunity and the principals of the company are the key investment

⁵ Riding et al. (1997) also mentioned that if Business angels notice any shortcoming in Management Team of the business opportunity provoked the majority of refusals

criteria. Second, the authors found that what stimulates business angels to reject business proposals is not the converse of what stimulates them to invest.

Mason and Harrison (1996a) work also answers the second question. The authors confirm that the decision criteria changes through the different stages of the decision process. At the initial review stage the criteria tended to be on the basis of the accumulation of a number of deficiencies rather than just for a single reason. Business angels would reject an opportunity after further research when they found out a single deficiency, what the authors called a 'single deal killer'. Riding et al. (1997) also support this finding. They go deeper in the analysis concluding that business angels use criteria that gives different weights across stages. Also, the importance of the entrepreneur and of the financial return increases as the process unwinds⁶. A large number of articles answer the second question. For example, Harrison and Mason (2002), Fiet (1995a) and Van Osnabrugge (2000) show that angel investors accentuate the entrepreneur/management team characteristics more than the product or service itself. Some authors also call attention to the importance of trust in the decision process; Manigart et al. (2002) and Kelly and Hay (2003) show that trust needs to be built up during the process.

Some scholars also compared the investment decision process among several types of investors. One of the most cited papers is the one conducted by Mason and Stark (2004). The authors match the decision making process of bankers, venture capitalists and business angels. The authors conclude that business angels are the ones that give more importance to 'investor fit' and to the entrepreneur. Bankers are more worried about the financial issues.

⁶ Maxwell et al., (2011) present some evidence that contradicts this finding; they show that Business Angels use Elimination-by-aspects (EBA) to trim the set of business opportunities looking for investment.

Venture capitalists could be considered somehow in the middle of both, since they are concerned with financial issues but also with the entrepreneur and 'investor fit'. Clark (2008) reinforces that the entrepreneur is one of the most important factors assessed by business angels. This paper discusses the relevance of a good oral pitch presentation to enable external finance. Therefore, the entrepreneur needs to be aware of how important are his presentational capabilities.

The heterogeneity of business angel represents a considerable challenge to researchers, since it will be difficult to generalize a rule. Decision criteria studies have shown that the reasons to invest vary between different angels. For example, Van Osnabrugge (1998a) used investor experience as a control variable and concludes that serial angels are 'less concerned with agency risk and more concerned with market risks' than less-experienced angels. The heterogeneity of the angel population has not been fully factored into the research on investment decision-making. A recent study asked for further debate on how the heterogeneity of the business angel population shapes the investment criteria (Hsu et al., 2014).

This very brief introduction of the investment decision making process of business angels has highlighted five important points: (1) there is a set of investment criteria; (2) high rejection rates; (3) the reasons to reject are not the same as the reasons to invest; (4) business angels change the investment criteria as the process unfolds; (5) homogeneity and decision making have not been fully explored. This last point is the key theme of this thesis, that is, how does business angel's diversity have an impact on the decision making criteria? So, do different types of business angel have different approaches to decision-making? The underling hypothesis of this research, is that angel investors should be segmented into

different cohorts given their rules of choice. Moreover, segmenting angels by their decision-making will enable the creation of theory for the different groups, allowing for a broader understanding of why projects typically get different results from different angels.

1.5 Overall purpose and overview of the chapters

This research aims to connect two bodies of business angel literature. On the one hand, scholars have emphasized the importance for the academic and practitioner communities to understand how business angels make their investment decisions. However, this body of literature has largely ignored the variations within the angel population. On the other hand, the categorization studies have tried to group the different “types” of angel investors without taking into account that their investment behaviour might also be different. Hence, this thesis aims to evaluate what is the impact of business angel diversity on the investment decision making criteria used by investors.

Chapter 2 – Literature review

This chapter provides an overview of the literature on the investment decision process of business angels, in particular the studies on their investment criteria. Whilst the bulk of the chapter covers the investment criteria, the first subsection reviews the studies on the investment process. The synopsis of the investment process literature presents the initial models that were focused on the venture capital archetype to the later style of decision followed by angel groups. This helps to situate the key moments of the investment decision and to position the research on the screening (evaluation) stage. The following section moved to the investment motivations with the aim of highlighting the variations within the angel population. This makes the point that investment motivations are associated with the

use of different criteria by angel investors. This is followed with a review of the investment criteria studies.

The investment criteria literature is divided chronologically into two blocks. A first set of studies that contributed to an initial understanding of the investment criteria used by angel investors. Typically, these studies provided a general description of the investing criteria. A second group of studies delivered more robust methodological and theoretical contributions. Thenceforth, the discussion moves to the rejection criteria and how the investment criteria changes has the investment process progresses. All of these reviews enable questions to be raised regarding how the homogeneity of the angel population impacts the variability of the criteria used by business angels. At the first glance, it is clear that the studies reviewed provide different results. Two possible justifications are advanced that could justify this outcome: (i) the effect of the heterogeneity of the angel population which would be reflected by the use of different samples or (ii) the result of the use of different methodologies and data. This is further discussed in the fourth chapter.

Chapter 3 – Research in business angels: the research challenges

In order to conduct robust research it is necessary to understand the object of study. This third chapter reviews the five main challenges that business angel scholars face (definition, invisibility, heterogeneity, sampling and response rates). After a detailed description of these challenges the chapter presents a discussion on how the evolution of the angel market has impacted these issues. Two of these problems are further debated: sampling and response rates. In terms of sampling the chapter offers a critical review of the recruitment sources used by scholars. Top academic publications are reviewed and it is observed that recruitment through angel groups has become the key source of data. The repercussions of such a practice

are debated. Lastly, the chapter suggests an alternative way to calculate response rates in the context of data collected via angel groups.

Chapter 4 – Methodologies for examining the investment criteria of business angels: a comparative approach

The literature review raised issues of inconsistent results across different studies. However, these studies have used several methodologies to evaluate the investment criteria used by business angels. It is possible that differences between studies are methodologically dependent. This chapter addressed this issue by using four methods (Open-ended questions, Verbal Protocol Analysis, Ordinal Measurement Method and Conjoint Analysis – pairwise comparisons) with the same sample of fifty one angel investors (21 gatekeepers and 30 individual angels). The results indicate that the choice of the methodology used does have an impact on the relative importance of the investment criteria. However, it is not possible to evaluate how much of this effect is due to cognitive limitations of the participants. Hence, the chapter suggests that the object of study should be the investment decision rather than the investor. This would reduce the impact of cognitive limitations of participants in the results and point to the heterogeneity of the angel population as a possible justification.

Chapter 5 – How similar are investment decisions made by Business Angels?

The fifth chapter evaluates whether the investment decisions made by business angels can be grouped by the criteria weights. In the best tradition of categorization studies, this research offers a typology of business angel investment decisions. This categorization suggests three types of investment decisions based on the weights given to a list of seven criterion. The results indicate a strong relationship with investment experience. Additionally, the findings denote that business angels are influenced by others (gatekeepers and other

investors) while investing. These results indicate the existence of herd behaviour. The chapter also suggests the use of communities of practice to explain these close connections with other investors and with the gatekeeper.

Chapter 6 – Do business angels always use the same criteria?

Building on the typology suggested in previous research, this chapter appraises if business angels change their investment criteria and what drives this change. As noticed during the literature review, the vast majority of previous studies assume a very static approach of angel investing. Using up to three investment decisions by the same investor this chapter is able to bring light on how the same investor changes his/her investment criteria. The findings suggest that: (i) business angels do change the relative importance of the investment criteria (46%); (ii) three areas are responsible for this variation (investment specific area, angel specific area and group specific area).

Chapter 7 – Conclusions

This chapter offers an overview of the key findings of this thesis. It reviews the methodological, empirical and theoretical contributions of this research and suggests practical implications for policy, entrepreneurs, angel groups/networks, entrepreneurial teaching and further research.

1.6 Conclusion

Generalizations in angel research are difficult to achieve due to the lack of homogeneity of the business angel population. This becomes the first key driver of this research – business angel diversity. This chapter offers a brief review of the business angel research, highlighting

two key bodies of the literature: (i) first and second generation of studies; (ii) investment decision making literature. These two reviews of the literature help to set up the discussion in terms of what is the objective of study of this thesis and what is known. The review of the decision making literature enables the identification of a second driver of this research – variations in investment decision making criteria across the angel population. Hence, this thesis has two key drivers. The first is that the business angel population is not homogenous. The second is that there are variations in the investment decision making criteria used by business angels. These two drivers help to position this thesis in the gap between the two bodies of angel literature. As it was already mentioned, this has not been previously explored by the existing literature and it is expected that the findings of this thesis can contribute to enhance the academic and practitioner knowledge on business angels.

Chapter 2. Literature Review

2.1 Introduction

Business angel investment decisions have attracted substantial interest from scholars with the research outcomes being extremely useful for several stakeholders. The first group of stakeholders who have benefited from the research findings are entrepreneurs. Research has enabled entrepreneurs looking for angel investment to understand what appropriate information is required by investors. Additionally, the reasons to invest and to reject an investment opportunity have become clear to entrepreneurs. It also informs them how a pitch should be conducted. The second group of stakeholders who have benefited from the knowledge produced by scholars are business angel group managers (gatekeepers). Research has helped the angel community to better understand what makes business angels different from other types of sources of capital (crowd funding, venture capitalists, etc.). This added understanding has been helpful for the rise of business angel groups/networks which has attracted a new breed of investors. The significance of business angels for the development of entrepreneurial ecosystems has been recognized by the academic community (Neck et al., 2004; Prevezer, 2001). The last group of stakeholders that have benefited from the findings of angel research are policy-makers, who have acknowledged this importance and have created policies to incentivize angel investments.

The aim of this chapter is to review the literature on the investment process, decision and criteria of business angels. The initial debate focused on the investment process, with a brief presentation of the models derived from venture capitalists (Tyebjee and Bruno, 1984). Then investment models specific to business angels (for example: Amatucci and Sohl, 2004; Haines et al., 2003; Paul et al., 2007) were presented. Business angels' investment motivations literature will also be revisited, with the intention of drawing links with the next

level of analysis – the investment criteria. The reasons to accept and to reject will be critically reviewed. Lastly, the major theoretical frameworks used in this topic will be identified and discussed.

2.2 Investment process

Several studies have acknowledged, the heterogeneity of business angels (Avdeitchikova, 2008; Lahti, 2011). However, this characteristic has had limited impact in terms of modelling the investment process of business angels. This is largely because, with just a few minor variations, the great majority of angel investors follow very similar steps when investing. Scholars were able to create linear models to express the different stages that an investment opportunity goes through when angel investors are involved. The multistage nature of the models developed facilitated the understanding of stage specificities and the actions associated with each step. These models were used as reference in different studies, in particular for investment criteria research.

The initial models of venture capital investment decision making were used as proxy in angel research. Several scholars have tried to model the investment decision making process of venture capitalists (Fried and Hisrich, 1994; Hall, 1989; Silver, 1985; Tyebjee and Bruno, 1984; Wells, 1974). However, not all of these models had clear relevance for angel investment decisions. From the models cited above the one suggested by Tyebjee and Bruno (1984) is closest to matching the investment process of business angels. This model has the fewest number of stages, five in total, from those previously cited: deal origination, screening, evaluation, deal structuring and post-investment activities. Similar characteristics, in terms of the number of stages and linearity of the process, can be found in the initial business angels' investment process model suggested by Dal Cin et al. (1993) and further

developed by Duxbury et al. (1997). Relying on almost 300 in-depth interviews of Canadian angel investors the two research teams developed a five stage model: deal origination and first impressions, review of business plan, screening and due diligence, negotiation and lastly, consummation and deal structure. However, the model did not acknowledge any activity after the deal is finalized. Typically, to keep investing angel investors need to recycle their money (Mason and Harrison, 2006) by achieving a successful exit. Usually, angel investors are associated with this liquidity event through a set of post-investment actions that enhance the likelihood of an exit occurring (Mason et al., 2015). These post-investment activities were not represented in this model. This can be considered as the principal limitation of the model.

Subsequent studies presented some variations in terms of the number of stages and on the perspective of the process. All the models fully represented the investment process from deal origination to exit. However, the major difference between models is the level of detail provided at each stage. Table 2-1 provides a summary of the different explicit models suggested by the research teams. Van Osnabrugge and Robinson (2000) presented an eight stage model. According to the authors, this model could represent the investment process of both business angels and venture capitalists. To some extent, this can be questionable given the differences between these two types of investors (Mason and Stark, 2004; Van Osnabrugge and Robinson, 2000). However, the model has clear contributions. First, when compared with the Dal Cin et al (1993) and Duxbury et al. (1997) models it covers a wider length of the investment process, from pre-investment to exit. Second, it highlights the importance of pre-investment factors, such as, motivations to invest and the criteria used by investors. This is the lengthiest of all explicit models. To some point, it can be seen as an advantage by providing a deeper level of detail when compared with other explicit models.

However, the pre-investment stages (investment motivations, investment criteria and finding deals) could have been grouped under a single stage as in the Haines et al. (2003) model.

The model suggested by Haines et al. (2003) echoed both the Tyebjee and Bruno (1984) and Van Osnabrugge and Robinson (2000) models. First, it expanded the five step model of Tyebjee and Bruno (1984) by replacing the evaluation and structuring stages by due diligence, negotiation and decision making steps. Additionally, the model by Haines et al. (2003) introduced the exit stage. These suggestions represent additional fit in terms of the investment process of business angels. The authors also suggested two considerable modifications to the Van Osnabrugge and Robinson (2000) model. As it was previously mentioned, the first three stages in the Van Osnabrugge and Robinson (2000) model were compressed into one single stage (deal origination) in Haines et al. (2003) proposal, while the negotiations and actual investment stage in Van Osnabrugge and Robinson (2000) was expanded into two steps (negotiation and decision making). Additionally, Haines et al. (2003) defined a broader set of actions for the post-investment stage. Whereas Van Osnabrugge and Robinson (2000) restricts this stage to a monitoring exercise, Haines et al. (2003) include all the typical activities (also known as value added activities (Politis, 2008)) at this point of the process. The length of stages in this model can be seen as one of its advantages since it enables a separation of the different actions across the investment process. However, subsequent models have suggested a reduction of the number of stages of the investment process.

The same research team went on to present a variation of the 2003 model. This comprised a five stage linear model from deal sourcing to exit (Riding et al., 2007). Compared with their previous suggestion, this model compacted the first two stages under one single step: deal

sourcing and initial screening. Additionally, the same procedure was done for the negotiation and decision making stages, which was compressed into a single stage. There is a clear trade-off between the number of stages in a model and the level of detail provided. To some extent the authors' idea of synthesizing the initial version of the model was useful. Fewer stages make it easier to describe, particularly when there is a sequence of actions. However, compressing stages reduces the level of detail at each step which can be seen as a limitation.

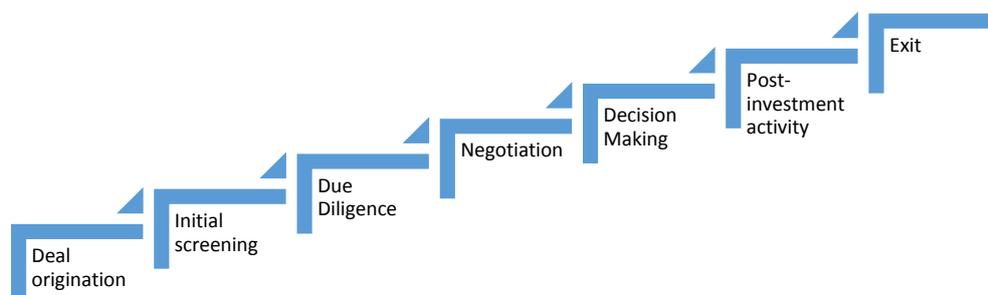
The further model was offered by Paul et al. (2007). These authors advocated a linear model with five stages: familiarization, screening, bargaining, managing and harvesting. The novelty of this model is to present an interactive assessment in the first three stages of the investment process. This enables the model to move forward and backward without restrictions. This feature recognizes that new or unexpected information may influence the angel investor to review the investment opportunity. The authors also recognised specific activities for each of the first three stages. For example, the familiarization stage has two activities: learning about the opportunity and meeting the entrepreneur. This can be seen as a good solution to reducing the number of stages without losing information about the process. Another interesting feature of this model is the reference to investment motivations. Similar to the Van Osnabrugge and Robinson (2000) model, the authors include the investment objectives as an important component of the process. But contrary to the Van Osnabrugge and Robinson (2000) model, the authors did not include it as a stage but has a factor that could impact the behaviour of the angel investor. The main criticism that can be made of the model is the lack of activities included in the last two steps of the model, particularly, regarding managing the investment. The authors could have linked this to the value-added literature (some examples: Bjørgum and Sørheim, 2015; Collewaert and Manigart, 2016; Fili and Grünberg, 2016; Politis, 2008).

The last model in this review was suggested by Amatucci and Sohl (2004). The originality of this model is that it represents entrepreneurs' perspective. Another particularity of this model is that it is the shortest of all linear models suggested in the literature, with only three stages: search, negotiation/contract agreement and post-investment relationship, future rounds, exit. The main aim of this model was to study the relationship between women entrepreneurs and angels investors and not to find the ideal model to represent the investment decision process of business angels. The major limitation of the model is the scope used by the authors to define the stages. By reducing the investment process to just three stages the authors made each stage very broad which can create misrepresentation problems. For example, the initial stage, pre-investment stage includes all the activities that enable the entrepreneur to reach to the point where they can negotiate with the angel investor. However, this implies that they need to make the investor aware of the opportunity and the investment proposal needs to be robust to survive the initial screen. These two activities are completely different. While the first is an issue of reducing searching cost, the second is a problem of satisfying the investment criteria of the angel investor. Nevertheless, the different positioning of this model – entrepreneurs looking for angel funding – can be seen as a very positive attribute. However, for this research this model is not ideal given that the core focus of this thesis is the investor or the investment decision.

The aim of this research is to study the decision making criteria used by angel investors. Hence, the choice of the model to use as a reference needs to reflect the aims of the study. The model suggested by Haines et al. (2003) is the one that best fits this research since it provides a clear initial screening stage. As mentioned previously, the length of this seven stage linear model allows to perfectly identify the specificities of the investment process of business angels. Although, this was the selected model, it is important to acknowledge the differences in the investment process of individual investors and members of angel groups

which is not reflected in this model. However, the purpose of this thesis is to study the investment criteria rather than the process. Figure 2-1 depicts the linear model suggested by Haines et al. (2003).

Figure 2-1: Investment process (Haines et al., 2003)



The first stage, the deal origination, is associated with investment motivations, investment criteria and finding deals. This stage is the starting point of the process and can be divided into two points: reasoning to be an angel investor and becoming aware of the specific opportunity. This stage can be understood as the set of justifications to be making angel investments associated with opportunity search mechanisms. Typically, this stage is different for members of angel groups since the group manager (gatekeeper) provides the syndicated investors with new investment opportunities (Paul and Whittam, 2010). Carpentier and Suret (2015, p. 813) acknowledge that “the initial steps of the decision process are delegated to a gatekeeper”. Hence, the searching costs and the motivations to invest might be slightly different from that of solo angels.

The second stage of the model is the initial screening. At this stage, the angel investors have an initial occasion to review the investment opportunity. This stage is associated with high rejection rates (Dal Cin et al., 1993). Typically, this is a very quick review, where the investor reads through a brief business plan to assess if the opportunity fits the investment criteria. This is the fundamental stage for this thesis since it is the first stage where the

investment criteria are used by the angel investment to evaluate an opportunity. In terms of the investment process of members of angel groups this initial screening stage could be divided in two. The first screening is often conducted by the gatekeeper (Carpentier and Suret, 2015) and the second by the individual investor. In the great majority of cases the gatekeeper has the power to decide what will be subject to the group's scrutiny. Typically, syndicated members would receive the investment opportunity by email so they could review it before the group meeting.

The following stage is the due diligence stage. According to the Haines et al. (2003) model this is the moment in the investment process where the business angel reviews the financial information contained in the business plans, meets with the entrepreneur and confirms that the material in the investment proposal is correct. The length of this stage can vary considerably depending on trust relationship between the entrepreneur and the angel investor. Haines et al. (2003) report that the way business angels conduct the due diligence process can vary from being quite informal to a very formal and structured procedure. However, in both situations, if the business angel starts to identify missing information or contradictions, this can jeopardize the possibility of a successful funding round. This happens because the investor needs to trust the entrepreneurial team associated with the opportunity.

In angel groups this stage is slightly different. Typically, entrepreneurs have an opportunity to pitch in front of the group members. This is followed by a question and answer session where several members look for additional clarifications regarding issues identified. Then the angel investors have to decide whether to show interest in the opportunity. If enough interest has been shown in the investment opportunity by group members then it follows to

a formal due diligence by the gatekeeper and/or members with industry expertise (Carpentier and Suret, 2015). Mason and Botelho (2014) identify that “centralized” due diligence conducted by the gatekeeper is seen as one of the advantages of being part of an angel group.

The fourth stage in the process is negotiation. Carpentier and Suret (2015) noticed the opportunities that reach to the negotiation stage are considered investable. However, the entrepreneur and the angel investors might disagree on the deal terms. Typically, the source of divergence are financial considerations, in particular the firm valuation (Carpentier and Suret, 2015) and size of equity stake (Paul et al., 2007). Haines et al. (2003) emphasize that, at this stage, the most frequent reason as to why investment opportunities do not get funded are unrealistic expectations of the entrepreneur regarding valuation. This finding is also supported by other research (Carpentier and Suret, 2015). This is a particularly important stage since it is the moment at which the angel investor can try to minimize the likelihood of adverse selection and moral hazard with the use of a contract (Kelly and Hay, 2003). However, contracts are not enough to ensure that either will not occur. Kelly and Hay (2003) point out that angel investors need to supplement the contract with a high level of involvement in the investee company. Typically, in angel groups, this stage is centralized on the gatekeeper or on a group member with industry expertise (Paul et al., 2003). The group representative negotiates the deal terms with the entrepreneur. Normally, the deal terms do not differ across the group members.

The following stage is the decision making stage. Haines and his colleagues (2003) define this stage as the moment immediately after the conclusion of negotiations. The authors emphasize that investors can still reject investment opportunities at this stage. This can be seen as the moment when the angel investor makes the final decision whether or not to write

the cheque to the entrepreneur. This is the point of “no return”, that is, if the angel investor decides to invest then he would be associated with the investee firm until a liquidity event, also known as an exit. In an angel group context this stage is not significantly different. Typically, in angel groups this is the moment where all members send the required financial resources to invest in the opportunity, and the group administrate all the legal and logistical procedures for the investment to go through.

The sixth stage of the investment process is the post-investment activity. A significant body of literature has focused its attention on this aspect of the investment process. First, scholars have questioned whether angels add value or not with the post-investment activities (Macht and Weatherston, 2011; Macht, 2011). Second, research has been conducted to characterize these value added activities (Macht and Robinson, 2009; Politis, 2008). In a review of the literature, Politis (2008) classifies the post-investment activities into four categories of roles that can be played by the angel investors: strategic, supervision and monitoring, resource acquisition and mentoring. The level of involvement that the angel investor will have with the investee company will depend on its needs. Nevertheless, this stage is particularly important for the development of the non-financial contributions of angel investors (Macht and Robinson, 2009).

This stage is considerably different for business angels investing through groups. Normally, the group nominates one non-executive board member in the invested venture. Hence, to all other members of the group, the post-investment activities are associated with monitoring the information provided by the angel group. Contrarily to solo/leading angels, members of angel groups are not hands-on and in case of doubts they should enquire the gatekeeper about the investee firm. In some cases, the gatekeeper can nominate one group member to be a

non-executive board member. However, only a very small number of group members are invited to take this role. The key factor to be invited to such a role is to have specific knowledge about the industry/sector where the investee firm operates. Kerr et al. (2014) identify that the value added contributions that angel groups make to their investee companies, is more important than their financial contribution. The post-investment activities may have a direct effect on the outcomes of the final stage – the exit. Scholars have identified that post-investment activities can increase the likelihood of achieving a successful exit (Kerr et al., 2014; Mason and Botelho, 2016).

The last stage of the model suggested by Haines et al., (2003) is the harvesting moment, the exit. This is the moment where the angel investor realizes the investment and can measure the financial return associated with the opportunity. In terms of recycling resources this stage is fundamental for angel investors. Without achieving successful exits, angel investors will be less motivated to make new investments and may lack the financial resources to do so (Mason et al., 2015) with repercussions in terms of aggregate market activity. At this stage, the entrepreneur and the angel investor end their partnership. This stage can generate conflicts between the two. Collewaert (2012) identifies that the angel intention to exit can create conflicts with the entrepreneur. In an angel group context, the most common outcome is the gatekeeper providing an indication to the group members that they should exit the investment. Carpentier and Suret (2014) note that angel groups have a preference for to exit an investment via a trade sale.

Various studies have identified that the investment criteria changes as the process progresses (Brush et al., 2012; Duxbury et al., 1997; Mason and Harrison, 1996b; Maxwell et al., 2011; Mitteness et al., 2012a). Hence, it is important to define what stage the research will focus.

The choice was to focus on the initial screening stage. This enables the comparison with other research on the same stage. Additionally, it is the stage that is the most important for entrepreneurs for two reasons. First, it is the one that defines if the entrepreneur will have a chance to interact with the angel investor. A rejected investment opportunity will not allow the entrepreneur to provide detailed explanations about the opportunity. Second, it is the hardest stage, with the highest rejection rates (Duxbury et al., 1997). Table 2-1 summarizes the different models reported in this review.

Table 2-1: Models of business angel's investment process

<i>Authors</i>	<i>Stages</i>								
<i>Dal Cin et al. (1993) and Duxbury et al. (1997)</i>	Deal Origination and first impressions			Review of business plan	Screening and due diligence	Negotiation	Consummation and deal structure		
<i>Van Osnabrugge and Robinson (2000)</i>	Investment motivations	Investment criteria	Finding deals	Initial screening	Due diligence	Negotiations and actual investment		Post investment monitoring	Exiting and realizing returns
<i>Haines, Madill and Riding (2003)</i>	Deal Origination			Initial Screening	Due diligence	Negotiation	Decision Making	Post-investment activity	Exit
<i>Riding, Madill and Haines (2007)</i>	Deal Sourcing and initial screening				Evaluation and due diligence	Negotiation, consummation and deal structure		Post-investment involvement	Exit
<i>Paul, Whittam and Wyper (2007)</i>	Familiarisation Stage			Screening Stage	Bargaining Stage			Managing Stage	Harvesting Stage
<i>Amatucci and Sohl (2004)</i>	Pre-Investment				Contract/Negotiation agreement			Post-investment relationship, future rounds, exit	

2.3 Investment motivations

The investment motivations of business angels have been a widely researched topic. As the case with other assets, angel investments are associated with financial rewards. Hill and Power (2002, p. 36) emphasize that for some angels “it’s all about cash”. However, this is not always the case. Business angels are also associated with nonfinancial motivations. In his early studies of business angels, Wetzel (1983) recognized that nonfinancial rewards might influence individual investors in their decisions. The author called attention to the fact that angel investors do not exclusively make decisions based on the financial return of their risk portfolios. Hence, before studying the investment criteria one needs to understand the full range of investment motivations of angel investors.

By definition, business angels are seen as hands-on investors. This feature is associated with the level of interaction between the investor and the entrepreneur to develop the investee firm. Scholars have defined these actions as value-added contributions (Politis, 2008). Previous research has presented two possible justifications for this behaviour. First, the similarity of motives and personal characteristics between angel investor and entrepreneur (Sullivan, 1991). Second, the entrepreneurial spark that both the entrepreneur and the business angel hold (Politis and Landström, 2002). These are often associated with non-financial motivations to invest representing the former entrepreneurial experiences of angel investors. To some extent, this justifies the mentoring role undertaken by business angels (Leonard and Swap, 2000) which linked with their aim of passing on the knowledge acquired while an entrepreneur.

A Japanese study (Tashiro, 1999) identifies that non-financial rewards were the main driver for angel investing. The author asked participants which reward was more important: financial or non-financial. Using a sample of 10 angel investors the author recognises that only one investor stated his preference for financial rewards. The most common non-financial reasons presented by participants were: fun, help young entrepreneurs, regional and technological development. While the importance given to non-financial reasons might be questioned for different reasons (e.g. cultural issues) the variety of non-financial motivations should not be questioned.

A study of German business angels (Brettel, 2002) showed similar findings in terms of the importance of the non-financial motivations. Using a sample of 48 angel investors the author highlighted that 81% of the participants thought that it was very important to have fun while investing. Being involved in the entrepreneurial process and supporting young companies were also a significant motivation to act as a business angel. More than 50% of respondents saw these two reasons as an important motivation. The financial motivations were also acknowledged by investors. Achieving high capital growth was seen as the financial reward with the highest level of importance with 46% of the investors identifying it as very important. The significance of non-financial motivations was further supported by Stedler and Peters (2003). Their research showed that there is a mix between financial and non-financial reasons to invest. The main reasons identified by the sample of 232 respondents were to pass on professional experience (81%) followed by higher ROI (77%) and contributing to successful start-up (73%).

Van Osnabrugge and Robinson (2000) emphasized the importance of the motivations to invest by defining it as a stage in the investment process. This is particularly relevant because

the authors defined this stage before the investment criteria. The authors identified that business angels have a set of primary investment motivations. Which they grouped into five categories: (i) high financial return (ii) involvement in an entrepreneurial process (iii) prospect of job and income (iv) social responsibility (v) the thrill associated with being involved with a new firm. Once again, research stresses the existence of both financial and non-financial reasons to invest. This duality of investment motivations has been further defended in recent reviews of the literature (Kelly, 2007; Morrissette, 2007).

One of the most structured studies on investment motivations was conducted by Sullivan and Miller (1996). The authors divided the investment motivations of business angels into three types: Economic, Hedonistic and Altruistic motivations. The first set of motivations, the Economic, can be associated with the notion of wealth maximization which focuses exclusively on the financial outcomes. This group can be seen as: higher ROI (Stedler and Peters, 2003), high financial return (Van Osnabrugge and Robinson, 2000) or ROI expectations (Morrissette, 2007).

The second set of motivations were the Hedonistic, this group are associated the notion of “psychic income”. This can be defined as the non-monetary or non-financial rewards that are provided from the economic activity. Simon (1959) emphasized that in the entrepreneurial setting the “psychic income” argument is not about profit maximization, arguing that entrepreneurs can always “balance loss profits against an increase of psychic income” (Simon, 1959, p. 262). Hence, these are the motivations associated with the individual’s satisfaction. Some examples of this set of motivations would be: fun (Brettel, 2002), societal and community recognition (Brettel, 2002) excitement of being involved

with start-ups (Van Osnabrugge and Robinson, 2000), involvement with the entrepreneurial process (Mason and Stark, 2004) and the personal challenge (Stedler and Peters, 2003).

The last set of motivations were the Altruistic, this group of motives are associated with the will to help others. Elster (2006, p. 186) defined altruistic motivations as all actions where “the agent is willing to suffer a net loss in welfare by the promotion of the welfare of another”. Examples of these type of motivations can be found in angel research: supporting socially desirable products or services (Brettel, 2002), job creation in the community (Freear et al., 1995), helping other entrepreneurs (Freear et al., 1995), social responsibility (Van Osnabrugge and Robinson, 2000) or passing on professional experience (Stedler and Peters, 2003). This work provides a clear representation of the motivations of angel investors, separating them into more than the initial two dimensions suggested by Wetzel (1983).

Ramadani (2009) acknowledged that in the 19th century, business angels were known to fund several musicals and plays in Broadway. Their main driver was their passion for the theatre and the possibility to be in the social circles of some of their favourite producers, screen writers and actors. Since then the perspective on business angels has changed as well as their investment activity, with the importance of their investment motivations diminishing considerably in terms of research focus. Business angel investment motivations have been largely been dropped from the research agenda. Partially, it is the result of research exhaustion of the discussion of the motivations for business angels to invest. However, this is a very simplistic and static view of business angels. The angel market is evolving from an individualistic to a collective approach (Sohl, 2012a) which can bring additional motivations to the discussion. Are angel groups changing the landscape of motivations to invest? Is the possibility of being part of a group a motive to invest? Or are angel groups bringing greedy

speculators to the market? Scholars need to acknowledge the implications of the dynamics of the angel market in terms of their investment motivations.

2.4 The criteria used by business angels

A considerable amount of angel research has focused on the investment criteria used by business angels. These studies have provided a robust understanding of what factors angel investors take into account while screening an investment opportunity. Although scholars have mainly put their efforts into the identification of the reasons to invest, additional research has been conducted on the motives to reject an investment opportunity (Mason et al., 2016; Maxwell et al., 2011). The main driver of the latter is the high rejection rates entrepreneurs' face when applying for angel funding (some examples: Duxbury et al., 1997; Mason and Harrison, 1995, 2003; Stedler and Peters, 2003). The significance of the rejection reasons can be seen as important as the investment criteria for two reasons. First, to achieve a desirable outcome an investment opportunity must not be rejected. Second, the reasons to invest in an opportunity are not the opposite of the motives to reject (Feeney et al., 1999). This was also raised by Haar et al. (1988) in an earlier study⁷, however, these authors decided to draw attention to what was common between the rejection and acceptance criteria instead of highlighting the differences. Hence, one may conclude that, to understand the investment criteria one needs to study the reasons supporting both outcomes. The following section will review both bodies of literature with a focus on the identification of the relevant criteria used to back an investment or a rejection decision.

⁷ Ahtila (2014) raises uncertainty regarding this finding. In his opinion the reasons to reject and accept are the same.

2.4.1 Investment criteria

Understanding the decision making process of business angels is particularly important for entrepreneurs (Some examples: Clark, 2008; Mason and Rogers, 1997), policy-makers (Freear et al., 1995) and even to the angel community (Maxwell and Lévesque, 2014; San José et al., 2005). Ever since the early business angels studies the investment decision process has been the focus of scholars. This is particularly true in terms of the investment criteria used by angel investors. The benefits of further understanding what drives angel investing have been spread to entrepreneurs in investment readiness training. Hence, it is important to understand what is known and which areas still need to be researched. Given the variations across the investment process this section will focus on the criteria at the screening (evaluation) stage.

2.4.1.1 Decision making criteria in ABC studies

The early attributes, behaviour and characteristic (ABC) studies focused on creating a profile of angel investors. Among other issues, these profiles explained how business angels screened investment proposals and what were the motivations for these investments (some examples: Aram, 1989; Benjamin and Margulis, 2001; Gaston, 1989; Haar et al., 1988; Riding and Short, 1988; Wetzel, 1981; Wetzel, 1983). These studies were able to identify the representative investment preferences in terms of: deal source, location, amount invested, stage, industry, possibility to add value, financial return, non-financial return, etc. The most important findings will be reviewed in the following paragraphs. Much of these have been seen as investment attributes/fit in later research (Some examples: Harrison et al., 2015; Mason and Botelho, 2016; Mason and Harrison, 1996a; Mason and Rogers, 1996, 1997). Scholars were able to verify that the investment preferences were very consistent across the world (Kelly, 2007).

In the USA, some of these early studies identified that business angels invest on average between \$50,000 to \$75,000 (Freear et al., 1994; Gaston, 1989; Hill and Power, 2002). Van Osnabrugge and Robinson (2000) data presented an average per deal higher than the upper bound of the range (\$145,000) and the median deal was of \$75,000. Scholars identified slightly lower absolute values for average (£30,000) and median (£50,000) invested (Van Osnabrugge and Robinson, 2000). The differences found can be justified by the lack of homogeneity in the angel population. Three studies showed this in a clear way. Freear et al. (1994) reported these differences using different measurements from Gaston (1989) and Benjamin and Margulis (2001). When comparing the last two studies, it is possible to verify a higher proportion of investors. Table 2-2 highlights these differences which lead one to conclude that the heterogeneity of the angel population is also reflected in terms of amounts invested. Hence, the amount available to invest would be a constraint to angel investors and would be a strong element of investment attributes/fit.

Table 2-2: Heterogeneity in terms of amounts invested.

Freear et al. (1994)		Gaston (1989)		Benjamin and Margulis (2001)	
% of Maximum Wealth Allocation	% of Angels	Amounts invested	% of Angels	Amounts invested	% of Angels
0-4	8	<\$10.000	21	<\$25,000	20
5-9	18	\$10,000 - \$24.999	22	\$25,000 - \$99.000	40
10-14	25	\$25,000 - \$49.999	21	\$100,000 - \$250.000	25
15-24	21	\$50,000 - \$99.999	14	>\$250,000	15
25-50	19	\$100,000 - \$250.000	14		
More than 50	9	> \$250.000	8		

These ABC studies identified that, typically, business angels wanted to invest close to their home or office. This would facilitate the interactions between the angel and the entrepreneur, enabling the investor to add value and to monitor the investee firm. Numerous studies have acknowledged this preference. However, scholars have provided different distances as a

reference. Riding and Short (1988) noticed that 85% of angel investments were made within range of 50 miles. Aram (1989) research observed that 24% of the investments were within 10 miles, 76% in a range of 50 miles and 96% in a radius of 150 miles. A study from the same year showed a different propensity to closeness (Gaston, 1989), 41% of the investments were within 10 miles, 72% within a radius of 50 miles and 82% within a range of 150 miles. Freear et al. (1992) identified that 66% of angel investments were made within a radius of 300 miles. This was later supported by Benjamin and Margulis (2001) who identified that 65% of angel investors prefer investing within the same distance. However, these results are not valid for the entire angel population. Once again, heterogeneity is reflected but now in terms of location of the investee company. Riding and Short (1988) noticed that 36% of their sample had no geographic constraint, Freear et al. (1994) suggested this value was slightly lower (24%) while Gaston (1989) showed an even inferior percentage (7%). The importance of this factor has decreased with the rise of angel groups due to the extended networks of this type of organization. One of the most advanced studies on the impact of location on business angel decision making was conducted by Harrison et al. (2010b). The authors were the first to identify and profile non-local angel investing.

Business angels are known for taking risks in unquoted companies. Typically, this happens at an early stage of the company development. The ABC studies stressed this point very clearly. One of the initial studies on business angels noticed that 44% of investments were at start-up stage (Wetzel, 1983). Similarly, the willingness to invest in the early stage in the future was demonstrated with 78% of investors stating a clear interest in conducting start-up and early stage investments. The same research observes that 80% of the investments were in firms that were less than five years old. Aram (1989) identified that 55% of his sample consisted of investment made at start-up stage. Another study from the same year (Gaston, 1989) reported a very similar percentage. The author noticed that 56% of angel investments

were at the start-up stage. Freear et al. (1994) highlighted that business angels showed interest in seed financing (35%) and at the start-up stage (52%). Sohl (2004) acknowledged that the 52 % of the 2003 angel investments were at seed and start-up stage. Hence, it is possible to conclude that these studies showed that business angels have a clear propensity to invest at early stages. However, this is perhaps the least restrictive investment attributes/fit requirement. All these studies reviewed report that business angels invest at all firms' growth stages.

Lastly, the ABC studies were able to provide a rich indication of whether business angels have a specific industry preference. The most supported idea is that business angels do not invest in only a specific industry. Rather, their portfolios consist of firms from a wide range of industries. However, this needs to be broken into two effects: at the aggregate level and at the individual level. First at the aggregate level, several studies showed that the angel population invest in a wide set of industries, some examples: manufacturing, natural resources/mining, retail trade, finance/insurance/real estate, etc. (Gaston, 1989; Haar et al., 1988; Mason and Harrison, 1996b; Van Osnabrugge and Robinson, 2000; Wetzel, 1983). In one particular study the participants reported to have invested in more than one industry (Gaston, 1989). Hence, this shows that typically angel investors would not invest in all industries. Therefore, despite the fact that at the aggregate value business angels invest in a wide range of industries this is not true at the individual level. The most cited reason for this behaviour is that business angels invest in industries where they have some specific knowledge/experience (Aram, 1989; Hill and Power, 2002; Van Osnabrugge, 2000; Wetzel, 1983). However, other early studies found contradictory results. Mason and Harrison (1996b) observed that in only 35% of the investments the investors had knowledge/experience within the specific industry. This was later confirmed by Benjamin and Margulis (2001). These authors acknowledged that 59% of angel investors had invested

in industries that they had no prior knowledge or experience. One early study identified one possible reason for this behaviour (Freear et al., 1994). In some cases business angels will try to diversify the risk by investing in a wide spread of industries. Another justification could be that it is the result of angels investing with others which would put the onus of the decision on the business partner which would typically have this business experience (Mason et al., 2013).

These studies were able to provide a very insightful image of angel investing. However, the major limitation of this stream of research was the lack of generality due to the biased samples used in the studies (Kelly, 2007). The natural path of this discussion is to look at what have been the most common criteria used in business angel decision making research. The debate will have a particular focus on the criteria trends that have been used and how relevant these criteria are at the selection stage. This is not an easy task because the number of articles analysing decision criteria is very extensive and have used different lists of investment criteria. Nevertheless, the next subsection will cover the key articles identified in the literature.

2.4.1.2 Decision making criteria

At the screening (evaluation) stage business angels make investment decisions based on a combination of factors (For example: Mason and Rogers, 1996, 1997). Hence, it is important to review the criteria used and its importance. This subsection aims to identify and explain the key criteria used in previous research providing a coherent list of criterion. It is important to acknowledge that the number of criterion used has ranged from lists with two broad criterion (Feeney et al., 1999) to studies that used 34 very specific criterion (Landström, 1998). The trade-offs of such a decision will also be discussed, taking into account the

current trend in terms of investment criteria used by researchers. The key list of investment criteria will be the one used by Mason and Harrison (1996b) with the inclusion of a more recent criterion (exit) that has arose from the lack of liquidity events.

The previous subsection showed that initial studies covered investment preferences that later would be considered by several scholars as investment attributes/fit. In terms of importance there are mixed reviews about this criterion. Some studies have identified this as not being important while others have shown contradictory results. Using a real time technique, Mason and Rogers (1997) studied angel decision making, which generated a list that included nine criteria of which investment attributes/fit was the second least important. In a study that used a conjoint method Landström (1998) asked 22 angel investors to rank the importance of a list with 34 criteria. The study identified that some components of investment attributes/fit were considered less significant, for example: Stage (34th), Scale and change of later rounds of funding (32nd), Location of the business relative to the investor (22nd) and Relative familiarity of investors with industry/technology (14th). A very similar result was found by Van Osnabrugge (1998b) in his PhD thesis. Using a Likert scale the author asked 143 angel investors to state how important specific criterion were. From a list of 27 criterion those associated with investment attributes/fit received the following positions: investor understands the business/industry (24th), venture is local (23rd) and size of investment (20th). Consistent findings in terms of investment attributes/fit were found by Mason and Harrison (2003), who also used again a real time methodology to rank the importance of a set of criteria Investment attributes/fit was the 7th most significant out of ten. In a USA study with 173 investors, Sudek (2006) reviewed Van Osnabrugge's (1998b) results. The findings of this study are much in line with this lack of importance. Size of the investment scored 21 (out of 25) and investor knowledge of the industry score 16 (out of 25). More recently, a study by Mason and Botelho (2016) used a real time methodology to evaluate if gatekeepers

took exits into account as a relevant criteria. The study ranked the importance of nine criteria and investment attributes/fit was the 7th most significant. Although this shows consistency in terms of the importance of investment attributes/fit as a criterion, other studies have shown contradictory findings.

Mason and Stark (2004) identified that business angels gave more emphasis to investment attributes/fit than banks or venture capital funds. The authors used a real time technique to evaluate if different types of funders assessed opportunities in different ways. Investment attributes/fit scores a higher importance when compared with previously mentioned studies, scoring four out of nine. Harrison et al. (2015) found its importance to be even higher. Applying a real time methodology, the authors evaluated how different investment experiences impact the weights given to each criterion. The study divided a sample of 12 angel investors into three equal groups, controlling the level of investment experience. Investment attributes/fit scored consistently higher in terms of its importance across the three groups (Nascent 4th, Novice 2nd and Super 1st). This suggests that learning has an impact on the way angels weight investment criteria. The conflicting results across the reviewed studies may be the result of two factors. First, this could be due to methodological differences. Some of these studies used real time methods while in others questionnaires were chosen. Second, this could be due to sampling issues. Typically, these studies used small highly biased samples which can represent problems in terms of generalization.

The early ABS studies allowed scholars to understand the importance that the characteristics of the entrepreneur and product/market features had at the screening stage (for example: Mason and Harrison, 1996b; Van Osnabrugge, 1998b). This is particularly true for the entrepreneur characteristics. The great majority of studies have highlighted the idea that, at

the screening stage, the entrepreneur is the key factor in an investment decision. This goes much in line with Fiet's (1995b) argument that angels put more emphasis on agency risk, therefore it is important to invest in a project with good entrepreneurs. According to May and Simons (2001) getting to know the entrepreneur is the most important step of the investment process. Two levels of analysis have been used to stress the importance of the entrepreneur. First, scholars have discussed the relative importance of the entrepreneur/management team within a set of investment criteria. Second, researchers have gone further to try to detect which characteristics of the entrepreneur were important for the angel investors.

The great majority of real time studies applying verbal protocol analysis have followed the first approach (Some examples: Harrison et al., 2015; Mason and Botelho, 2016; Mason and Rogers, 1996, 1997; Mason and Stark, 2004). This should not be seen as a limitation of this type of study. Instead, it should be understood as the result of the authors need to present aggregate findings rather than extremely specific conclusions. It should be noticed that although the coding scheme presented sub levels, only the key criterion was discussed in the research. In this type of study the importance of the entrepreneur is somewhat underplayed. The highest importance these researchers have given to the entrepreneur was in Mason and Stark (2004) study. Although the authors highlight that business angels give more emphasis to the entrepreneur than bankers and venture capitalists this criterion is just the third most important. Finance and market were respectively considered as the two most important criterion in this study; a consistent result when compared with earlier studies (Mason and Rogers, 1996, 1997).

Two recent studies showed even lower rankings for the entrepreneur. Harrison et al. (2015) study how different levels of investment experience impact the criteria importance. In this study the entrepreneur achieved consistently low scores in terms of importance provided by the three groups of angel investors. The entrepreneur scored between 5th and 7th position depending on the group. This was confirmed in Mason and Botelho's (2016), study which focused on gatekeepers' decision making criteria and identified that the people (entrepreneur/management team) were the sixth most important criteria. Another real time study used a video presentation of an entrepreneur looking for funding to evaluate the investment criteria (Mason and Harrison, 2003). Even with this methodological nuance, the results again show that the entrepreneur is not the key investment criteria (4th overall position) at the initial screening stage.

Alternative studies have used Likert scale to measure the relative importance of each criterion have presented a different story. In a Canadian study, Bachher and Guild (1996) asked three types of equity investors (Business angels, Public venture capital funds and Private venture capitalists) to evaluate the importance of five investment criteria at the screening stage. The findings highlighted that angel investors considered the entrepreneur as the most important investment criteria.

Subsequent research conducted by Van Osnabrugge (1998b) used a very similar research methodology that showed comparable results. Although the study used a wider range of investment criteria (27), with the entrepreneur being evaluated in five dimensions, it is straightforward to verify the importance of this criterion. Four of the five dimensions associated with the entrepreneur were ranked in the top five investment criteria with the last dimension (track record of the entrepreneur) being the 10th most significant in the angels'

opinion. This was later supported in the work of Sudek (2006). The author asked angel investors to express the importance of a list with 25 investment criterion. This list contained six criterion associated with characteristics of the entrepreneur. The results showed the top three criterion to be associated with the entrepreneur. The remaining three ranked the sixth, twelfth and fourteenth, respectively. Other studies using different methodologies showed that at the screening stage, the importance of the entrepreneur as the key investment criteria (Feeney et al., 1999; Haar et al., 1988; Landström, 1998; MacMillan et al., 1987; Mason and Harrison, 1996b). This is further developed by Mitteness et al. (2012a). The authors identified that the entrepreneur's strong points are seen as being more helpful for a proposal to move further in the investment process than the opportunity power.

The specific characteristics of the entrepreneur have been an object of study. In the great majority of the studies, researchers have focused on characteristics that are verifiable, what can be understood as the tangible part of an individual and are easier to evaluate, such as: skills, experience, track record and so on (Some examples: Haar et al., 1988; Landström, 1998; Mason and Stark, 2004; Sudek, 2006; Van Osnabrugge, 1998b). Other characteristics, which can be seen as intangible, have also been taken into account by some scholars, such as leadership (Landström, 1998), trustworthiness (Harrison et al., 1997; Sudek, 2006; Van Osnabrugge, 1998b) and enthusiasm (Feeney et al., 1999; Mason and Harrison, 1996b; Van Osnabrugge, 1998b). However, Maxwell et al. (2011, p. 218) observed that “precise attributes of the entrepreneur are often difficult to determine objectively or rank in importance”.

The major advantage of these studies is to help understand which characteristics are more important. The results of these studies are not consistent across studies. Take, for example,

how the most important characteristic of the entrepreneur has varied across studies: enthusiasm (Van Osnabrugge, 1998b), expertise (Mason and Harrison, 1996b), trustworthiness (Sudek, 2006), leadership potential (Landström, 1998), ability to management (Haar et al., 1988). This would seem to support the observation made by Maxwell et al. (2011). The oral pitch has also been the object of study. One of the most cited research papers identified that business angels put more emphasis on the negative effects of a bad presentation rather than what they take from it (Clark, 2008). Issues associated with lack of clarity and the information provided were the most mentioned problems referred to by angel investors. Mason and Harrison (2003) also identified the importance of presentation skills as a key criterion that influences the investment decision.

The product/market is an important investment criterion at the screening stage. As previously mentioned, Sudek et al. (2008) argued that the tangible nature of this criterion makes it easier for the angel investor to evaluate its potential when compared to evaluating the entrepreneur's characteristics. When the product/market was used as a single criterion (Mason and Harrison, 1996b) it was the criterion mentioned more times by angel investors (30 times versus the people that took second place being cited 26 times). According to the same study, the market (sales prospects) was more significant than the product (quality of the product). However, several studies have examined the importance of this criterion separately showing different levels of importance. Starting with the real time studies, it is possible to infer that when analysed in isolation as one individual criterion it loses importance. For example, in Mason and Rogers (1996, 1997) studies, the market was the most significant criterion with the same relative importance than the financial considerations, while product was the third most important.

A very similar conclusion can be drawn from Mason and Stark (2004). If this study reported that the market and the product as a single criterion it would be the most cited one with the percentage of thought units averaging 25.3%. However, the study reported the two separately, which made the financial considerations the most important criterion with 22.5%. Harrison et al. (2015) is possibly the best example of this issue. The authors also opt to present both criterion individually. The importance of the product and of the market presents a large variance across the three groups of business angels. The product ranged from 2nd to 3rd while the market ranged from 3rd to 6th. Contrasting with other studies where the market was more relevant than the product. Again, if the two were measured together the importance would be exactly the same across the three groups; it would be the most frequent funding criterion. A similar procedure was followed by Mason and Botelho (2016) while studying gatekeepers. The conclusions regarding the relative importance of product/market are the precisely the same. In the case of the two being presented independently the importance is low at 4th and 3rd place, respectively. However, if measured together, they would take the first place in front of financial considerations.

From the real time research under analysis, only in Mason and Harrison (2003) it is possible to verify a criterion scoring more than product and market together. The presentation is the key criterion in this study. However, this could be the result of the research instrument used (video with an entrepreneurs pitch for funding). Another study focusing on the evaluation of a pitch by angel investors, the market potential and the product features were two of the four most cited investment criterion (Clark, 2008).

In studies that used a wider list of research criteria, it is possible to recognise a high level of inconsistency across studies in terms of particular issues associated with the market and/or

product. In Landström (1998) the highest criterion associated with product/market, market growth and attractiveness, achieved the 9th position with the following one, uniqueness of the product being 13th. This indicates that business angels give a fairly low significance to this criterion. This was later supported by (Sudek, 2006), where the highest ranked criterion associated with the product/market was ranked 7th (growth potential of the market). A completely different scenario can be found in the work of Van Osnabrugge (1998b). According to this research it is possible to identify four criterion associated with product/market in the top ten⁸ and one in the top three.

The importance that business angels give to the product/market at the screening stage was previously considered by Bachher and Guild (1996). In this study business angels ranked the product as the second most important criterion while the market came third. Haines et al. (2003) also defended the market as the second most important criterion. According to this research, for some business angels this criterion is considered the most important of them all. Although no reference is made to whether or not the authors included the product in the criterion, the findings indicate that was the case. Similar results were found by Haar et al. (1988). Additionally, the authors identified a list of evaluation criteria that are important for business angels. In this list, product and market came under the same label which is consistent with Mason and Harrison (1996b). Again it is possible to identify a high level of inconsistency across studies on the importance of a specific criterion (product/market).

The original list of investment criteria suggested by Mason and Harrison (1996b) included the financial attributes. In this study the authors make a reference to high margins in the

⁸ Sales potential of the product (3rd); Growth potential of the market (6th); Quality of the product (7th) and Niche market (9th).

criterion. However, the financial attributes have represented a wider dimension of issues. For example, in real time studies that used verbal protocol analysis, the coding scheme included several dimensions to the financial considerations. In terms of coding schemes, two approaches have been followed by scholars for the meaning of the financial considerations. For the main stream of the literature the financial considerations comprised three areas: (i) financial projections; (ii) valuation and (iii) the exit (Harrison et al., 2015; Mason and Rogers, 1996, 1997; Mason and Stark, 2004).

A second approach also considered three dimensions under the financial considerations but replaced the exit by governance issues (Mason and Botelho, 2016). In terms of importance, the great majority of real time studies consistently considered this criterion as the most important (Harrison et al., 2015; Mason and Botelho, 2016; Mason and Rogers, 1996, 1997; Mason and Stark, 2004)⁹. The only exception, in real time studies, can be found in Mason and Harrison (2003), where the financial considerations were ranked at the 5th position in a list with ten criterion. This difference could be the result of methodological differences. The first group of studies asked participants to evaluate a business plan, whereas the second captured the impression, reactions and thoughts of investors while watching a video with an entrepreneur pitching for funding.

Alternatively, when scholars used other methods to study business angels' investment criteria the importance of the financial considerations becomes less significant. In contrast to the real time research, this group of studies did not aggregate the several financial dimensions under a single label. This makes it harder to measure the importance of this

⁹ In Harrison et al. (2015) the importance is not the same across the three groups of investors. However, in aggregate terms it is the criteria with the higher percentage sum.

particular criterion. One exception to this approach is Mason and Harrison (1996b) work. The study classified the financial attributes as the third most cited criterion. Another example can be found in Feeney et al. (1999) work. The authors separated the decision criteria into the attributes of the business and the attributes of the entrepreneur and identified that growth/profit prospects was one of the key criterion for angel investors. This indicates the importance of the financial attributes for business angels.

As it was previously mentioned, it is not easy to measure the importance of broad criterion such as financial attributes in studies that used wider list of investment criteria. However, it is possible to understand that the financial attributes are not the key factor in terms of decision making scoring consistently low across the criteria list. In Landström's (1998) study the financial attribute that received the highest ranking was expected rate of return in 15th position (in a list with 34 criteria). Taking into account that this criterion should be seen as a dimension of exit, the first financial consideration would be time to break-even in 27th.

A very similar result can be found in Van Osnabrugge (1998b) work, where the first financial consideration ranked at position 15th (out of 27)¹⁰. This lack of importance of the financial attributes is later confirmed in Sudek (2006) research. Return on investment was considered by the participants of this study as the 8th most important criterion in a list with 25 criteria. Other financial dimensions score very low, for example: size of the investment (21st), ability to reach break-even without further funding (22nd), and low initial capital expenditure needed (23rd). All of these rankings confirm Van Osnabrugge's (1998b) findings. Stedler and Peters (2003) found that for 34% of German business angels, high profit margins were considered very important. The move into profit quickly had an even higher percentage of participants

¹⁰ Perceived financial rewards ranked 8th but in this review is considered one dimension of the exit.

stating its importance (38%). Although the scores can indicate that a significant number of angels think that some dimensions of the financial attributes are important, this is not verified when compared with the rest of the investment criteria. In this study there are at least six criteria with a higher number of investors stating it is very important.

This review is able to highlight that the importance of the financial attributes varies across studies. As in the case of other criterion, sampling and methodological issues can be identified to justify the differences. In this particular case, the methodological reasoning can be stretched to the way importance is measured in the real time studies. When a particular criterion, such as, financial considerations, has several dimensions¹¹ then the likelihood of achieving a higher score is greater given that importance is measured by the number of times it was cited. However, when participants are asked to rank relative importance in a Likert scale this is done in a very specific manner which does not come without its drawbacks. Despite that, it is important to acknowledge that at the screening stage, angel investors look at the financial attributes in a very particular way. Clark (2008, p. 268) noticed that some angel investors had “criticisms about the financials, sales projections and the stated/unstated value of their company.” This negative mind set can be associated with the high amount of assumptions associated to financial projections (Brealey et al., 2012).

The business plan is a key document on the entrepreneur’s journey to achieve funding from angel investors. This is the minimum requirement by any funding source (Kuratko and Hodgetts, 1992). Entrepreneurs who are pursuing angel funding must have one since 75% of angel investors require one (Mason and Harrison, 1996b). However, Bygrave and

¹¹ For example, in Sudek (2006) approximately a quarter of the criterion can be considered financial attributes.

Zacharakis (2009) argued that entrepreneurs spend too much time and effort on the business plan rather than on other things that could impress the investors¹². One may question to what extent this is valid. Several studies of business angel investment criteria have included the business plan as one potential criterion. However, this has not been followed across different research teams. The evidence seemed to indicate that the business plan is not viewed as a key criterion, but as a necessary requirement since the document is only exactly reviewed after the initial screening (Riding et al., 2007).

One of the first references to the business plan as an investment criteria was made by Haar et al. (1988). The study draws attention to the fact that business angels require a much less detailed business plan when compared with venture capitalists. Most likely, for this reason, the importance of a thorough business plan was low. Only 3.2% of participants ranked this criterion as the top two investment criteria. In Mason and Harrison (1996b) the authors noted that angel investors looked at a business plan for evidence that the proposal is feasible. The study also noticed that angel investors expected to see that the entrepreneur had made a considerable effort producing a quality document. In a list of six investment criteria, the business plan was considered the 3rd most important with the same score of the financial attributes. However, it was only referred to in 5.9% investment opportunities. Some lessons can also be taken from international research. A study with German business angels identified that the business plan is fundamental for the investment decision (Stedler and Peters, 2003). A similar study in Japan noted that 47% of angel investors considered their investment decision to be guided by the business plan and management policy (Tashiro, 1999). This seems to reinforce the idea that a business plan is a necessary, but not sufficient condition to obtain angel funding.

¹² The authors stress the importance of having a product or service that has already been under the consumer appraisal.

The real time studies provided very consistent results on the importance of the business plan at the screening stage, in particular, the studies that used verbal protocol analysis. In Mason and Rogers (1996, 1997) the business plan is considered as the 6th most important criteria. A very similar result can be found in Mason and Stark (2004) where the business plan scored exactly the same position. The most significant lesson from this study is that distinctive funders will appraise the business plan in a different way.

Another real time study looked at how different levels of experience impacted the way investment appraisal was conducted (Harrison et al., 2015). The study noticed that angels with different levels of investment experience will value the same criterion differently. In this study the business plan ranges from being the 3rd most important criterion to being the 6th. This study indicated that more experienced investors tend to appraise the business plan as being a more relevant investment criterion. Moreover, the business plan obtains a higher rank with the super angel group, while its lowest ranking is with the nascent angel. Another real time study that looked at the decision making criteria of gatekeepers also reached to similar results for the business plan (Mason and Botelho, 2016). This criterion was considered the 5th most important criteria. Hence, this stream of real time studies has provided sufficient evidence that the business plan is not highly ranked as an investment criterion.

A variant of the real time studies was conducted by Mason and Harrison (2003) using a video pitch rather than just a business plan. The study identified that the presentation was considered as the top investment criterion. This can be seen as analogous to a business plan in a verbal protocol analysis. This can raise speculation regarding the importance of the

business plan. Unfortunately, only a small number of studies used the presentation as an investment criterion, particularly, when compared with other investment criterion. Decision making criteria research that used Likert scales, and were previously cited in this subsection, did not include any dimension of the business plan. Nevertheless, it is possible with the set of studies reviewed to have a clear notion of the prominence of this criterion. The great majority of studies reviewed seem to validate Bygrave and Zacharakis (2009) views on the significance given to the business plan by angel investors – entrepreneurs should put less efforts on the business plan and more on what matters to investors.

The last of the six investment criteria in Mason and Harrison (1996b) study is the attributes of the business. This is a very broad criterion. For example, in Mason and Harrison (1996b) it reflects: the industry, local, readiness of the product, stage of development, etc. Mason and Botelho (2016) defined attributes of the business to include: strategy, business model, operations, time frame and so on. This represented an innovation to the typical coding scheme used in real time studies, which had considered the strategy and operations independently, as two separate criteria (Harrison et al., 2015; Mason and Rogers, 1996, 1997; Mason and Stark, 2004). It is important not to confuse this criterion with the one used by Feeney et al. (1999). These authors divided the investment criterion into two groups, attributes of owners and business attributes. The latter, business attributes, reflects several different investment criteria (exit, financial attributes, investment fit, business plan and so on)¹³. Other studies of business angel investment criteria did not define the attributes of the business with sublevels, instead it was used as a single criterion. In this case, the review will follow a similar approach to Mason and Harrison (1996b) in what regards the attributes of the business.

¹³ Examples of the sub layers of attributes of the business are: Good business plan and proper security, Profit, Established well-respected company with obvious bugs that I can help fix.

The great majority of real time studies did not identify the attributes of the business as a key investment criteria. The only exception to this can be found in Mason and Botelho (2016). Gatekeepers of angel groups seemed to be more inclined to emphasize this criterion with it being the 2nd most cited criteria. This is in line with the importance given by venture capital fund managers that cited this criterion (sum of counts of strategy and operations) as 3rd most significant (Mason and Stark, 2004). This can indicate some truth in Sohl's hypothesis that business angels groups are evolving into venture capital funds (2012a). In all other studies the attributes of the business would range from 5th to 7th (Harrison et al., 2015; Mason and Rogers, 1996, 1997; Mason and Stark, 2004). This reasonable level of consistency in real time studies, related to the attributes of the business, seems to be also valid across the angel population. The three groups of angel investors scored this criterion consistently low in Harrison et al. (2015) research.

The low score for attributes of the business is also reflected in studies that used other methodologies. Landström (1998) showed that the highest attribute of business dimensions achieved a modest 15th position in a list with 34 criteria. The ability to create post-entry barriers in the market can be seen as a measure of strategy (Porter, 2008). Sensibility to economic cycles also scored low rankings (30th). Van Osnabrugge (1998b) findings also showed the same low level of importance of the attributes of the business. Two strategy dimensions were included in the study. Nature of competition in 17th and formal competitive protection of the production in the last position showed the low importance business angels give to this criterion. Another study with a very similar methodological approach showed slightly different results (Sudek, 2006). Three dimensions of strategy ranged from the 9th to

15th position¹⁴. However, this does not present a significant difference when compared with other studies.

It is possible to conclude that angel investors do not put too much emphasis on the attributes of the business, with the only exception being made to the gatekeepers of angels groups. A possible justification for this is how the dimensions of this criterion are able to be changed during the post-investment stage. Business angels are known for being hands-on investors that actively influence the entrepreneur in specific areas of the firm, such as: strategy and operations (Politis, 2008). This is a much straightforward area to influence than the entrepreneur or the product, for example.

From the original criteria list suggested by Mason and Harrison (1996b) this research only recommended the addition of one criterion. The last criterion evaluated in this review is the exit. According to several scholars and practitioners, the angel community is suffering from an exit drought (Gray, 2011; Mason and Botelho, 2016; Mason et al., 2013; Waddell, 2013; NACO, 2014; Mason et al., 2015). Hence, it would be expected that the lack of exits would be reflected in the decision making criteria. The suggestion aims to evaluate whether the lack of exits impacts the decision making criteria of angel investors. Although the exit is not always considered as a key investment criterion, scholars have used it in different ways across business angel decision making research. Hence, this suggestion should not be seen as a pioneering novelty.

¹⁴ Barrier for entry for competitors (9th) Nature of competition (13rd), formal competitive protection of the production (15th).

The exit, also known as liquidity or harvest event, is associated with the last stage of the investment process. However, scholars have questioned the importance of the exit as a selection criterion at the earlier stages of the process. In the great majority of cases, this reference has been associated with only one dimension of the exit, for example: time to payback (Landström, 1998), the potential exit routes (Sudek, 2006; Van Osnabrugge, 1998a), exit mechanism (Brettel, 2002), exit options (Stedler and Peters, 2003), exit plan (Feeney et al., 1999), expected rate of return (Landström, 1998; Van Osnabrugge, 1998b). Typically, these issues have not been ranked as highly important for angel investors. The main reason for this is that, at this early stage of the investment process, business angels only expect that the opportunity is able to present an exit route which would allow investor to obtain a financial return (Feeney et al., 1999).

The only exception is Sudek (2006) study where the potential exit routes was considered the fourth most important investment criteria. The author defended that this could reflect the distinctive nature of US angel investors. In his opinion, the US business angels think that “if a new venture does not have a clear exit path, it is unlikely to be successful and bring any return to the investor” (Sudek, 2006, p. 100). However, one can speculate about an alternative justifications. First, this could be the result of sampling problems. This study sampled angel investors from the oldest US group. Second, business angels need to recycle their money to keep investing. There is significant evidence that holding periods have increased (Mason et al., 2015). This, associated with Sudek’s study being the most recent study in this group, can justify the higher rankings for exit.

Two additional approaches have been followed by researchers to study the importance of the exit as an investment criterion. The first, followed by the great majority of decision making

studies, that used verbal protocol analysis, has included the exit route possibilities under the financial considerations criterion (for example: Harrison et al., 2015; Mason and Rogers, 1996, 1997; Mason and Stark, 2004). This type of analysis presents a considerable problem when trying to evaluate a single component since the studies only reported the first level of the criterion. It is not suitable to use the importance of the financial consideration on its own, since it is measuring more than one criterion. However, one particular study can be helpful to understand the lack of an identical view across the angel population about the exit as an investment criterion. Harrison et al. (2015) indicated that, depending on the investment experience of the angel investors, the importance of the financial considerations varies. Additionally, one quote can help to summarize the overall importance of the exit as an investment criterion. In this study, one angel noticed that the exit was one of the four things he looked at. Hence, it is possible to infer that the exit is the top issue for some business angels, but definitely not for all.

A second approach considered the several dimensions of the exit in the list of investment criteria. According to one of these studies, it is possible to conclude that most of the investors who made comments regarding exits did so in a negative way, and did not consider pursuing the opportunity further (Mason and Harrison, 2003). In terms of relative importance the exit was the 8th (out of 10) most important criterion. One real time study has addressed the importance of the exit in the decision making process of gatekeepers of angel groups (Mason and Botelho, 2016). Similar to the suggestion made by this review, the study adapts a coding scheme previously developed by other research teams to include the exit. This research highlighted that the great majority of gatekeepers stated that they do take into account the exit when investing. However, the result from the real time methodology states the opposite. The exit is considered the least important investment criterion.

Once again it is possible to identify inconsistencies across studies in terms of the importance of the exit as an investment criterion, although, the level of contradictions seems to be less significant than other cases previously mentioned. In the majority of studies reviewed, the exit seems to be almost negligible as an investment criterion. However, it has also been acknowledged as one of the key motivational factors to be considered while investing. Sampling, methodological and even temporal issues can explain these differences. Nonetheless, it should be acknowledged as an investment criterion in angel research.

In summary, this subsection has reviewed the key studies of business angel investment criteria at the screening stage. It has highlighted what the key investment criteria are for angel investors. However, the high level of inconsistent findings across studies is a clear feature of this body of literature. This questions one of the observations of a previous review of the literature (Riding et al., 2007) which argued that there is a high level of consistency across a set of studies regarding the importance of the management team, market and product potential. Two reasons can be highlighted for the different views. First, the range of studies reviewed is different. The set of studies referred in Riding et al. (2007) is just a subset of the decision making criteria literature. Second, some of the most recent studies have covered different “types” of angels which can increase the inconsistency of the results. Hence, this review highlighted this problematic issue and helped to set context for heterogeneity discussion that will follow in the subsequent chapters of this thesis. The next section is still on the domain of investment criteria but will broaden the discussion by looking at the reasons to reject.

2.4.2 Rejection criteria

The most common outcome that an entrepreneur will get when looking for angel funding is a rejection. This can be observed in terms of low Yield rates¹⁵ or by high rejection rates. The first observation has been received less attention by scholars and consequently has been less researched. In a review of the literature focused on the market evolution and trends, Sohl (2012a) identified that the Yield rate in the USA in the period between 2000 and 2009 varied from 23.3% to 7.1%. The author highlighted similar levels for other countries, for example: 28% for the UK, 27% for France, 13% for Italy and 16% for Germany. These values are considerably high when compared with other studies that evaluated the total acceptance rate. Sohl (2012a) acknowledged several problems in the calculation of yield rates since the measure does not take into account all the deals (screened and non-screened) only the ones that were screened. Hence, the author would expect a substantially lower rate in case the denominator included the non-screened deals. This is verified in studies that have used both screened and non-screened deals.

Several studies have highlighted the second type of observation (some examples: Croce et al., 2016; Dal Cin et al., 1993; Mason et al., 2016). The first study to empirically verify the high rejection rates was conducted by Dal Cin et al. (1993) with Canadian business angels. The authors identified that at the deal source and screening stage for every ten opportunities submitted to an angel investor seven are immediately put aside. The study tracked the rejection rates through the investment process and concluded that only 3% of the original business opportunities were successful in achieving funding. Recent studies have shown very similar results. A USA study included 332 firms that sought funding from a Boston

¹⁵ Yield rate or acceptance rate was measured as the ratio between the total number of investments made and the total number of opportunities presented to investors.

group (Brush et al., 2012) identified only 82 (24.70%) investment opportunities that were able to pass desk rejection. A study using a similar approach analysed the decision making process of Tech Coast Angels (Mitteness et al., 2012a). The study highlighted that only 4% of the opportunities that did not get rejected at the application stage were funded.

Mason and Harrison (2015) studied the levels of investment activity in the post 2008 financial crisis and identified that less than 3% of the opportunities got funded by angel groups. A very similar result was attained by Carpentier and Suret (2015). The authors analysed 636 investment proposals submitted to a Canadian angel group and identified that only 2.4% of the opportunities survived the investment process. According to the same study, the rejection rate varied across the different stages of the investment process. The pre-screen of the proposal is the stage with the highest rejection rate (70%), while the detailed presentation was the one with the lowest rejection rate (4%). Very similar results were found by Croce et al. (2016) who studied the 1942 investment proposal submitted to an Italian angel group. The research identified an overall rejection rate above 90% with 72% of the opportunities being rejected after the pre-screening stage.

Other lines of research have identified that the means by which the angel investor sources the investment opportunity has an impact on rejection rates (Croce et al., 2016; Dal Cin et al., 1993; Van Osnabrugge and Robinson, 2000). This is particularly significant for investment opportunities referred by business associates¹⁶. Angel investors perceive two implicit benefits from these referrals. First, the business associates will be the first screening mechanism working as an initial quality filter (Harrison et al., 1997) Second, a reference

¹⁶ Dal cin et al., (1993, p. 195) defined these business associates as individuals “with whom the investor have had extensive investment experience”.

from a business associate will be seen as a quality signal for the presented opportunities (Sørheim, 2003) which counts as a validation factor. Hence, both implicit benefits will be valuable for the angel investor, increasing the likelihood of finding a suitable investment opportunity (Kelly and Hay, 2003; Mason and Harrison, 1996a; Paul et al., 2007). Van Osnabrugge (2000) identified a third benefit of referrals. The due diligence requirements will be substantially lower for referenced opportunities. A subsequent study corroborated this finding (Morrissette, 2007). A recent study conducted by Croce et al. (2016) noticed that opportunities that had been referred by venture capital firms had a higher probability to pass the pre-screening stage.

To understand the reasons for this high rejection rate one must ask four questions. First, how many reasons do angel investors give to reject? Second, what are the most frequently reasons for a rejection? Third, do the reasons to reject change as the opportunity moves along the different stages of the investment process? Lastly, does the fact that business angels are not homogeneous impact the rejection decision? In other words, do different angels reject for different reasons? These four questions will be answered in the following paragraphs for a better understanding of the rejection literature.

The first question has been significantly researched (Carpentier and Suret, 2015; Mason et al., 2016; Mason and Harrison, 1996a; Mason and Rogers, 1996, 1997; Maxwell et al., 2011). Using a sample of 35 investment opportunities Mason and Harrison (1996a) identified that the great majority of rejected proposals (more than 90%) exhibited no more than three weaknesses. The study acknowledged that 61 reasons were given for rejecting the 32 investment opportunities. This represents approximately two reasons per proposal. However, this will not be the case across the different stages of the investment process. Mason and

Harrison (2003) showed that an even lower number of reasons to reject are given at the screening stage. Their study indicated that, on average, participants gave 1.29 reasons to reject an opportunity. Mason and Rogers (1996, 1997) identified a very similar approach for the way business angels reject a business opportunity. The authors emphasized that business angel's move toward the screening stage looking for justification not to fund the opportunity. However, this does not happen as soon as they identify a "fatal blow". The research found that angel investors will look for a combination of deficiencies which tentatively suggests the use of a compensatory decision model. This approach was defined by the authors as "three strikes and you're out" (Mason and Rogers, 1997, p. 43).

Subsequent research has questioned the type of decision model used. Maxwell et al. (2011) concluded that business angels do adopt a non-compensatory decision model which will allow them to make quick decisions based on finding one or more reasons to reject. The research identified that the detection of a fatal flaw¹⁷ will make the investor reject the opportunity. This finding validates the non-compensatory hypothesis of the study. Carpentier and Suret (2015) identified what was the specific "deal killer" during the screening stage. Out of the 105 opportunities rejected at the screening stage, the authors identified 105 reasons for this decision. Although all of these studies have focused on the screening stage, the difference in decision making models suggested can be related to the methodology used.

Shepherd and Zacharakis (1999) alerted the problems associated with different methodologies. This debate will be further developed in chapter four. The discussion will show that the importance of investment criteria is methodologically dependent. Additionally,

¹⁷ Other authors have called it "deal killers"

the difference in decision making models could be associated with generalization. Although Maxwell et al. (2011) defended a non-compensatory model, 89% of the rejections were due to a single reason, leaving 11% of decisions which the non-compensatory approach does not fit. Mason and Harrison (1996a) acknowledged that methodological limitation of their study prevented them from being able to evaluate whether business angels used compensatory/non-compensatory models. A recent study, Mason et al. (2016) provide a useful summary of this literature. The authors' analysed 148 investment opportunities that were rejected. The authors concluded that 90% of these decisions were based on three or less reasons. Any comparison with previous studies needs to be done with care since the authors did not control for the stage of the investment process in which the proposal was rejected. However, this research is able to contribute to the existent literature by highlighting that typically business angels do not need a significant number of reasons to reject an investment opportunity.

Several factors have been highlighted by scholars as justifications to reject an investment opportunity at the screening stage. Haar et al., (1988) attempted to profile the investment community in the USA. Relying on a sample of 121 East Coast angels the authors concluded the key reasons to reject. A considerable amount of participants (72.8%) reported that the lack of capability of the management team was the key issue to disqualify an investment. This was followed by insufficient market potential (67.5%) and problems with the entrepreneur with high valuation expectations (52.8%). The major limitation of this study is the lack of stage focus. These findings of this study are very similar to subsequent research that highlighted the importance of the entrepreneur, market and financial as possible fatal flaws.

A later study conducted by Mason and Harrison (1996a) reached very similar results. The research used a random sample of deals that were submitted to an angel group to evaluate what factors led angel investors to drop an investment opportunity. The authors coded the notes, memos and minutes of the syndicate discussions on the opportunities. This identified the entrepreneur/management team as the most important factor contributing to a rejection at the screening stage. Marketing/market related issues and finance were in joint second position in terms of importance for a rejection. The most cited reason to reject was a weak management team (referred to 11 times) followed by unrealistic financial projections (mentioned seven times). The importance of the people, in particular their management capability, was stressed by Feeney et al. (1999) as the central rejection criteria. The study also called attention to other factors but it emphasized that people characteristics are the main driver of a rejection (lack of managerial knowledge, unrealistic expectations and personal qualities).

A recent study reached similar results. Mason et al. (2016) used two different samples¹⁸ to emphasize that the most common reasons that lead an angel investor to reject an opportunity are the people followed by product/market. During the in-depth interviews, issues related to the entrepreneur's character (honestly, trustworthy, believable and so on) were the most cited deal killers for participants.

However, there is a second group of studies focusing on rejection reasons that did not identify the entrepreneur as the central deficiency. Mason and Harrison (2002a) used a sample of 74 investors to identify the barriers that angel investors' face while investing. Although the results also stressed the importance of the entrepreneur, in particular,

¹⁸ 30 in-depth interviews and 148 questionnaire responses

credibility issues, it was not the key reason identified by investors. Issues associated with the business plan (unrealistic assumptions, unsatisfactory information, and lack of credible evidence) was key flaw in the investment proposals available to angel investors. Mason and Harrison (2003) presented additional evidence to support the idea that the entrepreneur is not the key reason behind a rejection. The authors sought to minimize methodological criticisms by using a real time technique. Hence, a video with a real pitch was presented to a sample of 30 angels and participants were asked to think out loud with the unit of thought being recorded. The study identified that 80% of the participants rejected the opportunity, with the most referenced negative reasons that led to this decision being: presentation¹⁹, market and lastly, the financials.

Issues regarding the importance of presentational skills were further developed by Clark (2008). The author asked participants to watch three real-life presentations and then asked their investment decisions and the reasons for these resolutions. The results show that non-presentational reasons were more frequently pointed as justifications to reject than presentational motives. Participants highlighted as the most important non-presentational reasons (i) lack of investment fit (ii) competitive issues (iii) apprehensions regarding the business model. However, when asked specific opinions about the presentation angel investors were extremely critical with 70% of the presentational comments being negative. The main limitation of this research is the fact that the study focus on presentational issues which are important but not necessarily the reason for the rejection. In their study, Carpentier and Suret (2015) presented slightly different results, with much less emphasis on the entrepreneurial team. The study acknowledged that the main reason to reject at the screening

¹⁹ The study had separate criterion to evaluate the presentation and the entrepreneur (people).

stage was the market (39%) followed by product and model (37%) and the financial (12%). The team (entrepreneur/management team) only represented 10% of the reasons to reject.

Four possible justifications can be advocated for the different findings. First, it is possible that in almost 30 years entrepreneurs have become more aware of what is needed to get the approval of an angel investor. It is reasonable to expect that this could be an effect of entrepreneurial learning/training. Second, the results are influenced by how the importance of the criteria is measured. Mason and Harrison (1996a) measured importance in two ways (i) the number of times the criterion was mentioned (ii) the number of opportunities that the criterion was referred. In Mason and Harrison (1996a) study, if the importance is measured with the latter, then the results are much closer to Carpentier and Suret (2015). Thirdly, this could be related to sampling issues. These studies have used the data provided from different sources: individual angels, syndicated angels and gatekeepers. Previous studies have shown that the heterogeneity of the angel population impacts the decision making criteria (some examples: Feeney et al., 1999; Harrison et al., 2015; Landström, 1998; Mitteness et al., 2012a; Van Osnabrugge, 1998a). Lastly, some of these studies are strongly stage dependent, while others are not. While asking participants to recall a decision it is almost impossible to ensure that the answer will be stage dependent.

In terms of the third question, changes across the investment process are discussed. The decision making literature has clearly emphasized that analogous to the reasons to invest, the motives to reject also change as the process unfolds. Much of this change can be explained by Fiet's (1995b) research. Business angels put more stress on agency risk rather than in market risk. Their risk avoidance strategy will consist in "recruiting" an entrepreneur that is able to (i) manage the downsides associated with market risk (ii) minimize the agency

risk. The latter is particularly important given the emphasis that business angels give to agency risk. Ensuring that interests between the entrepreneur and the angel investors are aligned is extremely important. Hence, during the initial stages of the investment process the emphasis is on knowing (Haar et al., 1988; Riding et al., 2007; Sudek, 2006) and building trust (Harrison et al., 1997; Kelly and Hay, 2003; Maxwell and Lévesque, 2014) with the entrepreneur. At later stages the relative importance of these risks will change and market risk will become central (Paul et al., 2007). This approach is supported by several studies (for example: Mason and Harrison, 1996a; Mitteness et al., 2012a).

Specifically, changes in the number of reasons to reject as the investment proposal evolves across the different stages of the process has been examined by Mason and Harrison (1996a). During the initial screening stage, angel investors will reject for a combination of reasons, while at later stages they will be reject based on a specific “deal killer”. Although with a different research angle Maxwell et al. (2011) also examined changes in the decision models used by business angels across the different stages of the process. This research reported that at the screening stage the angel investor will use a single deal killer, while at later stages the rejection will be due to an accumulation of reasons. A third study by Croce et al. (2016) showed that investors presented more reasons to reject after pre-screening rather than after screening²⁰.

In a recent study, the findings of Carpentier and Suret (2015) suggest that in a group context the level of variation of the investment criteria across the process may be smaller. The study highlighted that after the pre-screen stage the reasons to reject do not vary. However, one

²⁰ 1813 reasons were mention for the 1381 rejections after pre-screening while only 526 were presented for the 466 rejections after screening.

limitation of this analysis is the exclusion of the negotiation stage. The rationale for this decision is that at the negotiation stage the key reasons to reject are the financial considerations, in particular the valuation. Hence, one may conclude that the variation might be smaller than initially expected. The research also provided evidence of different rankings of importance across the investment process. The market (39%) was the most common reason to reject at the screening stage, while during all the following three stages, product and model (60%) was the key reason to discard the opportunity. Financial considerations (50%) were the main reason to reject at the negotiation stage.

Homogeneity is also a feature of the rejection discussion. A recent study has looked at the reasons to reject taking into account the lack of homogeneity of the angel population (Mason et al., 2016). A key finding of this research was the fact that investor characteristics were not a good predictor to explain the number of reasons to reject nor the specific reasons presented. The authors suggested that this similarity of investment approaches could be the result of investors being part of angel groups which could be generating ‘communities-of-practice’ where participants share a similar identity. Some level of convergence can also be found in Harrison et al. (2015). Using three samples of four investors the authors looked at how investment experience impacted the way business angels made decisions. The three groups exhibited the same rejection rates (75%) while taking different average times to reject the opportunity. Although the criteria rankings are different across the different groups, it is important to emphasize that this study did not focus on the motivations to reject. Hence, the criteria rankings are not suitable for this section of the review.

Feeney et al. (1999) used a sample with active investors and another with occasional investors. The study identified that the biggest turn-off for an active angel was the

entrepreneur's attributes, while for occasional investors it was the business attributes. Hence, one may conclude that earlier studies recognized that homogeneity plays a role in terms of rejection criteria. However, recent research has called attention to the possibility that angel groups might be reducing the variability of the investment behaviour of business angels, which could be explained by the learning process associated with being part of an angel group (Harrison et al., 2015).

One may conclude from this review that the reasons leading to a rejection have been under researched, both when compared with the investment criteria literature and in terms of what is still to be found. There is a clear need to understand the change in the rejection criteria as the process evolves. The contradictory results do not make it clear how important is the entrepreneur at the screening stage in terms of a rejection criteria. Therefore, one can question the reasoning made by Fiet (1995b) that the angel investors hedge market risk with their choice of entrepreneur. Another questionable finding regards the differences between investment criteria and rejection motivates. In a review of the literature, Ahtila (2014) questioned the extent to which the investment criteria differs from to the reasons to reject. In fact, the author noticed that contrary to the findings of previous research (Feeney et al., 1999; Haar et al., 1988), the investment and rejection criteria are very similar. Hence, it is fundamental that scholars put more emphasis on the rejection reasons so these queries can be clarified.

2.5 Conclusion

The purpose of this chapter was to review the key literature in terms of business angels' investment decision and to lay the ground for subsequent chapters. The road travelled has helped scholars to have a robust idea of the process and drivers of angel investing. But this review reveals that there is still more to be done, in particular, in terms of investment criteria and rejection motivations. At this stage, what is known by scholars about the business angels' investment decisions has been presented. This does not mean that there are no disagreements in the literature or unknown areas. Possible justifications to explain the reasons for contradictory results are associated with methodological and sampling problems. However, this review sought to provide a deep overview of the different areas of angel investment, such as: process, the motivations to invest, the criteria to invest and to reject. In terms of the investment process, the review enabled an informed decision on which model is more suitable for this research.

A reference is made to the differences between group and individual investment processes. Much more could be said if the aim was to reflect an angel group investment process. However, the results focus on the individual decision process. This is done without forgetting the importance of syndication to the process. The investment motivations are reviewed and it is possible to identify that recently the literature has not been developed. A call for acknowledgement of the importance of investing with others that results from the growing of angel groups is made. In terms of investment criteria, this review has identified the set of criteria commonly used in previous studies. Additionally, this review has put a precise emphasis on the inconsistency of relative importance given to specific criterion. This is particularly important given that previous research has highlighted exactly the opposite (Riding et al., 2007). Lastly, the literature on rejection motivations is summarized with the

need for further research being requested. This is due to the contradictory findings in terms of how the rejection reasons change as the process unfolds. Additionally, scholars should acknowledge that this stream of research has been undermined when compared with the investment criteria.

This chapter has provided the underling literature for the three empirical chapters. Nevertheless, given the differences across the topics further discussed in this thesis, each empirical chapter will have a specific review of the literature covering the debate. The following three empirical chapters will extend the discussion of business angel investment decision in terms of (i) methods used (ii) typologies of investment decisions (iii) changes of investment criteria. This will obviously require three additional literature reviews highlighting in detail the need for the discussion and the state of art of the research area.

Chapter 3. Research on business angels: the research challenges

3.1 Introduction

Entrepreneurship has been a common practice of mankind since the beginning of time and it was first defined more than 250 years ago. But only recently, has entrepreneurial knowledge developed significantly, with particular progress being made over the last 30 years (Cornelius et al., 2006). Hence, it is a research area still trying to achieve the necessary legitimacy (Bruyat and Julien, 2001; Busenitz et al., 2003). Over this period the field of entrepreneurship and small business management has evolved considerably both in terms of importance and research conducted, particularly in terms of its conceptualization, methodologies applied and topic development (Landström et al., 2012). However, this does not mean that conducting research in entrepreneurship will not have a considerable number of challenges. This is also particularly true in entrepreneurial finance, which is the motivation for this chapter.

To a large extent, business angel research reflects these issues. Kelly (2007) recognised how much scholars have developed this research area. However, the author emphasized that much more needs to be done, with definitional, methodological and theoretical issues being noticed as possible improvements. Illustrations of such issues can be easily found. For example, in terms of the definitional concern, the recent universalisation of equity crowdfunding platforms has brought additional confusion to the business angel definition. The overlap of the two communities is not totally clear and not very easy to measure.

Methodologically, scholars have attempted to improve the methods of data collection to achieve representative samples. Two alternative strategies have been used by scholars. On

the one hand, scholars have used secondary data sets, e.g. Dragons' Den data (Maxwell et al., 2011; Maxwell and Lévesque, 2014), Global Entrepreneurship Monitor (e.g. Ding et al., 2015). On the other hand, angel groups have been used as mechanism to collect aggregate or individual data (some examples: Carpentier and Suret, 2015; Mitteness et al., 2012a; Parhankangas and Ehrlich, 2014). Both strategies are not without limitations that should be addressed by researchers. Lastly, there has been an increasing number of publications that are theory driven. However, it is important to acknowledge that this demand for strong theoretical foundations is not always possible. Two justifications can be acknowledged. First, several areas in angel research are still under developed. Take the exit process as an example where the strategies used by business angels are still under researched (Carpentier and Suret, 2014; Mason et al., 2015). Second, the fast evolution of the small business equity finance market creates additional pressure for scholars to describe, explain and discuss the implications of new developments.

There has been an awareness of the challenges of researching business angels since Weztel's (1983) pioneering work. Hence, it is fundamental to understand how scholars have dealt with these limitations and what can still be done to overcome them. This discussion takes into account the evolution of the alternative finance industry. The aim of this chapter is to discuss the challenges of conducting business angel research and to provide methodological suggestions to researchers in the field. The next section will present the three characteristics of the angel population which create challenges for researchers. Subsequent sections will debate the implications of the solutions presented by scholars, particularly, the methodological solutions used. Lastly, the chapter suggests a new approach to calculate response rates when business angel groups are used in the recruitment process.

3.2 Definition

The definition of a business angel has evolved without a clear path or direction. Farrell et al., (2008) presented an extensive review of the definitions used in previous research highlighting the two major concerns about these studies. First, scholars have used different definitions for the same concept (business angels). Second, the definitions used are created to fit specific studies. Both problems pose limitations in terms of generalization and theory development. Similar concerns were raised by Avdeitchikova et al., (2008). They emphasized that after 25 years of research there is no standard definition of the key concepts in the field. The existence of three grey areas is referred to as the justification for the lack of a single definition.

Contrarily to other objects of study, business angels have a wide spread of individual characteristics and backgrounds (for example: industry experience, education, investment motivations and so on). This variability adds complexity to formulate a valid definition. This is reflected by Mason and Harrison (2008) who argued that the crucial issue to define an angel investor is associated with the delimitation of the concept. Business angel activity is not static. This has repercussions not only in terms of what makes an investor become a business angel, but also in terms of population size. The authors identified the transitory nature of angel investing. Other scholars (Avdeitchikova, 2008; Riding, 2005) also supported the argument that the dynamic nature of the angel market which generate definitional complications (Avdeitchikova et al., 2008). This indicates that the major problem is how set the limits of a concept that is not static. This has led scholars to produce

conflicting definitions, which in many case have been produced to satisfy data requirements rather than develop knowledge.

The terminology used by researchers has not been consistent. ‘Informal investors’, ‘business angels’ and ‘private investors’ have been used interchangeably in the literature, although the terms do not represent the same concept. Four papers (Avdeitchikova, 2008; Avdeitchikova et al., 2008; Farrell et al., 2008; Mason and Harrison, 2008) have addressed the problems created by scholars by using the different labels under the same umbrella. Several reasons have been referred to in each paper. Reasons do not vary too much across the studies. All four papers make reference to two factors (i) the lack of differentiation between love money (family and friends) and business angels (ii) the level of investment experience – minimum number of investments. The remaining causes presented highlighted different dimensions: involvement with the invested firms, financial tools used, syndication, dynamics of the angel market, heterogeneity of the angel population, etc. For all of these reasons, and with the evolution of the angel market, it is important to acknowledge the limitations associated with angel research. Table 3-1 summarizes the problems identified in these four papers.

Table 3-1: Definitional problems presented in previous research.

<i>(Farrell et al., 2008)</i>	<i>(Mason and Harrison, 2008)</i>	<i>(Avdeitchikova, 2008)</i>	<i>(Avdeitchikova et al., 2008)</i>
Timing	Dynamics of angel activity	Love money	Requirements on the channelling of investments
Debt	Investment experience	Investment experience	
Virgin Investors	Heterogeneity		Requirements on the level of investment activity and hands-on contribution given to the company invested in
Corporate Angels	Love money		The types of relations between the investor and the entrepreneur
Family Friends	Syndication Hand-off		

The rise of equity crowdfunding platforms brings an additional grey area to this discussion. How can researchers clearly differentiate between crowd funders and angel investors? Scholars have already identified commonalities between business angels and crowdfunding investors (Ordanini et al., 2011). A recent UK study (Mason and Botelho, 2014) identified that 22% of business angels also invest through crowdfunding platforms. Another UK study, conducted during a similar period, identified that 45% of business angels invest alongside crowdfunding platforms (Wright et al., 2015). Hence, scholars need to be alert when designing surveys which investor type they are targeting. The new alternative finance trends can lead to incorrect recruitment processes which would result in unrepresentative samples. Hence, scholars should use previous definitions to enable comparison between studies. However, scholars have to be alert to market evolutions to ensure that the definitions are up-to-date.

3.3 Invisibility and Anonymity

The angel market is known for having two segments - visible and invisible (Wetzel, 1994). The visible side is characterized by investors who are members of business angel networks or business introduction services. This enables researchers to be able to estimate the size of the visible market with a comfortable degree of assurance when compared with the invisible segment. The invisible side of the market is characterized by investors who operate on their own, or in very small groups. These investors want to be anonymous with their investment activity not being publicly documented (Mason and Harrison, 1997). Their practices are slightly different from those in the visible market. For example, their deal flow depends on their reputation and word-of-mouth. The size of the invisible portion of the market still remains unknown. As a consequence, the total size of the angel population is also unknown.

This is not surprising, since in his early study Wetzel (1983, p. 26) has maintained that the size of the angel market ‘is unknown and probably unknowable.’

This important characteristic has significant impact in terms of research design. Mason and Harrison (1997) acknowledged that the biggest fragment of the angel market is the invisible fraction. The same research team emphasized that in the UK the visible market can also be segmented into two overlapping parts (Mason and Harrison, 2010): (i) visible market (ii) tax relief scheme. The first sub-segment consists of investments made through some type of business angel networks or groups. The second sub-segment entails those investments made using the Enterprise Investment Scheme (EIS). It becomes clear that although these two sub-segments are considered “visible” they are not equally accessible to researchers. First, not all angel networks provide information about their members. Second, not all EIS investments are made by angel investors (Mason and Harrison, 2010). Hence, it is not possible to understand how much these two sub-segments overlap.

However, this is just a part of a bigger problem – understanding the relation between the visible and invisible markets. The existence of these two segments of the angel market generates additional problems to scholars conducting angel research. First, the relationship between segments of the angel market remains unknown. Until recently, scholars were not able to precisely quantify the size of both segments. Scholars have “played with numbers” to produce fragile estimations of the market segments. An example of this was conducted by Mason and Harrison (2000a). Having calculated the size of the visible market based on membership of business angel networks, the authors suggested that in the UK the invisible market is five times larger than the visible counterpart. However this was a guesstimate so the research presented two additional suggestions (i) invisible is ten times larger than the

visible segment (ii) 20 times relationship. Hence, the invisible segment of the angel market does not allow a correct estimation of the angel population. Second, the level of interaction between segments.

Mason and Harrison (2010) recognised three “types” of investment behaviour. First, there were a group of investors who solely operated in the invisible market. Second, there were business angels who invested in both the visible and invisible markets. Lastly, there were those who only invest through networks or as part of angel groups. The proportion of each “type” of investment behaviour is unknown. In a later study, Mason and Harrison (2015) highlighted that “many” angel investors were actively involved in both segments of the market. However, it is not clear to what extent both segments overlap which creates additional imperfections to the correct estimation the size of the angel population.

Scholars have acknowledged the sampling limitations created by invisibility and anonymity of the angel market (Avdeitchikova et al., 2008; Mason and Harrison, 2008). If the size of the angel population is unknown how can scholars collect representative samples? Several sampling techniques have been employed (Avdeitchikova et al., 2008), but only a rare number of studies, if any, were able to collect a random sample (Riding, 2008). Harrison and Mason (2008) noticed the need for sampling improvement, with the need to go beyond just identifying and surveying the angel population. They stressed the need to identify, measure, and track the angel market using new procedures rather than following similar rules as venture capital research. However, in the majority of cases, scholars have described a highly invisible market using the visible counterpart (Kelly, 2007). This will be further discussed in a following section. In the great majority of angel studies scholars have solved the invisibility and anonymity limitation by surveying the visible market. Given that the

interaction between the visible and invisible segments remains unknown, representativeness cannot be ensured. However, scholars are able to get a step closer to understanding angel investment behaviour.

3.4 Heterogeneity

The lack of homogeneity in the angel population has been identified in Wetzel's (1983) initial work. This characteristic has direct impacts on business angel research, specifically the level of homogeneity of a population has a direct impact in terms of research design. On one hand, it has sampling implications. Zikmund et al. (2013) noticed that the heterogeneity of a population will be one of three factors necessary to identify a sample size. On the other hand, it has direct definitional implications. This was observed by Mason and Harrison (2008) when the authors pointed to it as one of the reasons for the definitional problem. Farrell et al. (2008) made a similar comment when referring to specific "types" of investors as a definitional issue. Scholars have conducted categorization studies to better understand to what extent this heterogeneity is important and what does it represent. A 22 year old journey that allowed scholars to offer different typologies enabling unique ways to understand the angel population. However, the common feature in categorization studies is that different angels will have different investment behaviours.

Since the initial categorization study conducted by Gaston (1989), scholars have highlighted differences in the angel population. However, the rules used to distinguish angel investors have varied across studies. Typically, categorization studies have used investor characteristics to differentiate angel investors. The most frequent characteristic used has

been investment activity (Freear et al., 1994; Kelly and Hay, 1996, 2000; Kelly, 2000; Sørheim and Landström, 2001), but scholars have also looked at investment motivations (Sullivan and Miller, 1996), entrepreneurial background (Coveney and Moore, 1998) and investment preference (Erikson, 2007). Avdeitchikova (2008) represented a breaking point in categorization studies. First, her research suggests the use of the investment as a unit of analysis, rather than the investor. This suggestion is perfectly aligned with previous research (Avdeitchikova et al., 2008; Farrell et al., 2008; Mason and Harrison, 2008) that goes beyond categorization studies. Second, the research showed that the investment behaviour of business angels is not static, but varies across investments. Hence, if investment behaviour changes then investors can switch the “type” they belong to. This implies that it is a much harder task to map the angel population.

The heterogeneity of the angel population increases the problems of achieving representative samples (Farrell et al., 2008). The great majority of business angel studies are based on samples of convenient population groups (Harrison and Mason, 2008) that have not taken into account the heterogeneity of the angel population. The evidence collected by researchers showed that the angel market is evolving with the visible segment increasing size (Mason et al., 2013; Sohl, 2012a). The effect on the level of homogeneity of the angel population has not been studied. However, as discussed in the first chapter of this thesis, it is reasonable to expect that angels in the visible segment are becoming more alike, increasing the homogeneity, associated with the standardization of the investment process and the learning from group interactions. A recent study conducted by Mason et al. (2016) on the rejection criteria of business angel noticed how group membership was creating a common way of thinking across investors. The effect on the invisible segment is harder to predict. Hence, one logical step is to take Avdeitchikova’s (2008) advice and conduct research that is investment driven rather than investor focused.

3.5 Sampling

The three characteristics previously mentioned raise a very important challenge to scholars to generate representative samples. Much of the studies conducted in angel research has been the product of convenience or snowball sampling (Riding, 2008). This is not a desirable outcome, but the result of the characteristics of the angel market. First, scholars need to be able to identify representative samples (Månsson and Landström, 2006). This problem is directly linked with the invisibility/anonymity characteristic. Second, the alternative sampling approaches do not come without their weakness. Avdeitchikova et al. (2008) reviewed sampling techniques used in angel research and identified the different trade-offs of each approach. The authors argued that “to gain robust knowledge within the field, we need to increase the quality of the sampling techniques used” (Avdeitchikova et al., 2008, p. 392). This research suggested two options in terms of sampling approaches (i) random sample approach (ii) multi-sample approach. The first sampling approach is comprised of two stages (a) identification and (b) data verification. At the identification stage, the researcher would contact a large number of potential angel investors. Then, the second stage consists of verifying which of the respondents can be considered as business angels.

Avdeitchikova (2008) applied this approach in Sweden and from an initial random sample of 40,320 individuals, the author completed 278 interviews with angel investors. The second sampling approach suggests, rather than using a unique sampling technique, the researcher should use a number of different sampling methodologies. Avdeitchikova et al., (2008) used this approach applying 7 procedures (for example: business angel’s networks, media, referral, earlier study and so on). This approach resulted in 297 responses of angel investors from 1518 invitations. Both sampling approaches are seen by the authors as ways to increase the quality of the data. However, the great majority of studies from 2008 onwards did not

follow this recommendation. Scholars have used self-selected registers (business angel networks/groups) as a sampling frame.

Farrell et al. (2008) had already called attention to the rise in the use of business angel networks and business introduction services as a sampling frame. The authors conducted a review of angel research in the period between 1981 and 2007 and identified three methodological trends. First, scholars have reduced the number of convenience methods used. Second, there was a decrease in the number of organization types used in the studies. Research conducted before 1993 examined an average of 3.6 different organizations while studies conducted in the following period only surveyed two types of data sources. Lastly, the number of business angel networks and business introduction services examined has increased significantly²¹. This increase in the number of organizations examined is seen as an attempt to reduce biases (Mason and Harrison, 2002c).

However, Farrell et al. (2008) emphasized that the use of these organizations still represented a convenience sample because of self-selection biases. Investors who are members of such organizations are not necessarily representative of the angel population. First, these organizations are believed to be just a small proportion of the angel investing and do not represent the entire market (Mason and Harrison, 2001). Studies using this sampling approach would not include the group of investors that only invest in the invisible market. Second, Farrell et al., (2008) defended that even if scholars increased the variability of business angel networks surveyed, it is impossible to guarantee that a sample is representative. The key problem is the uncertainty associated with the invisible segment. If scholars could better identify the size and the practices of the invisible segment, then the

²¹ From 10 BISs surveyed by Van Osnabrugge (1998a) to 19 BISs studied by (Mason & Harrison, 2002c)

sampling approach would be seen less susceptible to biases. Otherwise, scholars should take on board Avdeitchikova et al.,'s (2008) suggestion.

Subsequent research has not taken into account the advice offered by Farrell et al. (2008) regarding the use of business angel network as a sampling method. Since 2008, the great majority of studies have used business angel networks/groups as a sample or as a recruitment mechanism. To evaluate if Farrell et al.,'s (2008) findings were still valid, a review of angel research from 2008 to 2015 was conducted. This built on the period of analysis used by Farrell et al., (2008). The decision was to choose journals articles in the field of entrepreneurship. Only 3 and 4* journals²² in the field of entrepreneurship were included. This represented a total of eight journals, five ranked as 3 and three ranked as 4*. The rationale behind this decision was to evaluate which sampling approach high level publications have used. The last decision was to identify which words to use in the search. The words used were "business angel" and "business angels". The objective of this search strategy was to identify high quality publications on angel research rather than maximizing the number of articles found on the topic.

The combined results of the two searches are presented in Table 3-2. Depending on the search words used the number of identified articles differed. The two result lists were combined into a single list. The aggregate list of publications had a total of 178 articles that had some reference to business angel(s). The following step was to identify articles that had the angel investor and/or investment activity/process as the key theme of the research. From this initial set, only 22 (12%) of these articles were focused on business angels and/or their practices. In terms of the number of publications, the results show that there is no significant

²² Journals in the ABS rankings

difference between the number of 3 and 4* journals. Both ranks of journal have published around ten articles in the period under review. The total number of articles found that used business angel networks/groups or business introduction services was 11 (50%). A further three papers were based on data from TV shows Dragons' Den and/or Shark Tank. This would increase the values to 14 (64%). This inclusion can be defended by the similarities between angel groups and such TV shows²³. These results indicated that the sampling recommendations made by Farrell et al. (2008) and Avdeitchikova et al. (2008) have not been taken into account in succeeding research. When evaluating the quality of the publications the results are even more surprising, 75% of 4* journal publications used groups as a sampling approach. This finding is even stronger if the analysis evaluates publications by the creation of new data set.

There is a clear division between articles that used existing data sets (38% representing 7 articles) and others that collected new data (62% representing 15 papers). The first group of research used financial data that were publicly available. This included data from the Global Entrepreneurship Monitor. The second group of papers needed to generate a data set which implied a data collection process. The articles found in the search indicated that 93% of the research with new data used business angel networks/group or business introduction services. Only one article did not use this sampling approach. This provides a clear indication that scholars have a strong preference to study what they can easily identify rather than pursuing representativeness of the sample gathered. Hence, one might ask if this is an appropriate behaviour and what can lead to this decision. On the one hand, scholars cannot fully understand the invisible segment. So, how can researchers discuss representativeness

²³ Size and investment process.

when the population is unknown? On the other hand, surveying the visible segment is cost effective and likely to be less time consuming.

Table 3-2: Published angel research in 3 and 4* journals, 2008 to 2015

Initial search	"Business Angel" and "Business Angels"
Rank 4	74
Rank 3	104
Total	178
Angel Research	
Rank 4	12
Rank 3	10
Total	22
BAN/G Sampling	
Rank 4	6 (9)*
Rank 3	5
Total	11 (14)*

The increase of the number of articles in angel research using business angel networks/groups reflects the low cost²⁴ and simplicity of data collection process. Additionally, it also reflects the increasing interest in angel groups (Gregson et al., 2013; Mason et al., 2013; Sohl, 2012a). However, this practice does not come without limitations. As previously mentioned, representativeness can be questioned.

3.6 Response rates

Measuring response rates is a further challenge in angel research. The first issue that arises in angel research is to define the unit of analysis the response rate is going to be measured. Response rates can be measured in terms of business angels or in terms of groups/gatekeepers supporting the research. If scholars decide to use the investor as the unit of analysis, then the population will be the total number of business angels. This has clear

²⁴ Time and money.

problems, namely, how to identify and quantify the population of business angels. Some studies have applied a random sample approach to try to identify angel investors (Avdeitchikova, 2008), which besides representing a considerable cost, raises questions regarding the denominator of the response rate. As previously noted, Avdeitchikova (2008) contacted 40,320 individuals achieving 278 responses of angel investors. The author presents several responses rates following each of the stages of the sampling approach. The final response rate is 69.3%, however, this is questionable since 278 investors out of 40,320 initial contacts provides a considerable lower response rate (less than 1%). Hence, more needs to be done to calculate response rates.

The main efforts of scholars have been to estimate the size of the angel market in terms of number of investments/amounts invested (for example: Sohl, 2003a), which is an easier task than the number of investors. The attempts to evaluate the number of angel investors started with Wetzel's early estimations (1986). Using a market based approach, which consisted of comparing supply and demand, the author made a guesstimate of a total of 100,000 angel investors in the USA in the early 1980s. In a later study (1994), the author updated his estimation and projected that the number of angel investors in USA had rose to 250,000 in the early 1990's. The reliability of these estimations is low, as he acknowledges (Wetzel, 1986).

Gaston (1989) used a firm based approach which consisted firstly of identifying firms that had raised finance resources from business angels using a Small Business Administration survey, and then contacting these investors. The author estimated a total number of 720,000 angel investors in the USA. Comparing both studies, it becomes clear how hard it is to have a reliable estimation of the number of angel investors. Other techniques have been used, for

example, the capture-recapture approach used by Riding and Short (1988) to estimate the angel population in Ottawa-Carleton, Canada. Using the known number of members of business angel networks (visible market) operating in the UK as a reference, Mason and Harrison (2000a) inferred the total number of angel investors (visible + invisible).

Avdeitchikova and Landström (2005) used a large scale large omnibus survey to conclude that in Sweden the number of angel investors ranged between 154,000 and 180,000. All these techniques have limitations that are well documented in the literature, but were helpful to provide an initial notion of the dimension of the angel market. However, as Wetzel recognized (1983, p.26) the size of the angel market is ‘unknown and probably unknowable’. Hence, this has implications in terms of research design – how is it possible to evaluate the quality of a sample if you do not know the population. A valuable alternative is to use the angel groups as the unit of analysis. This enables scholars to understand how representative a sample is in terms of the visible segment of the market. Additionally, it would be easier to understand bias problems. This helps to understand its use as a sampling approach by scholars.

Response rates in angel research vary across studies depending on the way they are measured. The response rates are easier to calculate, when the study does not use business angels’ networks/groups as a sampling approach, because typically scholars are using convenience samples. However, when scholars decide to use this sampling approach, the way response rates are calculated varies across studies. Partially, this is justified by what information is available. In some cases, the response rate might be calculated based on the number of angels, while in other cases it is computed using the number of groups supporting the research. Several scholars (Mason and Harrison, 2008; Avdeitchikova et al., 2008;

Farrell et al., 2008) have identified how problematic response rates are in angel research. Response rates measured in terms of angel investors range significantly (15% to 46%) (for example: Erikson et al., 2003; Harrison and Mason, 1992a; Wiltbank, 2005). Yet, if they are measured by the groups taking part, it seems to be slightly higher.

In a study evaluating angel organization, Sohl (2006) reported a 37% response rate. This value is measured in terms of angel groups taking part in the research. Another study that took the same approach in terms of response rates looked at women syndication (Sohl and Hill, 2007). From the 120 groups' contacted (19 women exclusive and 101 male dominated groups), the authors received the support of 47 groups representing a response rate of 39%. Mason and Harrison (2008) raise suspicion about the response rates in Sohl first study. The authors indicated that the response rate was not correctly calculated with the results presented being inflated. Nevertheless, the scepticism raised by Mason and Harrison (2008) is not only problem of this response rate. Calculating response rates based on angel organizations participation can result in misleading indicators. Two points can be raised regarding this issue. First, response rates do not take into account the type of organization. Sohl (2007) identifies six types of angel portals²⁵ with different investment processes, visibility, organizational structures, membership criteria, etc... Hence, depending on the type of "portal" supporting the research, the results can be easily questioned in terms of validity and reliability (Hair et al., 2006). Second, response rates do not consider the size of the organizations surveyed. This is particularly important in terms of representativeness (Schalm and Kelloway, 2001). Membership of angels groups varies significantly from just a couple of investors to larger syndicates with almost three hundred members. If response

²⁵ The author defines portal as the interface between business angels and entrepreneurs.

rates are measured in terms of angel groups then it is possible to have a distorted representation.

An alternative approach to calculate response rates was followed by Wiltbank and Boeker (2007). The authors contacted 279 angel groups but only 89 of them accepted to take part in the research. However, the response rate was not measured in terms of angel groups, but in terms of investors. Using the group membership, the authors reached a 13% response rate. However, if the response rate was calculated using the number of angel groups supporting the research, the value would increase to 31%. This particular procedure of calculating response rates using the group membership was also followed by Wiltbank et al. (2009). The authors based the research on two samples (i) based on 12 business angel groups (ii) an online investment network. The reported response rate was based on the number of investors taking part, which was 23%. Although the authors of these two articles seem to have a conservative approach, the method used to calculate response rate can be questioned.

First, it is not clear if the groups supporting the research provided details of the membership list, or just the number of members belonging to the organization. Assuming that the individual details of group members were not provided to the researchers, double counting of might have occurred. That is, the same investor could be counted more than once by belonging to more than one group. This not only underestimates the response rate²⁶ but it also represents a misrepresentation in the study. Second, the authors calculated response rates with the returned responses instead of the usable responses. This procedure goes against Baruch (1999) and it can be seen as an attempt to “camouflage” the actual response rate

²⁶ If membership details were provided then scholars would be able to identify members of more than one organization. Consequently, the denominator would be smaller which would generate a larger response rate for the same number of participants.

(Baruch and Holtom, 2008). Lastly, and the most problematic issue, the reported response rate does not take into account the groups that did not support the research. The authors decided to only include the group membership of the organizations that supported the research, excluding all other organizations that did not answer, or did not accepted the request. However, this does not reflect the initial attempt to include all angel groups. The denominator in the response rate calculation should refer to the total number of investors in all angel groups supporting the research. Hence, the reported response rate does not reflect the initial effort of recruiting the angel groups, which should be measured in the response rate.

Of course, this procedure needs a second level of confirmation which should be assessed by using the number of respondents and should take into account: the sample size and a multiplier for multiplicity of groups. Equation (1) provides the two components of the response rate if groups are used as a vehicle to recruit participants. Equation (2) provides a simple weight of the number of groups that supported the research versus the total number of groups identified. Equation (3) provides an approach to calculate response rates, and it follows a similar approach of Mason and Harrison (2000a). Thus, the response rate should be calculated:

$$R = f(r_g, r_i) \quad (1)$$

$$r_g = \frac{g}{G} \quad (2)$$

$$r_i = \frac{n}{N} \times m \quad (3)$$

Where:

R = response rate

r_g = weight of support

g = groups supporting the research

G = total number of groups of the sample

r_i = individual response rate

n = number of responses

N = total number of members of the groups supporting the research

m = the average number of angel groups²⁷ which these business angels are registered with

This recommendation solves the problems of the two approaches previously mentioned. It takes into account the two dimensions of the recruitment process (i) angel group stage (ii) individual investor's phase. Scholars should follow this approach when recruiting from business angel networks/groups or business introduction services. The interpretation of this measure would help not only to understand how valid and reliable the results are, but also how representative is the sample. The quality of a research article should not be evaluated just on the basis of the response rate (Campion, 1993). However, the denominator of this measure is directly linked with the visible market which can provide a clear notion of its size allowing researchers to assess the potential of the findings. Nevertheless, this suggestion does not come without any drawbacks.

Four major limitations can be highlighted to this approach. First, it will only take into account the visible market. This is not a direct problem of the measure, but of the sampling approach. Second, the number of angel groups is not constant. The angel market is

²⁷ Of the groups supporting the research.

continually evolving with new groups being created and old ones being amalgamated or even disappearing. Hence, it becomes fairly easy to underrepresent the number of active groups. Third, the group weighting does not take into consideration the dimension of the groups. For example, in the UK the group memberships range from two to close to two hundred members.²⁸ If business angels' networks are included the variety would increase²⁹. But this could provide a misleading result of this index. Lastly, the multiplier is an estimation based on the sample results. Hence, it can still provide a misrepresentation of the response rate since it does not take into account the size of the groups involved. However, the aim of this recommendation is not to present a flawless measurement, but to call attention to the need of an approach to standardization when calculating response rates when the recruitment is done through angel groups.

3.7 Discussion

The previous section has presented a problematic issue regarding angel research – the response rate. However, one might ask if the size of the population is unknown, how can it make sense to calculate a response rate? Watters and Biernacki (1989) argued that it is impossible to calculate response rates when studying hidden populations (1989, p. 426) “since one can never know and, therefore, enumerate the total number of qualified respondents who became aware of the study by word of mouth”. This is true for hidden populations that do not have a visible segment. However, the angel market has a visible segment. Hence, it does make sense to calculate the response rate in angel research.

²⁸ Very similar to the USA market where the largest group, Ohio TechAngels, has 340 members (Ohio Techangels, 2015).

²⁹ For example, Angel Investment Network reports 300,000 members worldwide, with more than 30 networks in over 80 countries.

However, it is important to understand that these response rates will mainly be associated with the visible segment of the market.

This represents an additional pressure for scholars to use business angel networks/groups and/or business introduction services as a sampling framework. However, the use of such an approach has been widely criticized by scholars (Avdeitchikova et al., 2008; Farrell et al., 2008) as a unique sample approach. The increased use of such an approach has indicated that the academic community values more a larger data set, than an unbiased one. This becomes particularly obvious when the great majority of alternative sampling methods also present representativeness biases. Hence, the decision is not whether to use the visible market in angel research, but why scholars have not followed any of the sampling suggestions presented by Avdeitchikova et al. (2008)?

This thesis is able to provide additional support to defend the use of business angel networks/groups as a sampling approach. The evolution of the angel market has been widely recognized by scholars with the proliferation of angel groups being the most cited indicator. This has a clear impact on the size of the visible segment of the angel market. The data collected for this thesis, through an extensive online survey of the visible segment has suggested that more business angels are starting their activity in groups, rather than individually through the invisible market. Participants reported when they conducted their first angel investment and the year they joined a group. This enabled an evaluation of the effect of syndication in terms of the origin of new business angels. Cross tabulation of Age of the investor/years investing and the Angel origin, that is, the way the investor started (group or individually) presented clear indications of an increasing significance of the visible segment versus the invisible one.

Figure 3-1 and 3-2 provided depict these findings. Figure 3-1 depicts the relationship between the age of the investor and the way the business angel started investment. Solely analyzing the investors who started in the invisible market, it can be seen that older angels are more likely to have started in the invisible segment of the market, whereas younger investors are more likely to have started investing as part of a group. This effect is not consistent through the five age categories. But, if the investors who started investing in the same year that they joined a group are included, then it becomes clear that new business angels are starting their activity in the visible segment.

Figure 3-2 depicts the relationship between years investing and the origin of the angel investor. This analysis is more robust than the previous one since it focused on the length of the investment activity, which is a better proxy for the market evolution. The results show a clear increase of the proportion of investors joining groups to start investing. Approximately three quarters of the investors who made their first investment prior to 1999 did it on their own. Only one out ten investors that made their initial investment after 2009 did it on their own. The proportion of investors who only invested after joining a group increased in the period under review, from 5% to 22%. Lastly, it is important to acknowledge the rise in the percentage of investors who started investing in the same year they joined a group. It is reasonable to assume that these investors are likely to have invested after joining an angel group. This finding points to the increased importance of the visible segment of the angel market, which can justify the sampling method under discussion. However, if this is valid, and it is enough to evaluate the visible market, then it becomes important to standardize procedures in this type of study.

Figure 3-1: Investors' Age and Angel origin

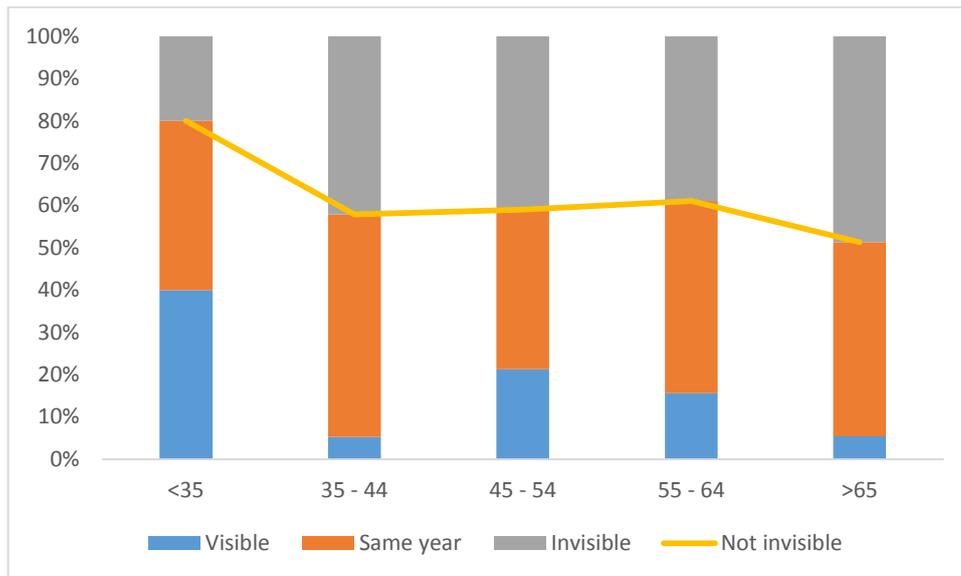
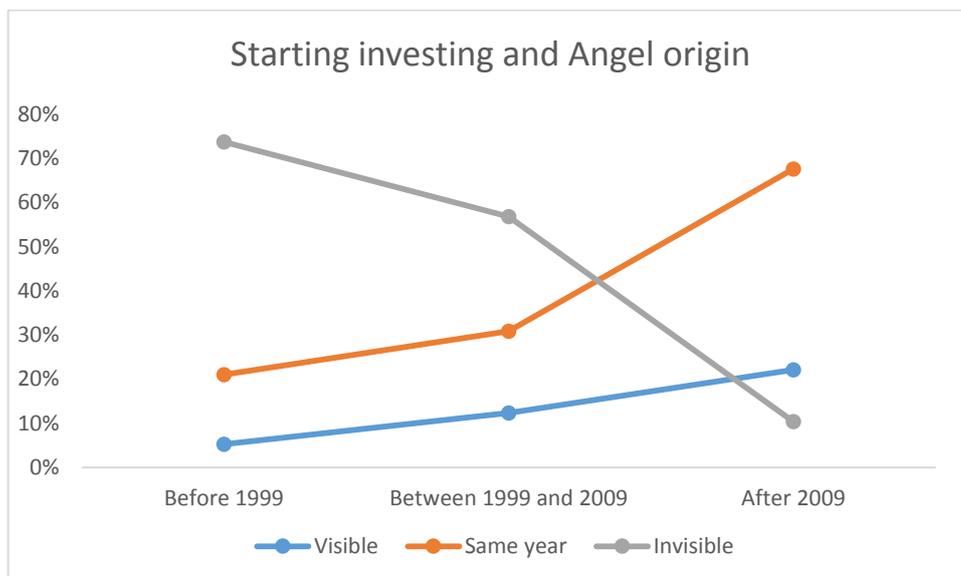


Figure 3-2: Years investing and Angel origin



In summary, scholars need to acknowledge the importance of reporting the correct response rate. If the object of study is investors in both the visible and the invisible segments, then the response rate should be calculated taking into account the total of potential participants contacted. This can be considered virtually impossible because of the restrictions imposed by the nature of the invisible segment of the angel market. Exceptions are made to studies that used a much more focused sampling approach, e.g. snowballing sampling. However, if the focus is solely on investors operating in the visible market then scholars should agree on

a standardized approach to calculate response rates. This would bring comparability to angel research following similar processes in other areas of knowledge.

3.8 Conclusion

Initial angel researchers had to overcome the limitation of studying a highly invisible population with a high degree of anonymity. The nature of this hidden population has changed with the concept of business angels becoming widely spread, through different mechanisms including several TV shows. However, this does not mean that angel research is free of problems. Definitional and sampling issues have created disagreements among scholars resulting in less comparable studies. However, the popularization of angel investing has also had positive effects.

In the recent years, the angel market has moved from investors acting on their own to a more collective structure. This transformation has had a direct impact on how researchers collect data. Business angel groups have become a very attractive way for researchers to gather data. However, it has raised questions about the reliability of the research findings of such studies. Evaluation of articles published in top journals showed that the use of this sampling method has increased significantly, becoming the most common approach used by scholars when new data set is created. Given the Avdeitchikova et al., (2008) and Farrell et al., (2008) warnings, the use of this sampling approach can be seen as counterintuitive. However, the data collected in this thesis can help to defend this approach since it has suggested that this is the outcome of market evolution. There is a clear indication that younger (age) and less experienced (years investing) investors start investing as part of an angel group. This suggests that the visible market is a key driver of new business angels. One effect of this alteration is the decrease of sampling bias considerations when recruiting through angel

groups. Hence, if this sampling approach is accepted by the academic community, then the way research is reported and evaluated needs to be consistent. If this is not put in place, the calculation of response rates will vary across studies that used the same sampling approach.

This discussion has important implications for business angel researchers. First, it has reviewed how the characteristics of business angels have impacted researchers and what solutions have been used by scholars. Second, it has showed the proliferation of published research using business angel networks and/or business introduction services as a sampling approach. Third, it has suggested that a sampling approach that only focuses on the visible market might be less problematic than was initially supposed, due to the market evolution. Fourth, it has proposed that angel researchers should seek to standardize the way response rates are calculated when business angel networks/group and/or Business introduction services are used as sampling approach.

Chapter 4. Methodologies for examining the investment criteria of business angels: a comparative approach

4.1 Introduction

Typically, business angels invest in just a handful of the investment opportunities that they see. The majority of these investment proposals are rejected at the initial screening stage and after just a few minutes consideration (some examples: Carpentier and Suret, 2015; Croce et al., 2016; Mason et al., 2016; Mason and Harrison, 2015). One of the key themes in business angel research has been to understand how investors select the right ventures in which to invest. Early studies based simply on interviews have been criticized for their retrospective nature and failure to differentiate between different stages in the investment process. Subsequent research has used real time methodologies, notably conjoint analysis and verbal protocol analysis, to offer more rigorous approaches. However, as highlighted in the second chapter of this thesis, there is no consistency in the findings. Two possible reasons are suggested for this inconsistency. First, it may reflect the effect of the heterogeneity of the angel population. The lack of homogeneity of the angel population increases the likelihood of biased samples. This problem can be even magnified by the remaining challenges in angel research. Second, findings may be dependent on the methodology used. This second reasoning is further developed in this chapter.

A first step is, therefore, to evaluate if the inconsistencies found in previous studies are the result of the use of different samples and methodologies. Hence, the discussion will centre on the impact of the use of different methodologies to assess business angel decision making criteria. The aim of this chapter is to probe this issue in greater detail, applying various methodologies to the same sample of angels in order to offer a clearer assessment of what

investment criteria are consistent across methodologies and which findings can be attributed to particular methodologies and why. This is the first study in angel research applying four different methods of data collection to the same sample and to test if the results are consistent across methodologies. The aim of this study is to answer four research questions regarding the decision making criteria of business angels.

The vast majority of previous decision making literature have looked at aggregate rankings of investment criteria rather than individual scores (for example: Mason and Botelho, 2016; Mason and Stark, 2004; Sudek, 2006). Hence, the first research question aspires the similarities of the aggregate rankings. Thus:

[Research Question 1]: Are aggregate rankings similar across methods?

The previous question discusses whether aggregate ranking of the investment criteria are the same across the four methodologies. However, this could be a problem of aggregating data. It is widely acknowledged that the choice between aggregate or individual data is directly linked to the research purpose (Greener, 2008). However, aggregating rank data can add some distortions (Cooper et al., 2003). Stevens (2012) noticed that by not using individual data the researcher would be losing valuable insights on the variations occurring within the data. Hence, it is important to evaluate the individual data separately. This will bring additional robustness to the analysis since it allows for statistical support. Thus:

[Research Question 2:] Do individuals rank each criterion in a similar way for different methodologies?

The specificities of each methodology are expected to influence results. If this is the case then it is important to examine whether different methodologies produce similar results. So:

[Research Question 3]: Which methodologies provide the most similar results?

Angel research consistently shows that some investment criteria are considered more important than others. However, the relative importance of these factors changes across studies. Hence the fourth research question is:

[Research Question 4]: Which investment criterion presents less variation across methodologies?

Hence, the overall goal of this chapter is to call attention to the methodologies used in angel research and ask the extent to which these methodologies are responsible for the inconsistencies in the findings identified in the second chapter of this thesis. Answering these questions will provide a better understanding of business angel investment criteria and indicate the trade-offs between methodologies. Additionally, this informs the discussion on the impacts of the heterogeneity of the angel population in terms of variations of decision making criteria, by introducing whether the inconsistent findings are exclusively an effect of the lack of homogeneity or if there is methodological impact.

4.2 Literature review

4.2.1 The scope of methodologies used in decision making studies

The volume of literature on business angels is relatively small despite their importance in providing risk capital to new and early stage businesses, financing several times the number

of businesses that raise finance from venture capital funds. To understand business angel research we have to go back to the early 1980s, to the first ABC-study (attitudes, behaviours, characteristics) conducted by William Wetzel (1981) in New England. This work offered the first insights about business angels. Subsequent research broadened the perspective, conducting efforts internationally; studies were undertaken in: UK (Mason et al., 1991), Canada (Riding and Short, 1988), Sweden (Landström, 1993), Germany (Brettel, 2003), among others. These studies were classified as first generation studies. Their focus was on the demographic aspects of business angels (Mason and Harrison, 2000b). This could be defined as “profiles of private investors”.

A second generation of studies shifted the attention in the direction of how the business angel market operates. Some of these second generation studies focused on the investment decision-making process (Landström, 1995; Landström, 1998; Mason and Rogers, 1996; Riding et al., 1994; Van Osnabrugge, 2000). It is important to notice that some authors have explored these themes using diverse theoretical viewpoints, e.g. decision-making (Feeney et al., 1999; Landström, 1995), agency theory (Fiet, 1995a; Landström, 1992; Van Osnabrugge, 2000), social capital (Sætre, 2003; Sørheim, 2003) and signalling theory (Prasad et al., 2000).

Much of the research that has been undertaken focuses on the investment decision-making process (Mason, 2006). Studies have focused on two main issues: (i) the various stages in the decision to invest (and how it compares with that of venture capital funds) and (ii) the investment criteria used by business angels. Much less attention has been given to the later stages in the process, notably due diligence, negotiation and contracting, post-investment relationships and the exit.

Initial studies of the investment criteria either simply asked investors what factors they took into account when assessing an investment opportunity or provided a check list of possible criteria for angels to score. Researchers have adopted one of two possible approaches. One approach uses questionnaires administered to a large set of investors. One of the early studies using this method (Riding et al., 1994) focused on Canadian business angels. The authors used a two-phase approach for the data collection by means of direct interviews. Van Osnabrugge and Robinson (2000) also used interviews and questionnaire responses in their research. The same procedure was used by Sudek (2006) in his decision making study. This approach has been criticized. First it is subject to the standard problems associated with survey-based research, notably post facto rationalization, lack of weighting and over-generalisation. Second, subsequent research identified that the investment decision-making process comprises several stages, notably an initial screening, at which more than 90% of opportunities are rejected, and a detailed appraisal of the remainder (Feeney et al., 1999). Critically, the weighting given to investment factors changed between these two stages (Feeney et al., 1999).

As noticed in the second chapter of this thesis, rejection seems to be the most common word in this process. Dal Cin et al. (1993) reported that around 70 percent of the opportunities were rejected out of hand. This was corroborated by Mason and Harrison (1994). The authors used a case study approach to evaluate an investment syndicate; only two investment proposals out of thirty five were not rejected after the syndicate conducted its own evaluation. Riding et al., (1994) also noted that Canadian business angels had high rejection rates, with approximately 90% of the projects being rejected before even meeting with the entrepreneur. These studies indicate that investment proposals are rejected due to a cumulative number of deficiencies (three strikes and you are out).

However, interview studies have typically not differentiated between the different stages of the investment process. This, in turn, led various scholars (e.g. Shepherd and Zacharakis, 1999) to argue for the use of real time methodologies in order to gain a more detailed understanding of how business angels make their investment decisions. Two main approaches have been used. The first is Conjoint (trade-off) analysis, one of the most widely-used quantitative methods in marketing research. It is used to measure preferences (e.g. for product features) but has also been applied to the venture capitalist's investment decision (Muzyka et al., 1996; Riquelme and Rickards, 1992; Shepherd and Zacharakis, 1999). However, only one study applied this approach exclusively to business angel investment decisions (Landström, 1998). Another example of the use of this methodology can be found in Hsu et al., (2014), where the authors evaluated if four specific factors are considered differently by business angels and venture capital investors.

The second real time approach is verbal protocol analysis which asks respondents to “think out loud” as they perform a task, in this case, assessing an investment opportunity. The initial studies that used this methodology to understand the decision making process and criteria were conducted by Hall (1989) and Hall and Hofer (1993) on venture capitalists. Here again, this technique has not been widely used in studies of business angels (Harrison et al., 2015; Mason and Botelho, 2016; Mason and Rogers, 1996, 1997; Mason and Stark, 2004; Maxwell et al., 2011). These studies highlighted the inconsistency of investment criteria used, both between different types of investors (angels, venture capital fund managers, bankers) (Mason and Stark, 2004) and by business angels with different levels of investment experience (Harrison et al., 2015).

Until now no research has discussed whether different methodologies applied by scholars is a source of dissimilar findings. Hence, it is important to understand to what extent the use of particular methodologies matters in terms of the relative importance of specific investment criterion.

4.2.2 Methods used in decision making criteria

The review of the literature on business angel's decision making criteria noted that investors rank each criterion differently across the different stages of the investment process. (some examples: Brush et al., 2012; Maxwell et al., 2011; Mitteness et al., 2012b). Hence, to understand the variations of investment criteria across studies it is important to focus on one specific stage of the investment process. As previously noticed, this research focuses on the screening stage. Table 4-1 summarizes the methodologies used by scholars in previous business angel research. These studies are focused on the investment criteria used at the screening stage and can be grouped into four different groups. The four groups of studies provide a clear image of the methodologies to be used in this research: (i) interviews; (ii) conjoint analysis; (iii) verbal protocol analysis (VPA) and (4) questionnaire³⁰.

³⁰The research asked participants to rank the investment criteria using a raking procedure instead of a Likert scale. This choice wanted to avoid the possibility of investors giving the same weight to different investment criterion.

Table 4-1: Groups of methodologies used in investment decision studies

<i>Focus groups/Interviews/Case Study</i>	<i>Conjoint Analysis</i>	<i>Verbal Protocol Analysis</i>	<i>Questionnaire</i>
Mason and Harrison (1994;1996b)	Landström (1998)	Mason and Stark (2004)	Clark (2008)
Haines et al., (2003)		Mason and Rogers (1996; 1997)	Erikson et al., (2003)
Feeney et al., (1999)		Mason and Botelho (2016)	Sudek (2006)
Paul et al., (2007)		Mason and Harrison (2003)	Haar et al. (1988)
		Harrison et al., (2015)	Harrison and Mason (1992b)
			Stedler and Peters (2003)
			Kelly and Hay (2003)
			Brettel (2003)
			Van Osnabrugge (1998; 2000)

4.2.3 Consistency within these methods

This section will summarize the key variations identified in the literature review chapter with the aim of directing the discussion. The discussion will focus on the each of the seven investment criteria to identify whether variations exist and if these variations are linked to the methodologies used. The investment criteria were divided into three groups; moderate consistency across studies, inconsistency due to heterogeneity and inconsistency due to methodology (and heterogeneity).

Only one investment criterion obtained moderate consistent results across previous decision making studies and methodologies. Although the business plan is seen as a necessary document for entrepreneurs seeking external funding, it has consistently been considered as a less important investment criteria (Haar et al., 1988; Mason and Botelho, 2016; Mason and Rogers, 1996, 1997; Mason and Stark, 2004). The only exception to this was found with more experienced business angels in Harrison et al., (2015) which can be seen as the effect of the heterogeneity of the angel population. However, this can be seen as a moderate effect which does not impact the consistently low scores in other studies.

The second group of investment criteria are those where the inconsistency is related to the heterogeneity of the angel population. Investment criteria that obtained inconsistent results in studies that used same methodology were clustered in this group. Three investment criteria are classified within this group. The first criterion to be considered in this list is investment attributes/fit. Scholars have noticed that business angels do not give too much emphasis to the investment attributes/fit (some examples: Landström, 1998; Mason and Botelho, 2016; Mason and Rogers, 1997; Van Osnabrugge, 1998b), with these studies using a range of different methodologies. The source of inconsistency comes from the verbal protocol studies. There is a number of real time studies that presented higher rankings for this criterion (Harrison et al., 2015; Mason and Stark, 2004). This inconsistency between real time studies could be the result of sampling issues which are linked with the heterogeneity of the angel population. In Harrison et al.,'s (2015) study the importance of investment attributes/fit varies with the different levels of experience of the angels which is an indication of the impact of the heterogeneity of the angel population.

The exit is the second investment criterion within this group. With the exception of a single study (Sudek, 2006) that considered the potential exit routes being of considerable importance, all other studies have ranked this criterion as being not very important (Landström, 1998; Mason and Botelho, 2016; Mason and Harrison, 2003; Van Osnabrugge, 1998a; Van Osnabrugge, 1998b). In this case, the inconsistent results are found in studies using questionnaires. As noticed in the review of the literature this could be related to the effect of sampling bias – Sudek studied members of one of the oldest angel groups in the world which could question the generalization of the results. Harrison et al., (2015) noted that more experienced business angels were likely to emphasize financial issues, such as the

exit, than their counterparts. This supports the idea that the inconsistency regarding the exit scores can be attributed to the heterogeneity of the angel population.

The last criterion in this group is the attributes of the business. As previously noted during the review of the literature, the attributes of the business are considered by angel investors as a less significant criterion. Several studies have shown this effect using different methodologies (Harrison et al., 2015; Landström, 1998; Mason and Rogers, 1996, 1997; Mason and Stark, 2004; Sudek, 2006; Van Osnabrugge, 1998b). However, a recent study on the investment decisions of gatekeepers has presented a different result (Mason and Botelho, 2016). Here the attributes of the business are considered as the second most important investment criteria. This might suggest that gatekeepers perform the initial screening differently from that of individual angels. This, in turn, raises the question as to whether gatekeepers are a special “type” of business angels. Once again it is possible to link this result inconsistency in VPA with the lack of homogeneity of the angel population.

Inconsistent results across studies using different methodologies is the third group. Three investment criteria are classified in this group. The first criterion to be considered is the people, with the vast majority of studies highlighting this as one of the key criteria at the screening stage (for example: Sudek, 2006; Feeney et al., 1999; Haar et al., 1988; Van Osnabrugge, 1998b; Landström, 1998; MacMillan et al., 1987; Mason and Harrison, 1996a). These studies used a different set of methodologies. However, real time studies are not included. Typically, in real time studies the entrepreneur is not the key criteria (some examples: Harrison et al., 2015; Mason and Botelho, 2016; Mason and Rogers, 1996, 1997; Mason and Stark, 2004). As previously stated, this could be the result of the use of a written

document – the protocol – which puts more emphasis on the opportunity rather than on the entrepreneur.

The second criterion within this group is the product/market. The vast majority of studies have used these two criteria separately. However, if the analysis takes into account the two together then there are consistent results across studies that used real time methodologies, in particular VPA (for example: Mason and Rogers, 1996, 1997; Mason and Stark, 2004). But this is not a consistent result across studies using other methodologies. In the studies by Landström (1998) and Sudek (2006) this criterion was not considered as significant as previously mentioned. However, the opposite can be noticed in other studies (for example: Haar et al., 1988; Haines et al., 2003; Van Osnabrugge, 1998b).

A very similar analysis can be done for the third criterion the financial attributes. In real time studies that used VPA this criterion is consistently considered as the most important (Harrison et al., 2015; Mason and Botelho, 2016; Mason and Rogers, 1996, 1997; Mason and Stark, 2004). However, in other studies using different methodologies it receives a lower evaluation by angel investors (some examples: Feeney et al., 1999; Landström, 1998; Mason and Harrison, 2003; Van Osnabrugge, 1998b) Two explanations can be advanced for this inconsistency. First, it could be associated with a methodological dimension - conjoint analysis undervalues the criterion. Second, instead of asking for the aggregate criterion importance, some methodologies look at the several components of the criterion which could dissipate its importance. An example of this can be found in Sudek's (2006) study with the financial considerations being disaggregated into several components: (i) return on investment; (ii) size of the investment; (iii) ability to reach break-even without further

funding; (iv) low initial capital expenditure needed. This idea fits the consistency found in studies using VPA which aggregates the different features of a specific criterion.

4.3 Data and methodology

4.3.1 Data Sources

This study is based on fifty one semi-structured interviews. Within this sample of fifty one business angels there were two subsamples, one with twenty one gatekeepers of nineteen groups investing in Scotland and another with 30 individual business angels. The decision to target gatekeepers was based on two main factors. Firstly, given the role of this position (Mason et al., 2013; Paul and Whittam, 2010); gatekeepers are the initial screening point for entrepreneurs seeking for funding from an angel group. Secondly, angel groups have increased in importance. Accordingly to Sohl (2012b), USA based start-ups and early stage businesses, valued under \$1m, can only rely on angel groups as a source of funding resources in the range £250,000 to £1 million. In the UK several studies have acknowledged the rise of angel groups (Gregson et al., 2013; Mason et al., 2013) and its importance for investors (Mason and Harrison, 2015; Paul et al., 2003).

In two groups the gatekeeper role was shared by two individuals. In each case both individuals were interviewed. The gatekeepers of all seventeen groups that are publicly listed on LINC Scotland's web site at the time of data collection were interviewed. Three other groups are also members of LINC Scotland but prefer anonymity. These groups were also invited to participate, via LINC Scotland, but declined to do so. Additionally, two other gatekeepers were interviewed. One was from a UK-wide group with a very active Scottish branch but has no association with LINC. The other was part of a group that is a Scottish Co-investment Fund partner that also has no association with LINC.

The Scottish Risk Capital Market Report (Harris and Mason, 2012) identified twenty four angel groups. However, the groups not included in this study either no longer exist or are private offices of high net worth families whose investments and operations are much closer to venture capital investing than angel investing. So, although the study could be criticized for being LINC-centric it would appear that we have captured most of the participants in the Scottish market. Additionally, LINC does not present any recommendation to the syndicates regarding their investment decision. Hence, it would not represent any type of sector or stage bias.

Securing the participation of such a high proportion of angel groups in the Scottish market was a considerable achievement. In many cases the initial response was not positive and follow-up approaches were required. As a consequence, the recruitment process took three months. It started with an initial email to the gatekeeper to request an interview. In several cases it was not possible to identify the gatekeeper, but in these cases the recipient of the email forwarded it to the relevant individual.

Of the twenty one interviewees that were gatekeepers of angel groups, nineteen were face-to-face and two were conducted on the telephone. All agreed for the interview to be recorded for later transcribing. The interviews ranged in length from 37 to 93 minutes, with the average being about one hour. The face-to-face interviews took place at a location of the interviewee convenience. Venues included the group's office, coffee shops and the researcher's office. It was agreed with participants that information on individual groups would not be disclosed and that findings would be aggregated.

Scholars have largely ignored the gatekeeper as a key actor of the visible market. Mostly, this is result of the recent raise of angel groups (Mason et al., 2013). Hence, this represents a challenge to identify how representative is this sample of 21 gatekeepers. However, Paul and Whittam's (2010) characterization of gatekeepers can be used as a reference. In terms of the gatekeeper background experience, this sample is much in line with the original description made in Paul and Whittam's (2010) study in which two characteristics were identified. First, gatekeepers typically have a professional qualification and/or a university degree. In this sample of gatekeepers 19 of the 21 gatekeeper had a university degree with the other 2 having a professional qualifications. Second, gatekeepers tend to have a varied range of professional backgrounds and industry experiences. The professional background of this sample of gatekeepers ranged from oil and gas to education with finance related areas being the most common experience (42%). The majority (52%) of these gatekeepers had being involved in setting up a new venture while 90% had previous been involved with small and medium-sized enterprises. All participants were responsible for the screening of investment opportunities in their groups. In terms of investment experience, this sample of gatekeepers had been involved in 382 group investments and on average have been undertaking this role for almost 5 years. Hence, this indicates that this can be considered as a representative sample of gatekeepers.

The subsample of 30 individual business angels was recruited through convenience sampling and snowball sampling. The starting point of the recruitment process was group meetings or through the gatekeepers introduction. The author attended group meetings and pitched to the members requesting participation. After the interview, the initial participants were asked to suggest other business angels to take part on this research. Whilst this sampling method has several limitations (Biernacki and Waldorf, 1981) the sample in this study is very broad. The

research took into account several factors including: syndication, investment preferences (number of investments, years investing, amounts invested, etc...) and education.

Of the 30 interviewees, 29 were face-to-face and only one was conducted on the telephone. All agreed for the interview to be recorded for later transcribing. The interviews ranged in length from 25 to 60 minutes, with the average being about one hour. The face-to-face interviews took place at a location of the interviewee convenience. Venues included the group's office, coffee shops and the participant's office/home. It was agreed with participants that information on individuals would not be disclosed and that findings would be aggregated.

The profile of the 30 individual investors is very similar to previous characterizations of a business angel (some examples: Gaston, 1989; Morrissette, 2007; Shepherd and Douglas, 1998), that is, mid-aged, male with entrepreneurial experience³¹. This sample of business angels have been investing on average for 12 years and made a total of 473 investments. The vast majority of participants, 80%, were part of angel groups while the remaining 20% invested by themselves. Three issues can be raised regarding the representativeness of this sample of business angels. The first, this sample does not include any female investor. According to Harrison and Mason (2007) this underrepresentation³² is not an issue since there is no considerable differences between female and male angel investors.

³¹ The 30 participants were all male with an average age of 56 years. The majority (57%) of investors had previously been involved in starting a new venture.

³² Different studies have shown the importance of female angel investors. Sohl (2014) indicates that in 2013, 20% of the angel investors in the USA were women. Recent studies denote that in 2014 between 12% to 14% of angel investors were women (Mason & Botelho, 2014; Wright et al., 2015).

The second, when compared with recent UK studies (Mason and Botelho, 2014; Wright et al., 2015) this sample presents higher levels of investment experienced – more investments (median of 10 vs 5 investments) and more years investing (average of 12 vs 7 to 10 years). This should not be considered as a problem for two reasons. The first, the sample is diverse in terms of investment experience. The sample was equally divided into three groups of 10 investors, one group with investors who only made 5 or less investment, another group of angels who had invested between 4 to 6 opportunities and the last group with more than 15 investments. This ensures enough variability within the sample of individual investors. Second, contrary to Harrison et al. (2015), this study does not aim to evaluate how investment experience impacts the criteria to invest. The aim is to understand if the same individual will ranking the investment criteria differently across different methodologies. Hence, a more experienced sample of angel investors is not an issue. Third is the high proportion of investors that are members of angels groups. According to Kelly and Hay (1996) there are no significant differences between solo and syndicated serial angels. Although it is not possible to evaluate the representativeness of this sample, due to the invisible nature of angel population (Wetzel, 1983), the characteristics of this sample of investors does not raises any bias considerations.

4.3.2 Methodology

During the semi-structured interviews, besides direct questions, participants were asked to undertake three additional exercises regarding their decision-making criteria. This section will discuss these four techniques of data collection, describing what participants were asked to do and what limitations the results may present. The objective of using these four techniques is to discuss the trade-offs between restrictive and unrestrictive techniques. The restrictive techniques asked participants to make a decision based on a pre-defined set of

factors while the unrestrictive techniques did not present any constraint to respondents, that is, they were free to choose which factors were taken into account. The restrictive techniques can be subdivided into pure and impure rankings, depending if an additional inequality restriction was imposed on participants. The unrestrictive techniques were divided according to how context specific this method is.

4.3.2.1 Open-ended question

First, respondents were asked an open-ended question about what were the key factors that they considered when assessing an investment opportunity. The limitations of this technique are well identified with conscious and subconscious errors associated with post-hoc rationalisation, recall bias both resulting from asking participants to bring to mind the reasons of a past decision. Zacharakis and Meyer (1998) mention in their decision making study that participants usually overstate the number of criteria used, understate the most important criteria, overstate the least important criteria. This point will be discussed later in this chapter, given the low number of investment criteria mentioned by each participant. On average, each participant only mentioned 3 (3.42) factors as the most important in their investment decision.

Once the 51 interviews were completed the data was transcribed and in the particular case of this open question the results were coded. How to analyse the information that was collected is recognized as one of the major challenges of this qualitative methods. For consistency reasons and to enable a comparative analysis of the result across data collection techniques we used the same coding scheme that was developed and used on the VPA. To ensure robustness of the results, the author of this thesis and his supervisor were involved in triangulating the coding (Leitch et al., 2010). The codes were put together under the same

investment criterion label and a frequency count was performed in order to depict an order. This unrestrictive technique is clearly not context specific, given that respondents are not biased by any external factor – such as a protocol or video. However, it is important to emphasize that participants mentioned that this answer was based on the most recent investment opportunity seen by them. Although, this technique is unrestricted and not context specific it has major potential for recall bias.

4.3.2.2 Verbal Protocol Analysis

In the second exercise, participants were asked to screen an investment opportunity. The investment opportunity was in the form of a business plan. To ensure that this document was according to market standards, a non-Scottish business angel network was contacted to provide some examples of business plans. From the four business plans made available by the network one was chosen. The choice of the protocol used was based on: location, sector, stage and initial investment. It was expected that the use of these controls would reduce the likelihood that participants would reject the opportunity in the first seconds of the experiment. This seemed to be much in line with previous research. The average and median durations are very comparable with those in Mason and Rogers (1997) study. In their particular case participants were able to reach to a decision within an average time of 11.25 minutes with a median of 9 minutes. In this case participants made their decision within an average time of 11.10 minutes with a median of 10 minutes.

The investment proposal was anonymised, changed in parts to make it fit the research objectives, and is used with permission. The final business plan presented to participants had seven pages length, which in some cases was considered by participants to be too long. Participants were asked to “think out loud” while they appraised the investment opportunity.

This assessment was intended to be as close as possible to the way they would do it for real. To guarantee that participants were verbalizing their thoughts they were instructed to make any comment about the document that came into their mind. These comments did not require any justification and in cases where participants lapsed into silence of more than 10 seconds the researcher would prompt the respondent to say what he/she was thinking. This is the procedure suggested by Ericsson and Simon (1993) for the use of this technique.

Their verbalisations were recorded and subsequently transcribed. The transcriptions were divided into individual “thought units”. The following stage required the development a coding scheme based on the investment criteria. Table 4-2 depicts the coding scheme. Each “thought unit” was coded following the coding scheme and then the frequency of each code was counted. As in the previous method both the author of this thesis and his supervisor were involved in triangulating the coding to ensure robustness. The frequency count provides an implicit order, that is, the higher the number of mentions of an investment criterion the higher the ranking position.

This unrestrictive technique presents some limitations. First, it is impossible to entirely eliminate the effect of the artificiality of the situation. One-third of the participants mention that they were not being totally fair to the opportunity given the nature of the circumstances. Second, it may overweight or underweight some factors. On the one hand, some participants may be uncomfortable or self-conscious about thinking and speaking out loud and being recorded. On the other hand, respondents may repeat something they are not sure about but say it only once if they are absolutely sure. Lastly, angel investing is very context specific. However, it completely ignores the source of the opportunity which is an important initial

influence on the investor's attitude towards the opportunity (Duxbury et al., 1997) and this might bias the results.

Table 4-2: Thought segments classification

<i>Investment Criteria</i>	<i>Description</i>
<i>1. THE PEOPLE</i>	Issues regarding: the entrepreneur, management team, the inventor. Their background, experience, qualities, etc.
<i>2. PRODUCT/MARKET</i>	The nature of the product: technical aspects, intellectual property protection, competitive advantages, design, etc. Additionally it included points on market: organization, growth, competition, geography, size, etc.
<i>3. BUSINESS PLAN</i>	Specific comments on the plan: length, presentation, content missing data, etc.
<i>4. EXIT</i>	Who? When? How much? Type of exit. Existence of an exit plan
<i>5. FINANCIAL CONSIDERATIONS</i>	Amount of investment, amount raised, future funding needs, valuation, equity share, cash-flows, valuation, etc.
<i>6. INVESTOR ATTRIBUTES</i>	Issues regarding investment fit, investment experience
<i>7. ATTRIBUTES OF THE BUSINESS</i>	This includes a broad scope of issues: e.g. strategy, business model, risks, operations, time frame, etc.

4.3.2.3 Ordinal Measurement Method – ranking procedures

The following methodology requested participants to take an ordinal measurement method - ranking procedure (RP). This is a very common technique used in marketing research to depict: preference rankings, market position, social class, etc. Respondents were asked to order a list of seven investment criteria. This list was based on the list of investment criteria used in a previous study on business angel decision making (Mason and Harrison, 1996b) and included (business plan, the people, product/market, financial attributes, attributes of the business, investment attributes, exit). Although other studies have suggested different sets of investment criteria, this list was consistent with the literature. Additionally, it was recognised that the list should not be very extensive. This was to ensure the total engagement of participants in the two methodologies that used it.

This list would imply just six decisions since $(n - 1)$ scaling decisions need be made in rank order scaling. Smith and Albaum (2005, p. 375) note that “one major concern in asking a ranking question is whether the number of items is too many for a person to be able to make distinctions”. One possible solution was proposed by Coombs (1964), who recommended that instead of ordering all factors participants only order k factors from a full set of n factors. In this research the “order k/n ” is equal to 1, that is, participants were asked to order all factors. The choice of a full rank order resulted from the initial decision not to have a long list of investment criteria. It important to emphasize that although an ordinal scale is able to determine whether a criterion is more or less important than some other criterion it is not able to determine how much more or less (Zikmund et al., 2012). Hence, this is a good tool to depict order but not distances between factors ordered. Unlike previous studies (Sudek, 2006; Van Osnabrugge, 2000) that used a Likert scale to investigate angel investment criteria this research used an ordinal scale for the reasons previously presented.

This was the most restrictive technique applied to respondents since it forced them both to make a decision from a pre-defined set of investment criteria and also to rank them from 1 to 7 without being given the opportunity of equality between factors. Forcing respondents to make a choice has pros and cons. The most obvious advantage is a clear order of factors both at individual level but also at aggregate level. The major disadvantages are: first, the list could miss other investment criteria that could be considered important for some investors; and second, not giving respondents the possibility of equality between investment criteria forces them to make a decision “on the spot” and this makes it harder to replicate the results.

4.3.2.4 Conjoint Analysis – Pairwise comparison

As in the previous case, the fourth experiment also used a restrictive technique based on a fixed set of seven factors, exactly the same list of seven investment criteria used previously. It follows Landström’s (1998) approach where respondents were asked to make a decision between two investment criteria. This trade-off approach requires participants to make $n(n-1)/2$ decisions. In this particular case ($n=7$) it required 21 decisions. For each of these 21 decisions respondents were asked to identify which of two investment criteria was more important or if they were equally important. The difference from the prior experiment lies in the type decisions that respondents were asked to make. While indifference between investment criteria was not allowed in the aforementioned experiment in this case, participants were given that choice. This technique could be classified as an impure ranking. The data from the 51 individual decisions were coded according to a conjoint model. This enabled the construction of a relative ranking between investment criteria for every participant. The individual rankings were then aggregated to provide a meaningful

comparison. Then the individual rankings of the investment criteria were aggregated for a whole sample of investors.

One of the main caveats of this method is the length of the experiment. Participants are asked to evaluate several trade-offs which make the task very time consuming. This might result in loss of concentration on the content by participants making them less engaged and consequently adopting a standardised answer pattern. The lack of realism of the situation is a further limitation of this method. Each time, respondents are only assessing two investment criteria instead of all possible factors. Only 7 participants³³ (14%) mentioned that this was not way they typically think about an investment opportunity. However, the decisions are considered to be easier and very suitable for a study that appraises a large set of investment criteria.

4.4 Analysis and empirical results

The following three sections present the results of this study, highlighting the different dimension of the research. The first section is an overview of the results, focusing on the aggregate data, identifying which are the top ranked criteria in each of the four methodologies. The two samples (gatekeepers and individual angels) will be separated to enable comparisons between them. The second section is an analysis of the consistency of the results across the four methodologies used. This analysis is undertaken at individual and aggregate level. This analysis looks at the two samples separately and then examines the whole sample of 51 investors. The third section considers the entire sample to assess whether methodologies produce the most, and least, consistent results.

³³ 3 Gatekeepers and 4 individual angels.

4.4.1 Overview

This first empirical section presents and discusses the overall results. This section answers the first research question. The aim of this section is to identify which are the key criteria in each of the four methodologies. The aggregate rankings for each of the four methodologies are shown in table 4-2. Each of the methodologies supplied 51 individual rankings providing unique insights into the business angel investment decision-making process. Similarity between methods is tested in both individual levels as aggregate level. To reach aggregate rankings two different procedures were conducted. Regarding the unrestrictive techniques, all the individual frequencies under the same investment criteria were added and an aggregate frequency count was carried out. Lastly, the aggregate frequency counts were ordered by the cardinality of the investment criteria, that is, the higher the number the more important is the investment criteria. In the case of the restrictive techniques the aggregate rankings were assembled using a data transformation suggested by Zikmund et al. (2013).

Table 4-3: Rankings of the seven investment criteria.

	Gatekeeper				Individual Angel				<i>Stand Deviation</i>
	Interview	VPA	RP	Pairwise	Interview	VPA	RP	Pairwise	
Business Plan	7	6	7	7	6	6	6	6	0.518
The people	2	5	1	1	1	4	1	1	1.604
Product/Market	1	1	2	2	2	1	2	2	0.518
Financial Attributes	3	2	3	6	4	3	3	4	1.195
Attributes of the Business	6	3	6	4	3	2	4	3	1.458
Investor Attributes	5	4	4	5	5	5	7	7	1.165
Exit	3	7	5	3	7	7	5	5	1.669

Three key issues can be observed from the analysis of Table 4-2. First, there is ranking inconsistency across the samples and methodologies. The results show that both the gatekeepers and the individual business angels rank the investment criteria differently across

the different methodologies. Second, some investment criteria are more methodological dependent while others are consistently scored high or low across the different methodologies. Third, some methodologies undervalue or overvalue specific investment criteria. So the answer to the first research question is that different methodologies do not provide similar aggregate rankings. This first point, the inconsistency, will be further developed in the next section for individual data when statistical tests are presented while the other two points will be presented here.

To help understand the second observation, which investment criteria are more susceptible to variations across the methodologies, the standard deviation will be used. The criterion with the highest variability is the exit. In some methodologies it is seen as moderately significant while in others its importance is negligible. This is not a surprising result, as noticed in the review of previous research which observed that this criterion of considerable importance (Sudek, 2006) while in other studies it were almost insignificant (Mason and Harrison, 2003). Mason and Botelho (2016) noted that gatekeepers comment that the exit was an important investment criterion. However this did not show in the VPA analysis when they were presented with an opportunity. The variability is higher in the gatekeeper subsample than with individual investors.

The second criterion with the highest standard deviation is the people. As noticed in the review of the literature, this criterion is typically considered as very important with the exception of the real time studies, in specific VPA studies. The results show clearly this effect, with the people receiving low scores on VPA in both sub-samples which results in a high standard deviation.

The third criterion with the highest variability is the attributes of the business. The variation of this criterion ranking is stronger with the gatekeepers than with the individual angel investors. Normally, gatekeepers tend to give a lower rank to the attributes of the business than individual business angels. As noticed in the literature review chapter, previous research has given moderate importance to this criterion. Similar results are found with the exception of the real time VPA study.

In the opposite direction, the investment criterion with the lower variability are the business plan and the product/market. While in the case of the business plan, this is not a surprise since the criterion is consistently considered to be of low importance across different studies and methodologies, for the product/market this comes as a revelation given the variability identified in the review of previous research. However, this could be the effect of grouping the several dimensions of the product/market into a single criterion.

The final discussion asks whether the rank of specific investment criteria are affected by the specific methodology used. As noted earlier, the business plan and the product/market show very low standard deviation which indicates a very limited methodological dependency. Two methodologies raise attention (i) VPA; (ii) pairwise comparison. The VPA provides a real time methodology that enables research to get additional insight on the decision making process. It seems to consistently rank the people lower than the other methodologies. This was previously noticed in the literature review section. In this study, this effect is visible for the two sub-samples – gatekeepers and individual angels. This could be the result of the nature of the use of the protocol which typically has more information about the business than about the entrepreneur. Another distinctive feature of the VPA is that the financial attributes and the attributes of the business achieve a higher rankings than in other

methodologies. This is seen both in the review of the literature and the results of this study. Again the effect of a written document (the protocol) could prompt the angel investor to give a higher consideration to these criteria.

The pairwise comparison provides higher rankings for the attributes of the business and the exit. This effect can be noticed in both sub-samples and could be the result of the less direct nature of asking the importance of an investment criteria. This methodology does not replicate the typical investment decision of a business angel and is not “reflective of ‘real-life’ decision contexts” (Hsu et al., 2014, p. 20). By being forced to compare between two criteria an investor is doing an abstract exercise that could lead to over-rating specific criterion. This increase in importance of these criteria could just be a misrepresentation caused by investors having to do a comparison rather than an independent choice.

These three observations rely on aggregate data. As previously noticed, aggregating data can create problems. Hence, the next section will analyze the individual data to evaluate if different findings can be found.

4.4.2 Consistency testing

This section will discuss how the four rankings were put together, how they were compared and what statistical tests were conducted. The first analysis answers the question whether aggregate rankings were similar across the four different methodologies. This will allow to answer the second research question. Two statistical procedures will be conducted to reinforce the robustness of the findings. The results will be presented for the sample of 51 investors instead of displaying the two sub-samples. There are two reasons for this choice.

First, this study aims to understand the reasons for the inconsistent results found in the literature. Second, the statistical tests require a minimum number of observations which is not satisfied for the sample of gatekeepers. However, the results are presented in Appendix 1 and 2 to indicate possible variations.

A test of proportions provides statistical evidence regarding this issue. A test of proportions evaluates the equality of proportions for a normally distributed random variable. In this specific application the test measures whether the ranking of one factor is the same in a different methodology. The null hypothesis states that for all individuals' observations the ranking of the factor is the same in the two tests. Table 4-3 presents all the tests outcomes. These are tests that compare the rankings of two methodologies. Hence, this combination without repetition of four methodologies compared two by two which will result in six possible comparisons³⁴.

Table 4-4: Tests of proportions for all methods

Test	Business Plan	The people	Product/Market	Financial Attributes	Attributes of the Business	Investment Attributes	Exit
Interview vs VPA	-181551,05	-199263,35	-110701,86	-190407,20	-194835,28	-177122,98	-225831,80
Interview vs RP	-194835,28	-132842,23	-159410,68	-185979,13	-190407,20	-212547,58	-203691,43
Interview vs Pairwise	-194835,28	-110701,86	-168266,83	-203691,43	-185979,13	-208119,50	-168266,83
VPA vs RP	-177122,98	-199263,35	-154982,61	-185979,13	-194835,28	-199263,35	-181551,05
VPA vs Pairwise	-159410,68	-194835,28	-141698,38	-194835,28	-181551,05	-208119,50	-194835,28
RP vs Pairwise	-101845,71	-92989,56	-101845,71	-137270,31	-137270,31	-88561,49	-123986,09

Each cell ij is the Z-statistic for the comparison of tests in row i and factor in column j

³⁴ This follows $C(n, r) = \frac{n!}{r!(n-r)!} = \frac{4!}{2!(4-2)!} = 6$.

The null hypothesis of the test of proportions (i.e., for all observations the ranking of the factor is the same in the two tests) is rejected whenever the absolute value of the test statistic is greater than the critical value. The critical value for a five percent significance level is approximately two. Therefore, it is possible to reject the supposition that the ranking of the factor is the same in the two tests for all observations, whenever the absolute value of the test statistic is greater than two. The rejection of all the null hypotheses provides a clear answer to the first question, that is, it is not possible to affirm that individuals rank each factor in a similar way for different methodologies. It is particularly interesting that only one participant gave the same order ranking in two of the four experiments. All other participants always had always four dissimilar rankings. Hence, it is possible to conclude that the answer for the second research question is also negative. Investors do not rank the importance of the investment criteria similarly across the four methodologies. The next section will discuss the reasons that might justify these differences.

A paired t-test evaluates whether the mean for a random variable from a within-subjects test group differ over two test conditions. The test assumes that the evaluated random variable is normally distributed. Thus, a paired t-test is used when there are two observations per subject and the researcher wants to measure whether the means on these two normally distributed interval variables differ from one another. The paired t-test is similar to the repeated measures ANOVA test. Table 4-4 depicts all the confident intervals.

Table 4-5: t-tests for equality of means for all methodologies

	Business Plan		The people		Product/Market		Financial Attributes		Attributes of the Business		Investment Attributes		Exit	
test	CI_LB	CI_UB	CI_LB	CI_UB	CI_LB	CI_UB	CI_LB	CI_UB	CI_LB	CI_UB	CI_LB	CI_UB	CI_LB	CI_UB
Interview vs VPA	0,706	1,687	1,963	2,899	-0,496	0,182	-0,174	0,880	-0,349	0,742	0,644	1,631	2,406	3,280
Interview vs RP	1,372	2,353	-0,331	0,213	0,395	1,096	0,743	1,728	1,088	2,167	1,410	2,668	1,379	2,229
Interview vs Pairwise	1,282	2,326	-0,163	0,477	0,291	1,120	0,966	1,975	0,473	1,488	1,494	2,702	0,645	1,747
VPA vs RP	0,105	1,228	-2,962	-2,018	0,524	1,280	0,374	1,391	0,780	2,083	0,172	1,632	-1,513	-0,565
VPA vs Pairwise	0,007	1,209	-2,735	-1,814	0,442	1,284	0,537	1,699	0,227	1,342	0,265	1,656	-2,237	-1,058
RP vs Pairwise	-0,276	0,394	-0,510	0,078	-0,192	0,271	-0,598	0,127	0,231	1,064	-0,319	0,201	0,218	0,998

Each cell ij contains the lower and upper bound of the CI for the comparison of tests in row i and factor in column j

It can be seen that the great majority of the null hypothesis of equal means of the pairwise tests can be rejected. In 74% of the tests the null hypothesis of no difference between the means are rejected because the confidence interval does not include zero. Table 4-5 summarizes these results.

Table 4-6: t-test for equality of means rejections

Test	Business Plan	The people	Product/Market	Financial Attributes	Attributes of the Business	Investment Attributes	Exit
Interview vs VPA	x	x	√	√	√	x	x
Interview vs RP	x	√	x	x	x	x	x
Interview vs Pairwise	x	√	x	x	x	x	x
VPA vs RP	x	x	x	x	x	x	x
VPA vs Pairwise	x	x	x	x	√	x	x
RP vs Pairwise	√	√	√	√	x	√	x

√ - the Ho cannot be rejected; x - the Ho can be rejected

Regarding the second question it is possible to state that the t-tests also allow to conclude that the rankings are dependent on the methodology applied. These outcomes support the findings of test of proportions regarding the methodological dependent of the results. Table 4-5 indicates that there are no two methodologies that provide exactly the same ranks. Hence, it is possible to conclude that the choice of the methodology will impact the way angel investors rank the investment criteria. A very similar results can be found for the two sub-samples (gatekeepers and individual angels), this analysis is provided in Appendix 3 and 4. However, it is important to notice that the t-tests for the individual angel investors show that it is not statistically possible to reject the hypothesis that the criteria rankings from ranking procedures and pairwise comparison are equal. This result will be further discussed in the next section.

The previous analysis also allows to answer the third and fourth questions. Which methodologies provide the most similar results? Which investment criterion presents less variation across methodologies? To answer these questions the results of the Paired t-tests conducted to test if means for each factor over individuals ranking were equal or not will be further discussed.

4.4.3 Methodological similarity

This last empirical section will address issues regarding methodology similarities. To facilitate the discussion a tick count was produced. This should be useful to answer the third and fourth questions. With respect to the third question, which methodologies provide closer results, the tests in table 4-6 show that the two closest methodologies are the ranking procedures and the pairwise (with 5 counts) followed by the relation between interviews and

VPA and VPA and pairwise comparison (with 3 counts). The similarity of results between ranking procedures and the pairwise can be explained by the restrictive character of these methods. Both restrict participants' decision to a seven rank decision. The likelihood of similar aggregate results is therefore greater because there was a close set of investment criteria provided to participants. This finding is also supported when the two samples are analysed separately – it is not possible to reject the rank similarity between these two methodologies.

Similar reasoning can be applied for interviews and VPA. These two unrestrictive techniques give respondents the freedom to reveal their investment criteria without imposing any restriction on the choice. In contrast, the methodologies that present the least similar results are VPA with ranking procedures (with just 0 counts). This indicates that the most restrictive method, with a closed set of investment criteria and forcing ranking, is the least comparable with the unrestrictive methods. This is a particularly important finding given that this field has a very strong presence of studies using VPA.

The results also provide evidence to answer the last research question. The investment criterion that is most consistent across methodologies is the people (with 3 counts) while exit is the least consistent of the seven investment criteria. It is interesting to notice that the results for the people are consistent across three methods and only lacks consistency in VPA. This is most likely justified by the fact that VPA is a context specific technique, that is, results can be biased by the use of a protocol. The level of information in the investment opportunity about the people can influence the number of thought units about this investment criterion and consequently the rank of this criterion. Exit was the criterion with the least level of consistency within the four methods. This can be explained by the recent evidence on how

angels look at exits (Mason and Botelho, 2016). This study shows that when prompted about the importance of exits, business angels emphasize the constant concern about the need to exit. However, when asked to make a decision whether or not to invest in an opportunity this criterion is not to be taken into account.

4.5 Discussion

4.5.1 Implications for future research

The key conclusion is that investors are inconsistent in their decisions when examined using different methodological approaches. In the open-ended questions investors give fewer investment criteria than in the verbal protocol analysis, ordinal measurement method and conjoint analysis, with people and product/market dominating. The implication is that open-ended questions provide a more superficial insight into angel investment decision-making when compared with the other three methodologies. There is a difference in the results from the two restrictive methods. Respondents find it easy to put the seven investment criteria into a ranking. However, in the trade-off analysis they find it much harder to make a clear distinction between pairs of criteria. So here again, this technique appears unable to clearly identify the critical elements in the investment decision. Verbal protocol analysis provides a much richer insight into the investment decision-making process, with additional factors emerging to those offered in the open-ended questions. In particular, issues associated with the exit are raised using VPA and also rank highly in the conjoint analysis but are given low emphasis in the ordinal measurement method and in responses to the open-ended question. On the other hand, VPA puts respondents in an artificial situation which may influence their approach to assessing the proposal which deviates from what they would do in practice. Future research should acknowledge the implications of methodological choices and this

should be reflected on the reviews of the literature. It is important that scholars recognize the methodological differences and the similarities to be able to provide robust comparisons of previous studies.

There are three potential reasons for these differences. The first is “that decision makers [angel investors] should be viewed as boundedly rational” (Kahneman, 2003, p. 1449). Bounded rationality can be linked to (i) the lack of specific information of some of the methodologies; (ii) cognitive limitations associated with the constraint of recent decisions; (iii) time constraints; and (iv) lack of realism of some of the methodologies. These factors could lead participants to provide inconsistent rankings across methodologies. The second possible reason is that angel investors use very subjective reasons that can be associated with intuition and ‘gut feel’. The existence of such behaviour has already been mentioned in previous research (for example: Clark, 2008; De Noble, 2001; Mason and Harrison, 2003; Mason and Rogers, 1996, 1997) which has helped scholars explain decision making ambiguities.

In either of these two initial reasons, there is an expectation that the decision maker is not able to fully explain the reasons why a decision was made. The last justification for these findings is not associated to the participants but with the methodologies applied in this chapter. Each methodology has its underlying assumptions, procedures and decision rules which can impact the specific research problems (Kothari, 2004). Hence, the choice of methodology used will have an impact on the outcomes which can influence methodological evaluations. Howe (1988) argues that there is an “incompatibility thesis” which does not allow qualitative and quantitative methods to be compatible for epistemological reasons. Johnson and Onwuegbuzie (2004, p. 15) support this view observing that “there are many

paradigmatic differences between qualitative and quantitative research”. This is much in line with the findings reported here, which found, first that quantitative methodologies provide closer results and second, that the two qualitative methodologies also produce similar results.

In the light of the likelihood of the resulting inconsistency being the effect of individual cognitive limitations this research suggests future research to use as unit of analysis the investment rather than the investors. This change of focus would reduce the emphasis on the individual and put the attention on the venture features that led to a positive investment decision. Additionally, this study was not able to identify which is the best methodology to study decision making criteria of business angels. As a result scholars should not change their approach in terms of methodology used but should change the unit of analysis.

4.6 Conclusions

This chapter has to presented insights on the questions raised in the Literature Review. Previous decision making studies have provided different rankings of the investment criteria used by business angels. Two reasons were suggested (i) the heterogeneity of the angel population; (ii) methodological differences. The findings indicate inconsistencies across the four methodologies when they applied to a sample of 51 participants. While the heterogeneity of the angel population cannot be rejected as a justification for the differences found in the literature, in particular, because it was not tested in this chapter. This study focused on evaluating the methodological effect on the results which is present. However, this does not mean that the source of inconsistency is exclusively methodological. The second reason, methodological differences cannot be refuted by this research.

However, the impact of the heterogeneity of the angel population cannot be excluded as a possible reason. This effect would be noticed on sampling issues. The results show that all “types” of angels provide inconsistent results³⁵. Harrison et al. (2015) noticed that investment experience had an effect on the way business angels ranked the investment criteria. Hence, the problem could lay on the convenience samples of previous studies that could be capturing just a specific type of angel which would imply a non-generalizable result.

The main contribution of this research is not just to show that results are methodological dependent but far more importantly, it provides evidence that some methodologies present results that are closer to one another than other methodologies. From a research perspective the study serves to highlight the complexities involved in understanding the investment decisions of business angels, with different methodologies generating different responses. It is not just the research question that is critical; it is also the way in which the question is asked. More open-ended approaches and real time approaches – which are combined in the VPA approach – appear to provide the best insight. This is because angels look at the “big picture” rather than specific factors when assessing investment opportunities. However, the artificial nature of this approach imposes limitations.

This study calls the attention of scholars to carefully consider the choice of methodology that they use in their work. It also emphasizes that researchers need to acknowledge the limitations of comparing results across studies with different methodological procedures.

³⁵ All 51 participants provided different ranking across the four methodologies with only 4 having exactly the same ranking for ranking procedures and the pairwise comparison.

Specially, researchers need to be aware of three types of trade-offs when choosing which methodologies to use:

- The use of a pre-defined list of factors (unrestrictive versus restrictive techniques);
- The use of methodologies that do not allow equalities of investment criteria (Pure versus Impure option);
- The use of a protocol can bias the results (context specific versus not context specific).

Scholars should consider experimenting with additional methodologies in future studies.

From a practical perspective the study highlights the need for entrepreneurs to be wary of trite and overly generalized discussions of the investment criteria of business angels that are provided in the 'how to' literature. They need to be exposed to a much deeper account of how angels make investment decisions to reach an understanding of why angels might say "yes" or "no" to their investment proposal and to shape the proposal accordingly. It becomes clear that under different experiments different outcomes would occur. This should also be acknowledged by investment readiness programs.

Chapter 5. How similar are investment decisions made by Business Angels?

5.1 Introduction

Business angels are major funding source for new and early stage businesses. Their importance is widely acknowledged. In the USA evidence suggests that angel investors fund 15 to 20 times as many companies as venture capitalists. A recent study conducted by the European Business Angel Network (EBAN) (2014) estimates total angel investment in Europe (visible + invisible) in 2013 reached 5.5 billion euros versus 3.4 billion euros of venture capital (EVCA, 2014). This is particularly pertinent in the UK where EBAN members financed 535 companies while their venture capital counterparts invested in just 371 firms. EBAN estimated that angel investment represented 73.3% of the European early stage investment market.

Understanding business angel investment decisions is extremely relevant, particularly, in terms of comprehending what are the combinations of investment criteria that make angel investors to undertake an opportunity. However, this is not a straightforward task, since the angel population is not homogenous (Lahti, 2011; Avdeitchikova, 2008). This limitation has not been acknowledged in many prior studies on angel investment decision making.

The heterogeneity of the angel population has been known since Wetzel's (1983) pioneer studies. Nevertheless, scholars have mainly focused on decision making in aggregate, ignoring the differences within the angel population. Only a small number of studies on decision making have evaluated how different "types" of angels made decisions. Van Osnabrugge (1998b) noted that the investment criteria used to make a decision by an angel

investor will vary depending on the investment experience. Feeney et al. (1999) corroborated these findings and also indicated that the decision process varied depending on the level of investment experience of the angel investor. This point was further developed by Harrison et al. (2015) who has provided an overall assessment that the level of investment experience has an impact on the investment criteria used by the investor. Mitteness et al. (2012b) has assessed how different levels of industry experience impacted the evaluations of the investment opportunities. However, the research topic is underdeveloped, with scholars focusing their attention on experience, and not on other angel characteristics. One of the few counter examples of this is a recent study by Mitteness et al., (2012a). The authors looked at how different characteristics (age, cognitive style, motivation to mentor, extraversion, openness and regulatory focus) of business angels impacted the way they evaluated entrepreneurial passion as an investment criterion. This lack of discussion can be seen as surprising given the views of Riding et al., (2007, p. 338) on this issue: “it is reasonable to expect that decision criteria would vary across different types of business angels.” Hence, one would expect that these differences need to be taken into account on decision making studies.

Surprisingly, business angel categorization studies also failed to call attention to the use of different investment criteria by business angels. The closest these studies have been to use the investment criteria has been in Sullivan and Miller (1996) and Erikson (2007) studies. The first study, presented an analysis of investor motivations. The authors presented three types of “groups” (Economics, Hedonism and Altruism). The second study suggested a classification based on investment preferences (Shumpeterian and Austrian). The remaining studies have focused on grouping angel investors or their investments using a wide range of variables. These studies could be separated into two sub groups. The first set of studies used different theoretical perspectives to group investors according to investor characteristics

(investment activity, competence, entrepreneurial background). The second set of studies has used different measurements of investor involvement (type of contribution, pre and post investment behaviour) to classify angel investments. Hence, it has become clear that there is a need for further work relating these two research areas.

This chapter aims to fill this gap by building on previous research on angel typologies to explore differences between types of angel investments in terms of investment criteria used by the angel investor. The unit of analysis of this research is the investment decision. Two main reasons can be presented to justify this choice. First, it follows the suggestion made by previous scholars (Avdeitchikova, 2008; Avdeitchikova et al., 2008; Mason and Harrison, 2008; Farrell et al., 2008; Lahti, 2011) who have argued that angel investing is a dynamic activity that can only be captured if the analysis is done at the investment level rather than at the investor level. Second, the findings of the previous chapter showed that results are methodologically dependent. However, the chapter does not provide an indication which is the best methodology to evaluate the way investors rank the investment criteria. Hence, by choosing the investment as the unit of analysis it is possible to avoid methodological limitations. The research has validated some of the previous findings in the decision making literature by highlighting the relative importance of some investment criterion (e.g. people).

This chapter examines the clusters that are generated when the investment criterion is used to group investment decisions, and the extent to which these clusters are distinct. The results display a clear link with the decision making process, presenting three different ways that angel investors weight the investment criteria. One of the distinct contributions of this thesis was to prove that Wetzel's views (Wetzel, 1983) on angel diversity are still valid. Using insights of the decision making criteria, this research has presented evidence that angel

investors make different decisions depending on the criteria used to accept an investment opportunity. The heterogeneity of the angel population is not assumed but tested. This is the first ‘data driven’ attempt to cluster business angel decisions, with the patterns within the data used to identify the differences and to prove that this diversity exists.

5.2 Literature review

5.2.1 Typologies of Business angels

This section has the objective of reviewing all of the major studies that have discussed angel classification. It provides the state of the art in business angel categorization studies. With the aim of mapping the differences within the angel population, scholars have put a considerable effort to identify the best ‘criterion’ for this segmentation. Angel research has a number of well acknowledged limitations. One is the fact that BAs are a heterogeneous population (Mason and Harrison, 2002a). There are a set of dimensions where they differ that range from the levels of familiarity with techniques of investing to their entrepreneurial experience and the motivation to invest. One solution for this limitation is to apply a cluster analysis, also known as market segmentation.

The lack of homogeneity of angel population has been known since Wetzel’s (1983) early studies. His analysis of financial returns revealed that the angel population is characterized by different perceptions of risk. This fact mirrors “the diversity of the informal investor population” (Wetzel, 1983 p. 30) In his work, Wetzel identified that a significant part of the respondents had different motivations to invest, that is, they did not look to maximize return. Forty five per cent of his sample had altruistic reasons to undertake an investment opportunity. From this point onwards several other scholars have looked at the heterogeneity of the angel population using different variables to illustrate the dissimilarities. This chapter reviews recent studies (e.g. Avdeitchiokava, 2008; Lahti, 2011) regarding the investment as

the unit of analysis. Table 5-1 summarizes the reasons presented by previous studies to defend this choice.

Table 5-1: Reasons to defend the use of investment as the unit of analysis

Author, date	Reason
Mason and Harrison, 2008	Easier to identify and to follow
Farrell et al., 2008	The collective nature of some angel investments, harder to identify "who" is the investor.
Avdeitchikova, 2008	Flexibility, not general behaviour but particular behaviour; Wider set of effects (investor, investment and context); Variability, more investment than investors;
Avdeitchikova et al., 2008	Dynamics of angel investing - different roles depending on the investment opportunity
Lahti, 2011	Aims of the study - investment differences and reasons that justify these variations.

The first attempt to develop a categorization of business angels was presented in Gaston's (1989) seminal work. Since then, various studies have examined business angels' categorization using different units of analysis and clustering variables. All of these studies reinforced the idea that scholars cannot assume that business angels are a single population as a whole without any discrepancies between them. Gaston (1989) presented his classification of ten different "groups" of informal investors (Business Devils, The Godfather, Peers, Cousin Randy, Dr Kildare, Corporate Achievers, Daddy Warbucks, High-tech Angels, The Stockholder, and Very Hungry Angels).

This classification was based on the authors' empirical perceptions of what he had encountered in his meetings with angel investors. The segmentation was empirically driven, based on what the author assumed to be the relevant characteristics for each particular type of angel (for example: investor background, investment goals, investment activity, levels of

wealth, entrepreneurial experience and so on) without assigning a specific clustering variable. As a result of this lack of objective measures, the segmentation did not generate mutually exclusive groups. In other words, an angel investor can belong to more than one group. This can be pointed as the major shortcoming in Gaston's (1989) work. Another limitation that can be highlighted is the lack of theoretical implications derived by this classification. However, the importance of this research should not be underappreciated. This research sought to "put boundaries on our ignorance" following Wetzel's tradition for undertaking angel research. Hence, the main contribution of this exploratory research is that it was the first attempt to segment the business angel population.

This empirical approach, of identifying groups of angels investors without having an explicit rule, was followed by Benjamin and Margulis (2000). The analysis of more than 1,359 listed angel investors in International Capital Resources' database allowed nine groups to emerge (value-added investor, deep-pocket investor, consortium of individual investors, partner investor, family of investors, barter investor, socially responsible private investor, unaccredited private investor, manager investor). Similar critiques to the ones made to Gaston's work (1989) can be made of this research.

The third study on the segmentation of the angel population was conducted by Landström (1992), who tested the fit of Ouchi's model (1977) to angel behaviour. The author questioned whether agency theory (Jensen and Meckling, 1979) could and should be used in the informal investment context. This economic theory focuses on the relationship between a *principal* (Business Angel) and *the agent* (the entrepreneur), who act rationally, trying to maximize each own utility function. The *principal* will have to create the right incentives to ensure that *the agent* is aligned with the principal, so he will act in the principals' best

interest, and for this he will incur agency costs. The level of asymmetric information (Barnea et al., 1981) also played an important role in this research, with higher levels of asymmetric information implying a larger difference between the information available to the entrepreneur and to the outside investors (angel investor). Hence, the entrepreneur has the capacity and incentive to affect wealth transfers between different parties and not just behave in his own interest. The most important contribution of this research was to highlight the need of a strong theoretical framework in categorization studies. Nonetheless, the study concluded that the framework suggested does not present acceptable evidence to elucidate the relation between the entrepreneur and the angel investor. But in comparison with Gaston (1989), this research used a narrower set of investor characteristics, which can be seen as an improvement on the previous study.

The following categorization study by Freear et al. (1994) used as a clustering variable the level of investment activity in entrepreneurial ventures. Three clusters emerged from this study, business angels, interested potential investors and non-interested potential investors. Chronologically, this is the first of several classification studies that has used the level of investment experience as the clustering variable. Although this research is not based on a strong theoretical framework, it provides insights into the relationship between the groups and investment preferences (for example: stage of investment, location, amounts invested and so on). Another contribution of this research is to present a substantial improvement in terms of the statistical procedures used in comparison to previous classification studies.

Sullivan and Miller (1996) presented an analysis based on investment motivations, which produced three “groups” (Economics, Hedonism and Altruism). Economic motivations are based on conventional economic and finance theories, supporting wealth maximization and

individual rationality (Dessler, 1980; Copeland and Weston, 1988). The informal investors categorized in this cluster are focused on the financial return resulting from the investment undertaken. Hedonistic motivations are related to nonfinancial factors, that is, factors that are not easily measured, such as a "psychic income" (Simon, 1959 p.252). This type of angel investor could easily be described as "people that are motivated solely by the desire to maximize pleasure and minimize pain" (Brue and Grant, 2012 p.137). Finally the members of the altruistic motivations cluster are encouraged to accept a proposal from an entrepreneur based on what Amitai Etzioni (2010) called the "moral dimension". The investors in this group were focused on giving back to society something that they were given some years ago. The key contribution of this research is that it was the first to examine whether or not business angels should be distinguished based on their investment preferences, particularly in terms of the reasons why they invest. The main criticism that can be made to this research is the fact that its unit of analysis is the business angel. Hence, it does not allow the motivations to invest to vary between the same angel investor.

A study dated from the same year (Kelly and Hay, 1996) focused the analysis on a segment of the angel population, serial investors. This particular segment of the angel market is defined as investors who have made three or more investments. Using the preferences of business angels regarding investing at an individual level versus collective level, the authors were able to identify two sub-segments: solo serial investors and syndicate serial investors. The main limitation of this research was that it only analysed a subset (serial angels) of the whole population, and consequently, it lacks completeness. However, the study provided new evidence on the investment activity, returns and investment behaviour of serial angels. The topic of serial investors has also been addressed by Van Osnabrugge (1998b). This paper examined the differences between serial and non-serial angels in terms of investment preferences, investment experience and expected outcomes. Contrary to Kelly and Hay

(1996), this research was an assessment of the whole angel market. The principal limitation was the broadness of the definition of a serial angel (investor that has made three or more investments). Sub-categories should have been made so that the effect of experience could have been assessed with greater precision.

In his doctoral thesis, Kelly (2000) follows the approach of using investment activity as the clustering variable. The author divided his sample into three sub-groups: investors with three or less investments; investors who made between four and nine investments; and investors with ten or more investments. Among other factors, the study contributed to our understanding of the contractual relationship between the entrepreneur and the angel investor, and how the number of investments made can affect this relation. This approach is more suited to provide a comprehensive overview of the different types of investors and what influences their decisions.

Kelly and Hay (2000) continued their research on this topic by dividing the middle group (investors with four to nine investments) of Kelly's (2000) dissertation sample into two. The study clustered the angel population into four types of investors based on investment activity (less than three investments, three to five, six to nine, more than ten). The focus of this research was to test the impact of investment activity on the type of suppliers of leads used, and on the quality of deal flow of opportunities. The findings reinforced the idea that investment procedures varied across the angel population. In particular, investors have different networks, which, as a consequence, influence the deal flow of investment opportunities. In terms of understanding the diversity of business angels, the study failed to include in the analysis the effect of investing in groups (networks, groups and syndicates).

Typologies using the levels of investment activity were further developed by Paul et al., (2003) which can be seen as a variant of Kelly and Hay (2003). The authors divided investors into four groups: Nascent angels (no investments), Novice (1 investment), Portfolio angels (2-5 investments) and Super angels (more than 5 investments). The study did not aim to identify particular differences across the groups. Rather it called attention to policy-makers of the heterogeneity of the angel population. The authors defended that the level of investment activity was particularly useful to (i) policy makers as it enables them to create optimal investment incentives; (ii) entrepreneurs as it is an objective way to detect who is actively involved in the supply of funding. The lack of novelty and limited contribution can be seen as the major drawback of this research.

Coveney and Moore (1998) presented a cluster analysis based on two main criteria: the investment activity and the entrepreneurial experience of the angel investor. Measurement of entrepreneurial experience was based on their financial and business backgrounds, while investment activity was measured through the number of investments made and the total amount of funds invested. These two criteria allowed the authors to create and profile four “groups” of active angels (wealth maximizing angels; entrepreneur angels; income seeking angels and corporate angels). Two groups of inactive investors were also identified and profiled: those who currently are not investing (latent angels), and those that have not made an investment yet (virgin angels). The limitations of this study are associated with the lack of information on how the groups were categorized, and the absence of a clear justification for this. From this point onwards, the discussion in categorization studies started to be less focused on investment activity, and more likely to be supported by investors’ characteristics as the unit of analysis.

Sørheim and Landström (2001) included investment activity as one of the units of analysis of the cluster analysis, but instead of using entrepreneurial background, they used competence as a second unit of analysis. The authors measured investor competence through a set of experiences: Professional; Self-Employed; Education; Business Background; Entrepreneurial Background. To measure investment activity a set of questions about future investment intentions and past investment were asked to identify the amount of investment activity of each business angel. These two criteria enabled the researchers to create four “types” of angel investors (Lotto Investors, Analytical investors, Traders, Business Angels). This study had both methodological and empirical contributions. Regarding the first, this research presented a more robust method of categorization (Iacobucci and Churchill, 2009) using a set of angel characteristics as unit of analysis. Additionally, this article refined the way investment activity was measured, and emphasized the importance that wider criteria will have in terms of robustness of the research. The results have drawn attention to the differences within the four groups of business angels in terms of investment preferences and investment procedures.

One common factor amongst these studies has been the lack of explanation on how scholars have chosen the clustering variables for their study. Erikson (2007) broke this tradition of the typology studies by suggesting a classification of business angels based on the two dominant schools of entrepreneurship (Schumpeterian and Austrian). The author operationalized this classification by assessing the investment history (last three years) of each investor. The Schumpeterian classification required the majority of investments made to be in new firms that were technology driven with an international market potential. The prerequisite to be qualified as an Austrian investor was to have the majority of investments in firms with the capability to reach the international market.

Erikson's research (2007) overthrew the dominant paradigm used in the categorization studies by presenting a strong theoretical base for classification. However, some questions can be raised by this study. First, the group classification seems too simplistic, with no references to different levels of technological orientation in the Schumpeterian typology. Second, the length of the analysis, three years, is too short. The number of group members could be biased by market trends. Third, the focus is on the investor and not the investment. Hence, a majority rule³⁶ does not reflect the dynamic of angel investing. A possible solution would be to use a 100% rule to define the two groups, and all the other cases would be hybrids resulting in a categorization with three clusters.

Avdeitchikova (2008) is responsible for the most significant categorization study. Her research drew attention to the limitations of previous typology studies, but also suggested an alternative way to classify the angel population. The article reviewed the deficiencies of previous studies by pointing out three crucial points. The first issue raised concerns to do with the reasoning behind the choice of the clustering rules. The author defended three justifications for this. The first, scholars have failed to explain the reasoning for previous categorizations. Secondly, there is a lack of a strong theoretical background on the clustering rules. Lastly, it is inappropriate to use investor-related variables and investment related variables at the same time. This creates ambiguity regarding the unit of analysis of the classification because the reader does not know if the clusters characterize investors or investments.

A second concern raised by Avdeitchikova (2008) was the lack of dynamics in previous categorization studies. These studies did not allow investors to adapt and evolve to have

³⁶ An investor is defined as Austrian or Schumpeterian if more than 50% of his investments are of one type.

different roles. Hence, she suggested changing the unit of analysis to the investment. The lack of theoretical contributions of the classification studies is regarded as a third key deficiency. The identification of these limitations had a direct impact on the classification used in her research. The classification was built from the two different types of contributions an angel investor can provide (financial and non-financial). The use of the investment rather than the investor as the unit of analysis was one of the key contributions of this study. This opened a new line of research within the classification studies.

Another key contribution of this research is that angel investing is not a static activity, in other words, investor behaviour (investor contributions) may change depending on firm requirements. However, this study has two major shortcomings. The author did not take into account the possibility of business angels investing with others. This has a direct impact on the type and level of contributions that a business angel can provide. Additionally, the choice of contribution might be investor dependent, that is, the contributions might depend on the personal preference of the investor. This might raise measurement problems, since the investor characteristics might provide a better justification for this categorization than the different types of investments.

The most recent categorization study was conducted by Lahti, (2011). Based on the Finnish angel market, the author advocated that investments can be segmented into subgroups, using for this, the time spent by the angel investor in pre-investment (due diligence) and post-investment involvement in the invested companies (value-added activities). This analysis created four different “groups” (Gambles; Conventional Angel Investments; Due Diligence Driven Investments and Professionally Safeguarded Investments). The theoretical background of this research was based on how angel investors can reduce the pre and post-

investment risks. This risk reduction is understood through the principal agent approach and contract theory. The first theory is the same used previously by Landström, (1992) which emphasized that the principal (angel investor) will try to align incentives of the agent (entrepreneur) with his/her own. Alignment can be achieved through complete contracts. However contracts are not complete since it is impossible to include all possibilities in the agreement. Therefore, pre and post-investment risk reduction will be a function of the time spent in due diligence (pre-investment) and the time spent in active involvement (post-investment).

At the first glance, the analysis has strong theoretical foundations. However some less intuitive results can be seen as the biggest shortcoming. An example of this is the discussion regarding the “gambles”. These are investments where the angel has low pre and post involvement. The author considered that gambles are investments of speculative nature and they have limited emphasis on managing risks, that is, they are just taking a risk without trying to minimize it by any means. However, this can be challenged. It is clear that gambles have mechanisms of risk sharing; they are the ones that demand the highest investment from the entrepreneur. This is a way of aligning incentives between the entrepreneur and the business angel. This variable is also statistically significant, reinforcing the conclusion that this as a tool used by this type of angel investor to align incentives and prevent entrepreneurs from shirking. This is a well-documented point in the literature (Barney et al., 1989; Prasad et al., 2000; Wong et al., 2009).

This summarizes the main body of literature on business angels’ typologies. However, it is important to acknowledge the existence of other studies that did not focus on developing categorizations of angel investors (or their investments). Instead, this body of literature

aimed to identify the specificities of certain subgroups within the angel population. One of these studies (Erikson et al., 2003) has compared angel investors that mainly invested in opportunities in which there were family ties against all other types of informal investors. The authors investigated four areas of angel investing (investing stages, number of investments, and degree of involvement and exit preferences) and concluded that contrasts between 'family angels' and other types of angels were significant. Erikson and Sørheim (2005) studied the differences between angel investors who invest in technological driven opportunities versus all other business angels. The analysis focused on looking at different dimensions of angel investing (deal origin, selection, monitoring and exit preferences), and concluded that 'technology angles' were considerably atypical from other types of business angels.

The particular characteristics of female angel investors have been investigated by two research teams. Harrison and Mason (2007) conducted their research with individual angels, while Sohl and Hill (2007) discussed the differences in a group environment. Visser and Williams (2001) looked at a specific type of business angel who invest in very distinctive opportunities - take over and turn around businesses in serious financial distress. Another study (Festel and De Cleyn, 2013) discussed the particularities of founding angels. The authors claimed that this type of investor complements both formal and informal venture capital.

5.2.2 Importance of Decision Making Criteria

In her 2008 work, Avdeitchikova claimed that previous typology studies of angel investors do not offer enough theoretical considerations to elucidate the reasons for the lack of

homogeneity of business angels and the distinctive types of investment behaviour. But is this a problem of lack of theoretical contemplations, or is it a problem of insufficient understanding of how similar investment decisions are? This research has sought to clarify this point by using the investment making criteria as the clustering variable. Previous research has not considered the possibility of looking at the investment decision criteria as the clustering rule. However, what better way to understand the investment behaviour than look at how similar the reasons are to invest?

The dynamic nature of the angel market (Mason et al., 2013) has generated more nuances in the angel population that previous studies have addressed. The first stream of categorization studies has grouped angels according to individual characteristics. The rationale for this was to group individuals for what they are - based on previous experiences (investment activity, entrepreneurial background, competences and investment motivations). The second stream of research has looked at the investment process (contributions, technology preferences; and involvement). In either case, scholars did not address the fundamental question of what leads an angel investor to undertake an investment opportunity, that is, what was the criterion or criteria that motivate this decision. Moreover, are similar decisions taken by different angels? Or do different angels have the same motivations?

The investment decision making literature has identified several critical findings in terms of the criteria used by angel investors. However, the knowledge about how similar angel investment decisions are still remains unknown. Research developed in this area has answered two questions. First, how similar are business angels' decision criteria when compared with other investors in the funding escalator. Scholars have acknowledged that business angels have a unique attitude in terms of investment criteria. Van Osnabrugge

(1998c) identified different approaches to investment appraisal between business angels and venture capital fund managers. A following study (Mason and Harrison, 2002b) emphasized that angel investors were more likely to undertake an investment opportunity based on 'gut feeling' when compared to venture capitalists. This was partially as a result of business angels being less concerned with the financial outcomes of their investment activity than venture capitalists.

Mason and Stark (2004) take this further and showed that angel investors have a different approach to formal venture capital, and also to bankers. Second, how much does the decision criteria vary across different "types" of angel investors. Two studies have brought some insights on the similarities. An introductory study conducted by Van Osnabrugge (1998a) identified differences regarding the decision criteria used by 'serial angels' and by 'non-serial angels'. The most significant difference raised by this work was the fact that 'serial angels' were more apprehensive about market risks, while 'non serial angels' were more concerned with agency risk.

An alternative perspective based on the investor experience was raised by Harrison et al., (2015). The authors divided the sample into three groups (super angels, novice angels and nascent angels) and identified differences in how each group assessed the investment opportunities. However, scholars have not drilled down to identify the ways in which decision criteria might systematically change to reflect the dynamics of different investment propositions, and the investment preferences of angels.

This research has suggested a novel way to cluster business angels based on their investment criteria, using seven investment criteria (the people, product/market, attributes of the

business, investor attributes, financial attributes, and exit and business plan). Previous research has worked on the basis that angels were different based on a specific range of characteristics and processes, and then looked how this impacted the decision criteria. This research suggests the opposite, to group the investment decisions based on the investment criteria used, and then understand how different the angel investors are. Hence, it is not that previous research asked the wrong question, but the way the inquiry was made.

5.2.3 Development of categorizational schema

This is the first research to present an alternative way to categorize the angel population based on the investment criteria used by investors. It is a data driven thesis and does not aim to answer Avdeitchikova's (2008) demand for a classification with a stronger theoretical basis in the stream of research. The key objective was to assess how similar the investment decisions are regarding the investment criteria used. The explorative nature of this research reflects the lack of focus of the academic community on understanding how the heterogeneity of the angel population affects investment decisions. Nevertheless, this section will review the main theories used in business angel decision making.

Maula et al. (2005) applied the social psychological theory of planned behaviour (Ajzen, 1991) to explain the susceptibility of individuals to be angel investors. The authors used individual characteristics such as: entrepreneurial experience, education and age to test a set of hypothesis regarding the likelihood of becoming an angel investor. The study concluded that, based on the results achieved, this theory fitted significantly the behaviour of business angels. Although this was a clear contribution to the literature, the use of the social psychological theory of planned behaviour is restricted to answer what are the characteristics that justify an individual to become an informal investor, and not what are the reasons to

invest in a specific opportunity. This study also used the economic theory on household portfolios developed by Guiso et al. (2000). The approach followed by this theory proposed that individuals allocated a part of their wealth to a different class of assets, depending on the risk/return relation, and on the individual level of risk aversion. Angel investing is seen as a type of risky asset. Maula et al. (2005) concluded that this theory is suitable to explain angel investing, particularly regarding tax related reasons. However, the same criticism can be made regarding the lack of coverage of each individual investment decision. The economic theory on household portfolios is only useful to explain the general reasons to become a business angel.

Agency theory has been used by several authors (Landström, 1992; Van Osnabrugge, 2000; Lahti, 2011). This theory was developed by Jensen and Meckling (1979) and depicts a relation between *the principal* and *the agent*, and what problems can arise given the separation between ownership and control (Fama and Jensen, 1983). These problems are commonly known as *adverse selection* and *moral hazard*. Van Osnabrugge's work (2000) compared the differences between formal and informal venture capital regarding investment decisions. The author identified that business angels have an incomplete contract approach, which explains that the principal will put extra emphasis on the post investment relation. This will imply that the angel investor will seek to exercise control over the entrepreneur. The venture capitalist will have the opposite approach, the principal agent approach. This approach explains that the investor will rely on thorough ex ante screening and due diligence of the investment opportunity. The application of the agency theory to business angel investment decision making has been criticized by several scholars (Landström, 1992; Kelly and Hay, 2003; Mason, 2007a) with several limitations being stressed, e.g. the existence of distrust, economic reasons driving the motivation to invest, size of the firms and so on. Additionally, its focus is on the principal/agent relation and not on the motivations to invest.

The sociological theory of social networks was initially applied to business angel decision making by Shane and Cable (2002). This theory is particularly useful to explain business angel investment decisions, predominantly, regarding the sourcing of opportunities. However, the application of this theory goes beyond the pre-investment stage, and can also be applied to explain part of the hands-on approach followed by angel investors. This point is obvious in recent research (Sørheim, 2003; Herrmann et al., 2015) in that, where the structured dimension is important for regional and industry contacts, the relational aspect is important in terms of how the angel investor is seen by his/her network. Lastly the cognitive element is related to way the business angel is seen by other investors, and by the entrepreneur. Although there is a clear contribution of the application of this theory to angel research, one needs to recognize the specificity of it. Business angels invest for a set of reasons and motivations, and this theory only looks at the social ties of the investor and how these connections impact the investment decisions.

In an effort to provide theoretical foundations to the business angel decision making literature, Fiet (1991) presented the notion of trust in the context of information sources, networks and reliance structures. This was the first attempt to associate trust as a decision factor for angel investment. This initial reference to trust regarding business angel decision making was further developed by other scholars (Harrison et al., 1997; Dibben et al., 1998; Dibben, 2000). A common characteristic of these articles was the use of Lewicki and Bunker's typologies (1996) as a theoretical framework. This framework has helped the authors to identify a relation between the different criteria used by the angel investors and the type of trust and its level. This would impact the levels of cooperation the business angel would be willing to have with the entrepreneur. The contributions from applying the Socio-Psychological Theories of Interpersonal Trust on business angel investment decision making

has improved the comprehensiveness of our knowledge. However, its focus is on trust and how it impacts the decision making; it is just a part of the several factors impacting the investment decision.

The previous section has summarized the key theories used by scholars to explain business angel investment decision making. It should be clear by now that there is no perfect fit in any of the theoretical applications previously described, with each of them targeting a specific approach to the issue. Riding and his colleagues (2007 p.344) suggested that one of the key areas scholars should focus is on “the development of a comprehensive model of investment decision-making”. For these two reasons, it is fundamental to take a step back and understand similarities and patterns in business angel investment decisions that would help generalization, and consequently have a theoretical contribution.

5.3 Data and Methodology

5.3.1 Data collection

This research is based on data collected on business angels and their investments from an online survey of United Kingdom angel investors that was made available for completion from April to July 2014. Harrison and Mason (1992a) suggest three different approaches to identify a sample of angel investors: large-scale sample surveys, investee reference and “snowball” method. Avdeitchikova and her colleagues (2008) suggest a fourth approach which comprises a “snowball” method with members of business angel networks and groups. The research design followed in this study could be considered a variation of the first approach, a large-scale sample survey with a very specific focus.

The research was mainly focused on the visible side of the market. Six reasons can be cited to justify this decision. First, the angel market has evolved from individual investing to a scenario of collective behaviour (Sohl, 2012a; Gregson et al., 2013; Mason et al., 2013). Second, angel groups are recognized as the visible side of the angel market (Sohl, 2007; Mason and Harrison, 2013), which clearly identifies who to target. Third, is the importance of business angels groups. In a Scottish study (Paul et al., 2003) half of sampled angels had previously invested via a business angel group. Fourth, several angels operate in both the invisible and on the visible market (Mason and Harrison, 2013). Fifth, the unpredictable size of the angel market (Mason and Harrison, 2008) makes it almost impossible to understand the population size. Lastly, increasingly business angels start investing within groups. As noticed in chapter three, angel groups are linked to the first investment of several investors.

There were two important requirements to be addressed before launching the survey: first, to identify the active angel groups investing in the UK; and second, obtain the support of the managers of these groups, also known as gatekeepers. The first requisite was solved by researching angel groups in several online sources, such as: UKBA Association member base, LINC Scotland member base, Syndicate room network directory, as well as personal knowledge. This process enabled the identification of 84 business angels networks/groups. This number is clearly above the ones reported by EBAN in 2008³⁷ (Mason, 2009). Again, when compared with USA data (Preston, 2007) these numbers³⁸ of angel groups are above what one would expect. The data collection process helped to identify nine additional networks/groups raising the total to 93. The second condition involved contacting the angel groups/networks to ask them to circulate the survey to their members. This involved an initial

³⁷ EBAN reported that in mid-2008 there were 35 business angel networks in the UK.

³⁸ Preston reported 250 Business angel organizations; using the 2014 Gross domestic product as a comparative measure we find that the USA is approximately 6.5 times bigger than the UK. Hence, using this as a reference one would expect to have 38 Business angel organizations in the UK. Source: World Economic and Financial Surveys from the International Monetary Fund.

contact by email to the group managers also known as gatekeepers (Paul and Whittam, 2010). This preparatory attempt was pursued by several follow on telephone calls. As part of the request, a consultancy report on their members' views on the group was offered to all the groups that achieved five or more respondents. This had the objective to align the interests of the gatekeeper to the research in terms of maximizing the number of respondents. The survey gave the groups a unique opportunity to have an independent scrutiny of their members.

The way the request was communicated to the members of the group differed, depending on the normal communication channel used by the gatekeeper and it varied between: a standard email, posts on the group private investment forum, communication at the group meeting and so on. Additionally, a list of 40 angel investors was contacted. The list was constructed in the previous data collection stage. The business angels were identified or by being known as an angel investor through the media or by snowball sampling. This multi-sample approach is a good solution to deal with bias sampling resulting from non-representative sampling methodologies (Avdeitchikova et al., 2008).

Out of the 84 identified groups 32 were willing to support the research and made it available to their members. The survey had the participation of 238 business angels. The respondents were predominantly members of at least one group. This is the result of the two main factors: first, it is virtually impossible to identify angels in the invisible market; second, the growth of angel groups and their memberships. This represents weight of 38.10% of the overall groups. These 32 groups represented around 1200 individual angels³⁹. On average each participant was a member of 2.08 angel groups. This results in an individual response rate

³⁹ Estimation based on the groups information.

of 41.13%. Using the suggested framework to assess response rate⁴⁰ this survey issued an R = (38.10%; 41, 13%). The results are much in line with previous studies.

5.3.2 Unit of analysis

Landström (2007) defends that even though 25 years of research has helped scholars to achieve a better understanding of business angels there is still space for improvement. He suggests that this should focus on both the investor domain and on the dynamics of the informal venture capital market. Hence, defining the unit of analysis of a typology can be extremely useful to answer this request. The great majority of previous categorization studies have used the investor as the unit of analysis. Only three studies did not follow this approach (relationship between the informal investor and the portfolio firm - Landström, 1992; Investment - Avdeitchikova, 2008; Lahti, 2011). This research advocates the use of the investment decision as the unit of analysis.

Four main reasons support this decision. First, the results from the previous chapter show variability in the way business angels make decisions. The lack of consistency seen in the sample indicates that the same individual might value differently a particular criterion depending on what is being asked and how it is being asked. Hence, setting the investor as the unit of analysis would not allow variability of the reasons to invest since it would force each individual to have the same choice. This variability dimension has been previously advocated and developed by Avdeitchikova (2008). Second, the nature of angel investing is very dynamic (Avdeitchikova et al., 2008), angel groups have enabled business angels to spread their investments across different industries. Collaborating with other angels permits

⁴⁰ The response rate was calculated according to suggestions made in chapter three.

each individual to have different sets of experiences and knowledge that will result in a different way to assess an investment opportunity (Carriere, 2006). Again, the reasons for a business angel to fund a firm are not always the same and are opportunity dependent. Third, as Riding (2005) observes, investment profiles may change over time. Hence, it would be impossible to assign an investor to one specific category since individuals can undertake different types of investments over time. This argument is directly linked with the last reason for this choice, the learning argument. Harrison et al., (2015) have identified that angel learning has a direct impact on the way they assess an investment opportunity with less experienced business angels acknowledging the contributions of expert investors. Thus, a categorization of investors would not allow this dynamic learning component.

The choice fell on the investment decisions, in particular the criteria that justified the investor to undertake such opportunity. One consequence of this choice of making the investment decision the unit of analysis was the possibility of collecting a wider sample since each angel investor could report more than one investment decision. There are obvious trade-offs of asking for a single answer rather than several investments. There is no consensus within the literature which is the best approach to be used. Looking at the studies that focused the analysis on the investments we can observe that Avdeitchikova (2008) asked participants to report their three most recent investments, while Lahti (2011) opted to request respondents to recall the most recent investment.

In the online survey, respondents were asked to recall their three most recent investments. This approach reflects the arguments of variability and inconsistency previously mentioned, and the larger sample would allow the identification of different patterns in the data. Lahti (2011) was concerned about collecting more than one investment decision for two reasons.

First, was the risk of self-selection bias. Investors might choose to report the most lucrative investments. This is not a significant problem in this research (i) investors were asked to recall the three most recent investments; and (ii) no questions were asked concerning investment outcomes, which reduces the incentives for investor to report successful investments. Second, there is a risk of skewed distribution, that is, the majority of observations belong to a small number of investors. The results of the data collection, shown in table 5-2, illustrate that this should not be a concern in this particular study. Out of the 177 respondents that completed the investment section 137 provided three investment decisions, representing more than three quarters of the respondents.

Table 5-2: Number of investments decisions per respondent

Number of investment decisions	Respondents	%
1	30	17%
2	11	6%
3	137	77%
Total	178	100%

Out of the 238 initial respondents only 178 completed the investment decision section. The survey collected a total of 463 investment decisions. Table 5.2 depicts the number of responses per angel. From these 463 investment decisions 16 were partially completed. Hence, the number of investment decisions analysed was 447.

5.3.3 Cluster analysis

As previously mentioned, this chapter aims to categorize the investment decisions made by business angels taking into account the criteria used in a positive decision. A list comprising seven criteria was used to explore the relative importance of each criterion. This was the

same list that was used in chapter four. The main problem with this approach relied on the fact that the cluster variables would be *specific* (investment decision) and *unobservable* (investor preferences). Scholars have identified that groups categorized with the use of specific unobservable variables are usually more homogenous (Wedel and Kamakura, 2000). Nevertheless, the utilization of these types of variables represented a challenge. The great majority of previous angel typologies focused on *observable* and *general* variables because these variables are easier to identify and to measure. Hence, the survey design was extremely important and required external validation. This validation was done with the help of two experienced researchers and with three gatekeepers of angel groups. The objective of this external involvement was to ensure that participants would clearly understand what was asked and that the variables were measured correctly.

A Likert scale was used to investigate angel how the investor gave different weight in an investment decision. This follows preceding investment decision studies (Van Osnabrugge, 2000; Sudek, 2006). The values for each of the criterion ranged from 1 (not important) to 7 (very important) following Vagias (2006). The list of seven criteria was the result of the literature review conducted on investment criteria and it was used in the previous empirical chapter. As already mentioned this list was validated in the first stage of data collection. Appendix 5 presents a detailed description of the seven criteria used in the study.

Clustering data is a method that enables researchers to form classes of objects with analogous characteristics. This is particularly important to understand specific patterns within the data. A two-step cluster analysis procedure was conducted. The choice for this technique was based on the fact that the algorithm used has two desirable features. First, is the ability to automatically choose the best number of clusters (Chiu et al., 2001). The aim of this research

was to identify how angel investors weight the different criterion in their decisions and what patterns exist. This algorithm is particularly useful for exploratory research since no theoretical framework is predefining the number of clusters. This is the most distinctive characteristics of this study since previous angel typologies (for example: Sørheim and Landström, 2001; Lahti, 2011) use the K-mean algorithm. Second, is the capability to analyse significant large data sets efficiently. Contrariwise to Hierarchical clustering technique, two-step allows researchers to work with data set with a wide number of observations. The analysis was conducted using IBM SPSS statistics.

After depicting the clusters, the clusters centroids were compared using investment aspects (e.g. amount invested, stage, sources of due diligence and so on) and investor characteristics (age, gender, entrepreneurial experience, investment experience and so on). This procedure aimed to assess the solution's validity of the cluster analysis. Mooi and Sarstedt (2011) suggested that this would help to appraise whether the groups are substantially unique considering one or more criterion variables. Additionally, it enables a deeper understanding of what is more important in terms of an investment decision, the investor characteristics or the opportunity features. As in previous studies (Sørheim and Landström, 2001; Avdeitchikova, 2008) the group means were compared using Scheffe analysis. This procedure is particularly useful when in group comparisons with unequal sample sizes. While running this analysis, Levene's tests of homogeneous variance were conducted simultaneously. One of the assumptions of the ANOVA is equality of variance and the Levene's test allows researcher to assess this condition. When the assumption of homogeneity of variances was violated two tests were applied (i) Welch and (ii) Brown and Forsythe test.

5.4 Analysis and empirical results

5.4.1 Overview

As noted above, the two-step procedure relies on an auto-clustering algorithm that enables the identification of the best solution regarding the number of clusters. This algorithm uses a combination of the variation of the Schwarz's Bayesian Criterion (BIC) value and distance change. The solution is identified by a sensibly significant value for the Ratio of BIC changes and a large value for the Ratio of Distance Measures (see Appendix 6). A three cluster solution was the best model found. To assess the goodness of fit an average silhouette coefficient⁴¹ was calculated and the solution scored 0.1 (see Appendix 7). According to Kaufman and Rousseeuw (2009) this result indicates a poor cluster structure. This will be further discussed in the limitation section of this chapter.

The first group of investments is a cluster where the centroids indicate that investor consider a subset of criteria (5 out of 7 criterion) as being extremely important, scoring the maximum value in the Likert scale. Out of these five, the criteria that had the most frequent response of 7 was Product/Market, with 85.8% of the categorized investments scoring the highest value. The other two criteria (Financial attributes and Attributes of the business) were considered as neutral for the decision, scoring on average a 4 in the Likert scale. This is the smallest cluster with 120 investment decision which represents 26.8% of the total sample. Two additional points can be raised regarding this cluster. First, these are the investments decisions which investors scored the highest level of importance of specific criterion (7). Second, the investors identify two levels of importance in terms of criteria. This seems to indicate that some criteria are very important while others are not that important. This can

⁴¹ The Silhouette coefficient combines both cohesion and separation, that is, it measure the distance between clusters but also within clusters.

be linked with compensatory procedures, since in these decisions five of the criteria were extremely important compensating for the two with neutral scores.

The second cluster is a group of investments where the angels had a three level analysis. The investments in this class were characterized by classifying the cluster centroids of two criteria as very important, two being moderately important and three neutral (6, 5 and 4 respectively in the Likert scale). Similarly to the previous group of investment, this cluster can also be linked with compensatory procedures. The main difference between the first and second cluster seems to be the level of detail the latter group of decisions contains, with more comprehensive level of preferences between criteria used. This was the biggest cluster with 200 observations which represented approximately 45% of the sample of investment decisions.

The last cluster is characterized investments in which investors considered that all the criteria were very important (cluster centroid equal to 6 in Likert scale). Out of the seven criteria, the attribute of the business had the most frequent response of very important, with 81.1% of the categorized investments having this feature. This is the cluster that reveals least about the way the angel investors make a decision. By having all the cluster centroids with the same value it is harder to understand what are the trade-offs taken into account while deciding. This seems to be a non-compensatory procedure which comprised a larger number of criteria that were important. In terms of size, this last cluster was the second biggest, representing 28.4% of the sample (127 investment decisions).

5.4.2 The importance of the predictors

One of the cluster analysis outputs is the predictor importance view. This feature allows the identification of the relative importance of each cluster variable in the estimated the model. The predictor importance ranges from 0 to 1 and the higher the value the more the variable contributes to the cluster formation. It can be particularly useful when dealing with large numbers of variables since it enables the elimination of needless predictors helping to fine-tune the model. However, this is not reason why it was used in this section. The following discussion is centred on the fact that this analysis signifies how well the cluster variable can distinguish the different groups. Hence, emphasising which variables were helpful to differentiate the clusters.

Of the seven criteria used in this research, *the people* was the criterion with the lowest predictor importance score⁴² (scored 0.12). This can be seen as a surprise since it means that this criterion has almost no effect on the cluster formulation. One possible justification for this result could be linked with the idea that the entrepreneur is fundamental in an investment opportunity and that business angels are more focused on agency risk (the relation with the entrepreneur) than market risk (product and market issues), consequently, it is not the best variable to distinguish the investment opportunities that received angel funding. The importance of the entrepreneur was highlighted by several research studies (Fiet, 1995a; Van Osnabrugge, 2000; Harrison and Mason, 2002; Manigart et al., 2002; Kelly and Hay, 2003).

The *financial attributes* was the criterion most useful to differentiate the clusters. This was closely followed by the *product/market* (scores of 1 and 0.99 respectively). In the first case,

⁴² Notice that *the people* had the second highest mean and second lowest standard deviation. Hence, it was not a problem of low scores or low variability.

scholars have shown that business angel investors can be differentiated between those with financial and non-financial motives (Wetzel, 1986; De Noble, 2001). Hence, it would be expected that angel investors with altruistic motivations to put less emphasis on the financial characteristics of the investment opportunity. Another possible influence is investor background: 37% of the respondents had their main working experience in financial services and so would be expected to have distinct capabilities to analyse the financial attributes of an investment opportunity.

The majority (73%) of the investment opportunities analysed were made through an angel group. This may also have influenced the findings. Typically, these organizations try to spread the risk by investing in several sectors (Gregson et al., 2013; Mason et al., 2013). Hence, investors did not necessarily have specific knowledge about the product or the market they were investing in. This point is closely linked with market risks. Van Osnabrugge (1998a) shows that serial angels are more concerned with market risks when compared with non-serial angels. Scholars have used different definitions of serial angels (for example: Farrell et al., 2003; Capizzi, 2013; Hellmann et al., 2015). However, the focus is always on different levels of investment experience measured in number of investments undertaken. In this study, approximately half of the respondents had made 7 or more investments. Hence, it would be expected that angels with different investment experience to emphasize the *product/market* differently. For a deeper analysis on the predictor importance, Appendix 8 provides the predictor importance for all seven clustering variables.

5.4.3 Comparison between cluster groups

The comparison between cluster groups has focused on two key indicators (i) the average score for each variable analysed (ii) the statistical significance of the differences. This

procedure has aimed to identify if the clusters suggested are significantly different, and to help profile them. A *post hoc* comparison was made using the Scheffe test. This test is less sensitive to the assumption of homogeneity of variances between groups. The procedure is not new to angel research (Sørheim and Landström, 2001; Avdeitchikova, 2008).

Table 5-3: Investor General Characteristics

	Cluster 1	Cluster 2	Cluster 3
Investor Characteristics			
Gender (1=Male, 2=Female) ^a	1.08	1.09	1.06
Age (1=under 35, 2=35 to 44, 3=45 to 54, 4=55 to 64, 5=65 and above) ^b	3.56	3.62	3.64
<i>Education and Professional Experience</i>			
University Degree (1=Yes, 2=No) ^c	1.24	1.26	1.23
Professional Qualification (1=Yes, 2=No) ^d	1.48	1.26	1.31
Top 5 Industries	Health Care (6%) Industrials (12%) Consumer Goods (13%) Others (28%) Financials (32%)	Consumer Goods (7%) Telecommunications (7%) Industrials (14%) Others (27%) Financials (36%)	Industrials (7%) Consumer Goods (7%) Health Care (8%) Others (24%) Financials (41%)

^a Differences not significant.

^b Differences not significant.

^c Differences not significant.

^d Significant differences between group 1 and groups 2 and 3.

The first layer of the analysis looked at the investor characteristics, in particular, gender, age, education and professional experience (see table 5-3 for more details). There were no significant differences between the clusters concerning age, gender⁴³ and university degree.

⁴³ There were not found significant gender differences in terms of the cluster weights. This provides additional evidence of the lack of gender inequalities in terms of the investment criteria used.

Investors making these types of investments were typically male, aged between 45 and 54 with a university degree. Having a professional qualification was more frequent for investors with investment decisions in the first cluster, when compared with the other two groups. When taking into account the professional experience of the investors, it was interesting to notice that the first group of investment decisions had the smallest proportion with a financial background and the highest of consumer goods background of the three. The second cluster had the highest number of investors with previous professional experience in Industrials and Telecommunications. The third group of investment decisions had the highest number of investors with professional experience in Healthcare and Financial.

The following level of analysis, still looking at investor characteristics, focused on three dimensions: entrepreneurial experience, investment experience and syndication. In the first case, there were no statistically significant differences. Hence, investors conducting decisions across clusters seemed fairly similar in terms of their entrepreneurial experience. A completely different conclusion can be reached in terms of the investment experience. Typically, investors who made investments in the second cluster were more experienced in both the number of investments and the years that they have been investing. This seems to indicate that more experienced investors were able to clearly differentiate the importance of the investment criteria when compared with unexperienced counterparts.

The last dimension considered was syndication. Again, business angels making investments in the second cluster were the most distinctive: (i) they were less likely to be part of a group (ii) they took longer to join a group (iii) they have spent a longer time as members of an angel group. Regarding the areas of syndication (motivations for joining a group, the number of groups and crowdfunding) the investors are reasonably alike across the three clusters. This

suggested that the investment decisions in the second cluster were conducted by more experienced investors. In the opposite direction, investors who had made decisions in the first cluster were the least experienced, had fewer years investing and, on average, had a smaller amount of investments. This conclusion is also valid regarding syndication. Investment decisions in the first cluster were made by business angels who typically belong to an angel group, although with a shorter membership. Table 5-4 depicts these relations.

Table 5-4: Investor General Characteristics

	<u>Cluster 1</u>	<u>Cluster 2</u>	<u>Cluster 3</u>
Investor Characteristics			
<i>Entrepreneurial Experience</i>			
Involvement in a Management Buyout (1=Yes, 2=No) ^e	1.60	1.59	1.67
CEO of an SME (1=Yes, 2=No) ^f	1.37	1.36	1.41
Board Member of a median to large company (1=Yes, 2=No) ^g	1.46	1.37	1.41
<i>Investment Experience</i>			
Years investing ^h	7.85	10.86	8.41
Number of investments (1 = 0 , 2 = 1 to 3, 3 = 4 to 6, 4= 7 to 10, 5 = More than 10) ⁱ	3.63	3.94	3.83
<i>Syndication</i>			
Part of an angel group (1=Yes, 2=No) ^j	1.03	1.10	1.05
Years in a group ^k	6.13	7.66	7.01
Years to join a group ^l	2.57	4.00	2.19
Invest with Others (7-point Likert Scale/ Strongly disagree - Strongly agree) ^m	4.19	4.21	4.46
Number of angel groups (1 = 1 , 2 = 2, 3 = 3, 4 = 4 or more) ⁿ	1.88	1.99	1.74
Crowdfunding investing (1=Yes, 2=No) ^o	1.79	1.76	1.82

^eDifferences not significant.

^hDifferences not significant.

^gDifferences not significant.

^hSignificant differences between group 2 and groups 1 and 3.

ⁱSignificant differences between group 1 and group 2.

^jSignificant differences between group 1 and group 2.

^kSignificant differences between group 1 and group 2.

^lSignificant differences between group 2 and group 3.

^mDifferences not significant.

ⁿDifferences not significant.

^oDifferences not significant.

The next level of analysis takes into account the investment characteristics⁴⁴ and the degree of influence of others (leading angel and other angels) in their decision. Investments in the three clusters are relatively similar with respect to the amount invested, stage of development and the number of due diligence sources. Typically, the amount invested is lower than £100,000 at the start-up stage and using an average of four sources of due diligence. The investments in the first cluster have a higher level of innovation which suggested that these projects were ground-breaking opportunities with a very strong set of attributes (5 out of 7 criteria were considered very important). Investments in the first cluster were also characterised by being the ones where the investor had the lowest industry experience. This is consistent with the neutral value of investment attributes given by investors in this cluster. This contrasted with the third cluster in which high levels of industry experience were associated with investment decisions where the business angel highly ranks the investor attributes.

There are no significant differences across clusters in terms of investing to diversify. On average, 50% of the investments made across clusters had helped the investor to diversify his portfolio. The great majority of the investments analysed were made through an angel

⁴⁴ Paul et al., (2003) notice that angel groups are allowing business angels to invest away from home (22% of the sample would invested away from home). Hence, location of the investment becomes less important. For this reason it was not included in this research.

group. Consequently, there were no differences across clustered investments in terms of being done as a member of an angel group. This was not surprising since the great majority of respondents belonged to angel groups. The investments in the second cluster were statistically different from the other two clusters regarding IP protection. These investments were less protected than investments in other clusters. This finding is associated with the fact that these investments were the less innovative ones, and seemed to indicate that motivations to invest were driven by the product/market and the people in the project. These could be opportunists that target very mature markets. All investments across the different clusters were fairly similar in terms of having a ready product and service. One reason for this could be the fact that business angels typically invest in very early stages where the firms have no product or service to offer.

Table 5-5: Investment General Features

	<u>Cluster 1</u>	<u>Cluster 2</u>	<u>Cluster 3</u>
Investment Features			
Amount Invested	1.13	1.20	1.18
<i>(1 = <£100,000 2 = £100,000 to £250,000 3 = >£250,000)^p</i>			
Stage of development	2.38	2.45	2.60
<i>(1 = seed, 2 = start-up, 3 = early stage, 4 = later stage)^q</i>			
Number of Due Diligence Sources ^r	3.79	3.58	4.21
Level of Innovation	3.90	3.46	3.56
<i>(5-point Likert Scale/ Very Low - Very High)^s</i>			
Industry Experience	1.88	1.98	2.29
<i>(years/1 = 0 to 5 2 = 6 to 10 to 3 11 = 14 to 15 4 = 16 to 20 5 = More than 20)^t</i>			
To achieve diversification	1.47	1.54	1.45
<i>(1=Yes, 2=No)^u</i>			
Angel Group investment	1.26	1.29	1.24
<i>(1=Yes, 2=No)^v</i>			
Intellectual Property Protection	1.35	1.50	1.38
<i>(1=Yes, 2=No)^w</i>			
Existence of a ready Product/Service	1.34	1.28	1.27
<i>(1=Yes, 2=No)^x</i>			
Influenced Decision			
Leading angel influence	4.09	3.90	4.46
<i>(7-point Likert Scale/ Strongly disagree - Strongly agree)^y</i>			
Other angels influence	3.70	3.32	3.92
<i>(7-point Likert Scale/ Strongly disagree - Strongly agree)^z</i>			

^p Differences not significant.

^q Differences not significant.

^r Differences not significant.

^s Significant differences between group 1 and groups 2 and 3.

^t Significant differences between group 1 and group 3.

^u Differences not significant.

^v Differences not significant.

^w Significant differences between group 2 and groups 1 and group 3.

^x Differences not significant.

^y Significant differences between group 2 and group 3.

^z Significant differences between group 2 and group 3.

Lastly, the analysis looked at the extent to which the investment decisions were influenced by a leading angel and by other investors. This is particularly important in a group context for two reasons (i) the increasing importance of visible site of the angel market (ii) the great majority of the investors in this sample were part of at least one angel group. Influence can be extremely important since it can create problems in terms of decision making. One of these problems is *representativeness heuristics*, where agents recognize a key feature of a category of events and apply it to all examples. Investors could imitate the investment decisions of a business angel with a successful track-record of investments without a deeper analysis of the opportunity. There are significant statistical differences between the second cluster and the third cluster in terms of the degree of influence by others. This suggests that there is a negative relationship between the level of influence and the capability to discriminate the reasons to invest. Taking the second cluster as a reference, it is possible to verify that this is the cluster where the investors were able to better discriminate the reasons for investing, and the decisions were less influenced by others. Hence, it seems suitable to profile the investment decisions in the second group as the ones where the investors were able to perfectly discriminate the reasons to invest. These investments were made by more experienced investors with a smaller propensity to be influenced by others.

Angel investors in the first cluster applied a moderate discriminatory set of reasons for investments. These investors' had the lower scores in terms of investment experience. The most innovative investments were the ones where the angel investors held the lower levels of industry experience. Lastly, the investments in the third cluster were defined by the most non-discriminatory set of factors. These decisions were made by investors with moderate investment experience, investing in projects that were moderately innovative, in which the angels had the highest market knowledge. These effects can be seen in table 5-5.

These results indicated that the angels investing in the second cluster were distinctive compared to the investors in the other two groups of investment decisions. The level of investment experience was the key to these differences. Hence, two direct implications can be drawn from these findings. First, there is a "type" of business angel who is able to provide a better discrimination of the reasons to invest (2nd cluster) - investors with a higher number of investments and with a longer investment history. This seems to indicate a clear effect of the learning process associated with angel investing (Harrison et al., 2015). Hence, all other investor characteristics do not seem to be useful to explain differences in the investment criteria used by business angels. Second, investments in the first and third cluster seemed to be made by relatively similar "types" of angel investor. This can indicate that the same investor can be in more than one group of investments, which denotes variability in terms of the criteria used to invest. Hence, this validates the initial hypothesis that angel investing is a dynamic activity which should be acknowledge by scholars and reflected in terms of research design.

5.4.4 Links with Decision Making Literature

The business angel decision making literature has presented both compensatory and non-compensatory models to explain these choices. One of the most recent contributions (Maxwell et al., 2011) in the decision making literature has claimed that business angels use non-compensatory models in the initial stage of the process, more precisely elimination-by-aspects (Tversky, 1972). This procedure allows investors to reduce the evaluation time by looking for one or two reasons to reject an investment opportunity. The authors argued that as the investment process unfolds business angels stop using elimination-by-aspects, and start using more compensatory models. This research has provided clear evidence of the latter. From the 447 investment decisions 44% had a score below four (neutral) for at least one of the seven criteria. The results suggest the use of a compensatory model where a positive score on one criterion can outweigh a negative score of any other(s). One possible reason for this could be recall bias, since participants were asked to reflect on previous decisions. However, the high percentage of respondents emphasising this tendency diminishes this limitation. This effect is even stronger if the analysis includes neutral evaluations, and 75% of the investments had at least one criterion considered neutral or below. Hence, highlighting the compensatory nature of business angel's decision making can be considered as one of the theoretical contributions of this chapter.

Business angels' investment decisions have been studied in terms of an individual decision. Previous research has identified a case of external influence in the investment process. Business contacts and advisors are particularly important in terms of obtaining new investment opportunities (Brettel, 2003; Lahti, 2014). However, with the change in the nature of angel investing from individual to collective (Mason et al., 2013), it is important

to measure the effect of others (gatekeeper/leading angel, other angels) in the investment decision.

This research showed a negative relationship between the degree of influence and the discriminatory degree of the decision. In other words, the less influence by others (peers and leading investors) on the decision the better is the investor to distinguish between investment criteria. This suggests the existence of herd behaviour. The consequences of this type of behaviour have been studied in detail by financial literature with the different focuses (banks, fund managers, investors and so on). This takes a particular emphasis on the behaviour of traders in the financial market, where the effect of “noise” can influence decisions. From the several models presented to explain herd behaviour, the most well-known are Banerjee (1992; 1993) and Bikhchandani et al. (1992). Cont and Bouchaud (2000) described that “in these models individuals attempt to infer a parameter from noisy observations and decisions of other agents”. A clear analogy can be made to the business angels’ context, in particular, in angel groups. This indicates that collective decision making models should be used in this new framework. Regarding the findings of this study, it seemed to be clear that the rationale behind a decision is weaker the higher the degree of influence. This can have clear repercussions for business angel in terms of value added, returns, learning, portfolio behaviour, and so on. This is the strongest theoretical contribution of this research.

5.5. Discussion and implications

5.5.1 Limitations

Two main limitations of this research can be highlighted. Firstly, the low value of the average Silhouette coefficient can be seen as the major limitation, as it indicates a poor cluster structure. One possible solution is to use the predictor importance to reduce the number of

clustering variables. If this approach was followed, the value of the average Silhouette coefficient could increase to achieve a fair model (Kaufman and Rousseeuw, 2009). However, it is important to emphasize the explorative nature of this study. The aim of this research was to question if investment criteria are a good method of differentiating business angels and their decisions. Hence, the intention of this research was to model the different criteria employed in an investment decision, rather than focus on maximizing the goodness of fit. The trade-offs of this decision are taken into account in the concluding section.

Secondly, this is an empirical driven classification which can be seen as lacking theory development and theoretical concepts. This is one of the few studies (few exceptions: Harrison et al., 2015; Mitteness et al., 2012a; Mitteness et al., 2012b) that acknowledges the effect of the heterogeneity of business angels on their investment decision. Previous decision making research has overlooked the lack of homogeneity in the angel population generalizing the results to the entire population. Hence, it is fundamental to start by understanding how angel investors make different investment decisions. Only after this identification stage is it possible to apply robust theoretical concepts to develop theory. An attempt is made to link the results with the decision making process to enable the identification of future research areas, for example studies on influenced decisions.

5.5.2 Implications for further research

This chapter has explored the extent to which the heterogeneity of business angels impacts their investment decisions. The results have indicated that clustering investment decisions based on the criteria applied by angel investors can be explained by both investor

characteristics and investment attributes. This study has direct implications for future research on two specific dimensions of angel investment.

The first research area is decision making studies. Two points need to be emphasized (i) generalization (ii) model. The great majority of previous studies did not take into account the heterogeneity of business angels. This study showed that the investment criteria vary across the angel population. Hence, scholars need to be careful in how to generalize the outcomes of their research. The model used in this study had seven criteria; results showed that not all of the criteria were important to predict the cluster structure. Hence, one possibility of extending this study is to identify what are the criteria that are more affected by homogeneity of the business angels.

This research also called attention to heterogeneity of business angels across the different stages of the investment process. Duxbury et al., (1997) described the investment process as a multi-stage model. This research found that the heterogeneity of business angels is relevant at the screening stage. Hence, it begs the question if this effect is also relevant across the other stages. This should not be restricted to the investment decision criteria. Scholars need to recognize that although the angel population is heterogeneous, their practices might not be. It is important to study to what extent heterogeneity varies across angel practices. For example, angel research should study heterogeneity in terms of value added activities, exit strategies, valuation models and so on.

The evolution of the angel market has changed the way angel investors' behave. This research has called attention to the influence of others in the investment decision. The results showed a significant effect of the gatekeeper and of other investors in the final investment

decision. Scholars should consider addressing the notion of influence in angel research, possibly applying the theoretical framework of communities of practice (Lave and Wenger, 1991). Wenger (1998) has identified some important consequences of this concept in terms of situated learning. The practices of an angel group are directly linked with the three dimensions acknowledged as foundations of coherence of a community. First, *mutual engagement*. Typically, angel groups have a clear hierarchical structure, which allows members to engage with fellow angels, but also with the gatekeepers. Second, *joint enterprise*. Opportunities are presented to the group members so that they can make a decision as to whether to invest or not. All investors want to find a flawless opportunity, questioning the entrepreneur to identify any weakness in the investment. This procedure helps to build a sense of joint enterprise along the members of the angel group. Lastly, *shared repertoire*. Normally, business angel groups meet regularly⁴⁵. This generates a set of stories, routines and behaviours that are recognized by the group members. Hence, it becomes clear that the level of influence identified in this study can be an outcome of communities of practice. Therefore, future research should set a discussion on communities of practice and test it as a theoretical framework for angel learning.

5.6 Conclusions

Angel research has predominantly focused on the individual, and in this case, on the investor. However, not everyone is the same and the level of variability can present big challenges to researchers seeking to generalize their findings. This can be particularly demanding when modelling the decisions instead of the individuals. This chapter broadens the current knowledge on business angel heterogeneity by evaluating to what extent their investment decisions are homogenous. The results showed a clear link between the level of investment

⁴⁵ Once a month, once every three month, it depends on the deal follow and on the group size.

experience and the way investors assess the criteria. Additionally, it was found that the level of risk undertaken by the investors also has a relationship with the combination of criteria important in an investment decision.

This chapter has two implications for entrepreneurs searching for funds. First, it clearly identifies what are the key factors in terms in an investment decision. The people and product/market are always seen as important factors in a decision. This is much in line with previous research. Second, it showed that the number of reasons justifying a positive funding verdict will vary across groups of investment decisions. Linking this with the investment characteristics, an entrepreneur will know what he/she needs to emphasize during a pitch. The angel community can also benefit, particularly gatekeepers of angel groups. The importance and popularity of angel groups is increasing among the angel population. Hence, managing a group of investors with different decision processes can be extremely difficult.

The results showed that investors with similar levels of investment experience and syndication have analogous investment behaviours. Hence, to minimize possible tensions arising from the existence of different reasons to invest across the members, it might be useful to the gatekeeper to divide the investors into distinctive subgroups. The results also showed a clear relation between the degree of influence of others and how well angel investors discriminate the criterion used. This has provided first evidence that a proportion of the angel market is following others. This is important for both practitioners and policy-makers. Another implication for policy-makers concerns designing incentives for angel investment. If the objective is to originate incentives for funding new innovative firms, it is fundamental that the conditions to access government support are less strict on investment

experience, as the findings indicate that the most innovative opportunities were backed by less experienced business angels.

Chapter 6. Do business angels always use the same criteria?

6.1 Introduction

From the early attitudes, behaviours and characteristics (ABC) studies, scholars have tried to understand the investment decisions of business angels. This is particularly relevant for policy-makers since angel investors are a valuable component of any entrepreneurial ecosystem, especially in a technological context (Chau, 2015). Scholars' efforts have answered different questions related to the investment process. First, how does the process develop? What are the different stages that an entrepreneur needs to go through to raise finance? Second, what are the reasons why business angels invest? What criteria do they employed to evaluate an opportunity and what is the relative importance of those criteria? The answers to these questions have been used in the development of investment readiness programs targeting new entrepreneurs needing external funding (Mason and Harrison, 2001; Mason and Kwok, 2010). However, one question is still to be answered. Does the investment criteria used by business angels' change over the time? In other words, how consistently do angel investors apply the same investment criteria? Is it linked to investor characteristics (investment experience, education and so on) or to the investment attributes (stage, amount invested and so on)?

From the initial studies where Wetzel (1983) compared the investment procedures of formal and informal investors, to more recently where scholars have tried to model the investment process of business angels, there have been different models to explain the investment process. From the initial attempt to use institutional venture capital models (Tyebjee and Bruno, 1984; Fried and Hisrich, 1994) to developing its own models (Duxbury et al., 1997; Haines et al., 2003; Amatucci and Sohl, 2004; Paul et al., 2007; Maxwell et al., 2011) scholars have sought to identify the different stages of angel investing. Typically, all of these

models have a focus on providing a comprehensive description of what are the different steps of an investment opportunity and what characterizes each stage. Small differences can be found across these models (number of stages, name of stages and so on). However, the key focus is the same - investors need to become familiarized with the investment proposal, then they will have to screen the opportunity and finally they will need to negotiate it. Paul and his colleagues (2007) called this process the interactive assessment. Some extensions to the basic model have looked to the post investment stage and exit. This type of model has been particularly useful for the development of stage based research, which in turn, has been useful to identify particularities across stages, and how the process unfolds.

Business angels' investment criteria have also been the object of detailed study. This journey has allowed researchers to refine the number of investment criteria under analysis, but also enabled the conduct of deeper discussions about their importance. The initial studies provided an exhaustive laundry list (Van Osnabrugge, 2000) while the most recent works with a "more parsimonious set of criteria" (Maxwell et al., 2011 p.220). Take, for example the entrepreneur; research has identified particular attributes of the management team/founder such as: competence, trustworthiness, capability, etc. (Harrison et al., 1997; Sudek, 2006; Maxwell et al., 2011; Maxwell and Lévesque, 2014). However, scholars have taken a very static approach to the discussion. This line of research has not considered the possibility of the same investor changing the investing criteria, which would reflect the dynamics of angel investing.

The closest scholars have been to addressing the variability of the investment criteria used by angel investors can be found in two distinctive types of research. The first stream of research has looked at how alterations at the investor level impacted the way decisions are

made. Longitudinal studies are a hard option since the possibility of following the investors over the years is a very challenging task. Only recently a study has used this approach (Carpentier and Suret, 2015); however this research followed a different unit of analysis – the investment. Hence, cross-sectional studies have been taken where scholars assess how different levels of investment experience impacted the criteria used (Feeney et al., 1999; Harrison et al., 2015). The second stream of research has looked at how the investment criteria changes as the process evolves (Mason and Harrison, 1996b; Duxbury et al., 1997; Maxwell et al., 2011; Mitteness et al., 2012b; Brush et al., 2012). The authors' review of the literature on the investment decision making by business angels (Riding et al., 2007 p.339) stressed that the “identification and importance of decision criteria are both dependent on the stage of the investment process and the context.” However, these two streams of research have not questioned if the investment criteria is investor dependent, that is, if an investor always invests for the same reasons.

The aim of this chapter is to develop some understanding of modifications in the investment criteria used by business angels. First, it identifies to what extent business angels change their investment criteria across investment opportunities. Second, by using investment and investors' characteristics, this study assesses what influences the likelihood of an angel investor to change their investment criteria. Lastly, the study has suggested a theoretical framework for modifications in investment criteria of angel investors. Relying on data from the same investor, this study attempts to introduce a concept of change which can be seen as a methodological contribution. Using the cluster analysis suggested in the previous chapter as a reference, change is measured for each participant by assessing if all investments reported belong to the same cluster. This procedure allows the use of a logistic model to assess the prospect of investments from the same angel belonging to different decision patterns. Given the novelty and the exploratory nature of this research there is no attempt to

test a theory. However, the key aim is to be the first to model change in investment criteria in business angel context. The overall fit of the model is maximized, and the “surviving” variables are the ones used to model the concept of change.

6.2 Literature Review

This section has the objective to review angel research on change of investment criteria and provide sufficient evidence of the existence of a gap in literature. The investment decision criteria literature has researched change with two different approaches. On the one hand, scholars have looked at the investor level and assessed if investment experience could predict the criteria used by angel investors. On the other hand, scholars have focused on understanding change of investment criteria as the process evolves. Although these studies have improved our understanding on angel investment decision making, no study has addressed if the investment criteria is investor dependent.

Much of business angel literature takes a very static approach, which in turn does not reflect the dynamics of informal investments (Avdeitchikova et al., 2008). Riding (2005) also called attention to the dynamics of angel investing. The author emphasized that angel investors can invest in different types of opportunities, simultaneously or across their investment experience. The only exception in the literature to the static approach is the work developed by Avdeitchikova (2008) which analyses the different investment roles undertaken by angel investors. The author assumed that the same investor can alter his/her contributions across different projects. The first stream of research completely ignores the underlying assumption of dynamic in Avdeitchikova’s research, while the second is stage driven and not investor focused. Hence, there is a clear need to assess to what extent business angels’ change their investment criteria and what can explain this alteration.

6.2.1 Investor characteristics as a predictor of change in investment criteria

A significant part of business angel literature has debated how business angels decide to invest. Since the initial findings that have emphasized high rejection rates (Riding et al., 1993) scholars have tried to broaden our understanding of angel investing. However, almost nothing is known about how angel investors change their investment criteria. Angel research has identified that decision making criteria is investor dependent, that is, what might be important for one investor can be completely irrelevant for other angel (for example: Landström, 1998) – the effect of the heterogeneity of the angel population. Hence, the challenge has been to comprehend what drives this variety.

The heterogeneity of business angels has led scholars to evaluate how investment experience impacts investment behaviour (Freear et al., 1994; Kelly and Hay, 1996, 2000; Van Osnabrugge, 1998a). To evaluate this relationship these studies have looked at a wide range of variables (stage of the investment, level of technology, amount invested, investor involvement and so on) to understand variability in the investment behaviour. However, the research focus was much broader than simply evaluating the investment criteria. Investment behaviour is a much more extensive concept that includes, for example: investment motivations and investing within a group.

The start of this discussion lays on what makes an individual want to be an angel investor. Freear et al. (1994) identified the differences between active angels, interested potential investors and uninterested potential investors. The study concluded that only small dissimilarities can be found between active angels and interested potential investors. These differences are associated with diversification, amounts to invest and disposition to invest with others. Much of these can be linked with the drivers of syndication (Mason et al., 2013).

Kelly and Hay (1996) examined the differences between solo and syndicated serial angels. The results of this study suggested that syndicated angels seem to draw some benefits from risk sharing of investing with others. This allows them to do more deals at earlier stages.

Van Osnabrugge (1998b) compared serial and non-serial investors. The author suggested that when compared with their counterparts, serial angels tend to put more emphasis on market risk and less on agency risks. Kelly and Hay (2000) evaluate whether business angels with different levels of investment experience used the same sources of deals. The results of this study showed that more experienced angels tended to use 'private' sources for leads rather than 'public'. Other investor characteristics have been used to evaluate the impact of decision making criteria. For example, Mitteness and her colleagues (2012b) found that different types of industry experience had an effect on the way angels appraised an opportunity. On the one hand, the authors identified that industry start-up was a negative moderator between investment criteria and evaluations of funding potential. On the other hand, industry operating experience and industry investing experience were positive moderators. This body of literature clearly shows the impact of investment experience on business angels and their investment behaviour. This suggests that as investor alters their experience their investment behaviour would also change.

The natural flow of the previous discussion led scholars to conduct evaluations of the impact of investment experience on investment criteria. With the objective to get a deeper understanding of informal investors decision making Feeney and her colleagues (1999) identified that angels with different investment experiences gave different weights to specific criteria. The study based on interview data with 115 active angels and 38 occasional investors concluded that these two groups differ in terms of "deal killers" and "deal makers".

When compared with active angels, occasional investors give a bigger weight to 'Good fit' as an essential factor. This type of angel also gave a greater emphasis to the importance of a strong business plan and of a reasonable exit plan. Although it is not considered by the authors as its most important finding, this study showed that angel heterogeneity is also reflected in their investment criteria.

Harrison et al., (2015) presented an analysis of investment criteria under a learning umbrella. The study relied on a sample of 12 business angels who were clustered into three groups according to their investment experience (experienced angels, novice angels and nascent angels). Using a real time methodology, that is, verbal protocol analysis, the authors were able to identify differences in the importance of particular criterion. Experienced angels tended to give precedence to investor fit while less experienced angels emphasized the financial aspect of the opportunity. The business plan was more important for experienced angels' compared to their counterparts. The least experienced group gave more attention to marketing issues than both other groups. Although the small sample size can be pointed to as a major drawback to generalization of the results, this paper has expanded the literature on the links between angel heterogeneity and investment decision making.

The key contribution of these studies is the proof that that business angel heterogeneity is a phenomenon that goes beyond the investor and his characteristics. Investment behaviour is not the same across the angel population neither is the way they evaluate an opportunity. But is it the same for each individual investor? With the aim to identify differences across the angel population and achieve generalizable results, scholars have categorized individuals according to specific characteristics. However, this does not allow for the possibility that individuals change their behaviours and attitudes between investments. The second stream

of research that studied criteria alterations did it as the opportunity moved through the investment process.

6.2.2 Changes in decision making criteria across the investment process

The process by which business angels invest it is well established research topic (Duxbury et al., 1997; Haines et al., 2003; Amatucci and Sohl, 2004; Paul et al., 2007; Maxwell et al., 2011). These studies have helped scholars to understand: the number of stages, the typical procedures, outcomes, decision models used and investment criteria employed. Previous studies have acknowledged that the investment criteria is stage dependent, that is, the importance of some criterion varies as the process develops. This captured some of the dynamics nature of angel investing. Nevertheless, it does not capture the lack of consistency in decision making criteria the same individual. Previously it has been noticed that different investors will evaluate the same opportunity differently (Harrison et al., 2015). Hence, it is necessary to know how consistent are business angels in the criteria they use for investment decision making.

Research that has identified individual criteria variations in the investment process have been divided in two groups. The first category recognizes that the number of reasons given to invest or reject varies across the stages of the investment process. This numerical dimension is particularly relevant for the discussion of the decision models used by angel investors. Mason and Harrison (1996b) highlighted that at the screening stage business angels will be less demanding than in later stages. The authors noticed that at an early stage angels will not reject an opportunity based on one specific deficiency, while the opposite will happen at a later stage. This suggested that, initially, angels use compensatory models, while at a later

stage they have a non-compensatory approach. A recent study using data collected in the show Dragons' Den (Maxwell et al., 2011) has investigated the reasons that angel investors use to reject investment opportunities. The authors concluded that a non-compensatory model, elimination-by-aspects (EBA), has a better fit to explain the decision making at the screening stage. The study concluded that, at a later stage, EBA is not suitable to explain the decision making process, which could suggest the use of compensatory models. Although these studies have contradictory findings, both showed that alterations of the decision models occur across the investment process.

The second type goes a step further and distinguishes what are the specific variations with the criteria used. Similar to the studies in the previous group, Duxbury and her colleagues (1997) identified specific variations in investors' criteria across the investment process. After the initial screening stage some criteria turn out to be more important, while others become less relevant. On the one hand, the importance of the entrepreneur/management team increases significantly. The same effect was verified with financial considerations. On the other hand, product considerations become significantly less relevant. Recent research has questioned these findings.

A USA study (Mitteness et al., 2012b) has analysed 2,234 investment decisions at the screening stage and at the funding stage. The paper identified that angel investors showed more interest for the entrepreneur at the screening stage. This interest decreases at the due diligence stage. The opportunity strengths go on the opposite direction, that is, they become the most significant investment criteria at later stages. A possible justification for these disparities might be found in a 2012 study (Brush et al., 2012). The authors noticed that quantifiable criteria are more important at earlier stages, while in the later stages the focus

turns to less quantifiable, intangible criteria. For example, the size of the top management team was found significant on both the screening stage and at the group presentation but with different effects, positive at an earlier stage and negative at a later stage. Hence, the importance of the criteria will be depend on the measurement used. The authors inferred that as the process unwinds angel investors become more and more stringent and start assessing very specific characteristics of the entrepreneur, such as: the trustworthiness, commitment, persuasiveness and passion. Hence, it is reasonable to assume that these two groups of studies have robust findings, highlighting the dynamics of angel investing while showing that variations occur.

To some extent, the two approaches identified in the literature were able to introduce the concept of change in business angel investment decision. While the first approach looked at variability across different “types” of investors, the second evaluated variations across the investment process. Either approaches failed to evaluate the investment criteria used by the same investor across different opportunities. This can be seen as the major gap that can be found in this body of the literature.

6.3 Data and Methodology

6.3.1 Data sources

The data for this study was collected through an online survey that targeted business angels from the United Kingdom (UK). The period of data collection lasted from April to July 2014 and the recorded data covered three areas (i) investor characteristics (ii) investment features (iii) investment decisions. To enable respondents to report their investment decisions, a list with seven investment criteria was provided. The choice for this design ensured a closed set of investment criteria which enabled comparison between decisions. The initial data set

consisted of a total of 463 investment decisions from 178 investors. For purpose of the analysis, 16 incomplete decisions were excluded. Hence, the final data set consisted of 447 investment decision of 172 investors.

The data were then classified using a categorization scheme suggested in chapter 5. This procedure resulted in three clusters with the following weights 26.9%, 44.7% and 28.4%. Table 1 depicts the number of different investment criteria, clustered by investors; 54% of the investors (79) always use the same investment criteria when making decisions. Each participant was asked to report on the latest three investment decisions. Hence, each respondent would have a maximum of three pairwise comparisons and a minimum of zero⁴⁶. This resulted in 405 pairs of decisions made by 145 angels' investors (15 with just one pair and 130 with three). A total of 27 investment decisions were eliminated from the analysis because they were the only information provided by that specific respondent. The data had no temporal dimension, that is, participants were not asked to order the investment decisions chronologically. Hence, it was possible to evaluate all pairwise combinations that would not repeat observations. Lastly, 71 observations were eliminated due to missing values. Table 6-1 provides a detailed explanation of the number of changes of investment criteria found per investor.

⁴⁶ Three investment decisions would allow three comparisons, two would correspond to one evaluation and one response would not permit to assess change.

Table 6-1: Investment decisions categorization

			n	%
Business angels that had investment decisions in the same cluster			79	54%
Business angels with different	66	1 change	3	2%
		2 two changes	56	39%
		3 changes	7	5%
Total number of business angels			145	100%

From the 79 investors who reported investment decisions in the same cluster, 14 only provided information on two deals while 65 recalled three opportunities. This has two clear implications. First, the number of reported opportunities seemed to have an impact on change, which is expected since more data will allow more comparisons⁴⁷. Second, the angel market might be more dynamic than was initially expected. There is a limitation on the amount of information scholars can request from the angel population. Hence, it is possible that by not having the complete investment history of each participants that some variability is lost.

6.3.2 Construct of change

Scholars have identified that angel research needs to reflect the dynamics of the investment activity (Riding, 2005; Avdeitchikova, 2008). Hence, new studies need to challenge the assumptions that reduce variability of investor behaviour. Following a similar approach to Avdeitchikova work (2008), this study verified if the investment decision reported by each investor followed the same pattern. Using a typology ruling on combination of decision making criteria for the fifth chapter, this research verified if investment decisions made by the same investor belong to the same cluster. In other words, a business angel will change

⁴⁷ With three investment decisions there are three opportunities for a change occurring, a ratio of 1 to 1. While with two investment decisions there is only one opportunity for a change occurring, a ratio of 2 to 1.

the criteria if the two decision do not belong to the same cluster. The clustering rule suggested in the previous chapter identified that investment decisions could be classified into three clusters. The main difference between the three groups was how much the investors were able to discriminate the seven investment criteria. The variation ranged from three levels of importance (second cluster) to a single level of significance. Hence, when comparing two investment decisions made by the same investor, the construct of change is defined as:

$$\begin{cases} x = 0 & \text{if two investment decisions are from the same cluster membership} \\ x = 1 & \text{Otherwise} \end{cases}$$

This is a simple way to measure change since it evaluates the variations in an objective index (cluster membership) without forcing any subjective judgment of the researcher. The construct of change used in this study provided a clear image of the dynamics of business angels' investment activity. Approximately, half of the sample (46%) of investment decisions used different weightings of investment criteria. The variability found in this study is extremely similar to the finding of Avdeitchikova (2008) where out of 213 investment situations only 91 changes occurred (43%). Hence, this seems to indicate that the way change is measured in this study is valid and supported by previous research. This result reinforces the claims made by Avdeitchikova (2008) on the dynamics of angel investing.

The preceding analysis focused on the investor. This is particularly relevant because of the unequal weight of cases provided by respondents. However, if the focus is the pairwise comparison of investment decisions then the results are slightly different. From the 405 pairwise decisions 269 belonged to the same group of investment decisions, while in 136 there was a change in cluster membership. When compared with the investor reference, this represented a smaller weight for change. Only 34% of the pairwise decisions did not belong

to the same group. Hence, it is safe to say that no matter how change is assessed, the dynamics of angel investing exists and needs to be studied.

6.3.3 Variables used in the study

The variables used in the model tried to reflect both the investor and the investment dimension. In terms of investor characteristics, the study included the typical demographic issues such as gender, age, education, entrepreneurial experience and investment experience. Variables on syndication were also included to reflect the importance that groups have in the angel market (Mason et al., 2013). These variables cover a wide spectrum of areas, such as length of time in a group, number of groups and motivations to syndicate. This enabled an assessment of the different components of syndication that can help to explain variations in the investment criteria used. Mason and Botelho (2014) identified several advantages and disadvantages of being part of an angel group, which shows that the views on angel syndication are not unanimous. Hence, it is reasonable to evaluate to what extent syndication impacts investment criteria and what components of syndication are significant in contributing to investment decision variability.

The data in this study compares pairwise decisions made by the same investor. Hence, the variables under discussion did not require any transformation since only decisions by the same investor were assessed. Table 6-2 provides a deeper description of the variables used in the model.

Table 6-2: Investor characteristics.

Variable		Description
Gender	(1=Male, 2=Female)	The members of one or other sex
Age	(1=under 35, 2=35 to 44, 3=45 to 54, 4=55 to 64, 5=65 and above)	The length of time that a person has existed
Education	(1=Yes, 2=No)	If the investor had an university degree
Professional	(1=Yes, 2=No)	If the investor had a professional degree
MB	(1=Yes, 2=No)	If the investor has be involved in a management buyout
SME	(1=Yes, 2=No)	If the investor has be a CEO of a SME
Board	(1=Yes, 2=No)	If the investor has hold a position in a medium to large business
First_Inv	Numerical variable	Years investing
N_Inv	(1 = 0, 2 = 1 to 3, 3 = 4 to 6, 4 = 7 to 10, 5 = More than 10)	Number of investments
Syndicated	(1=Yes, 2=No)	If the investor belongs to an angel group
When_syn	Numerical variable	Years in a syndicate
YTI	(0 = group, 1 = individually)	Angel origin (visible, invisible)
Investing with Others	(7-point Likert Scale/ Strongly disagree - Strongly agree)	Wiliness to invest with others
DE	(0 = just one, 1 = if both experiences)	Group experience and individual experience
N_Synd	(1 = 1 , 2 = 2, 3 = 3, 4 = 4 or more)	Number of angel group
Crowdfunding	(1=Yes, 2=No)	If the investor has invested through crowdfunding platforms

Some categorical variables from the list above were substituted with dummy variables. The objective was to gain further understanding of the relationship between dependent and independent variables. Exploratory analysis helped to identify which variables were statistically significant, and this in turn led to the creation of dummy variables. For example, from the initial categorical variable age, four dummy variables were created for each of the four categories of the original variable. The new variables created can be seen in Appendix 9.

During the survey, participants had reported features of the investments they had funded, and some additional motivations for the investment. These attributes covered a wide range of topics: amount invested, stage of investment, due diligence sources, level of innovation,

industry experience, diversification, intellectual property (IP) protection, syndicated investment, level of readiness of the product/service. The aim of using a wide range of topics was to capture what are the key aspects behind the modification of investment pattern. The investment variables had to be modified. As it was previously mentioned, the study analysed pairwise decisions. Hence, each combination of two observations could have different levels of investment features. Therefore, each investment feature variable was transformed and new dichotomy variables were created. These new variables measured if a change of the investment feature had happened or not. It followed a similar approach of the dependent variable (change in cluster membership). In some particular cases⁴⁸, an alternative to creating binary variables would be to generate categorical variables that measured if the variation was positive or negative. However, the lack of research about change in investment criteria justified this choice for a more conservative approach. Hence, the choice was just to evaluate if a change in the investment features would impact the probability of a change in investment criteria happening. Table 6-3 provides a description of the new variables created.

Table 6-3: Change variables

	Variable	Description
CAI	(0=No change, 1=change)	Change on the amount invested
CS	(0=No change, 1=change)	Change in Stage of investment
CNDD	(0=No change, 1=change)	Change in the number of Due Diligence sources
CI	(0=No change, 1=change)	Change in the level of Innovation
CIE	(0=No change, 1=change)	Change in the level of Industry Experience
CD	(0=No change, 1=change)	Change in the Diversification rational
CSY	(0=No change, 1=change)	Change in the level of Syndicated investment
CIPP	(0=No change, 1=change)	Change in the level of IP Protection
CRPS	(0=No change, 1=change)	Change in the level of Product/Service Readiness

⁴⁸ For example: amount invested

The list of variables covers a wide range of topics with several dimensions of the investor and of the investment being studied. Hence, by not focusing on a single driver for change in the investment criteria, this study is trying to include both sources of potential explanations. This procedure follows the tradition of exploratory research.

6.3.4. Choice of the regression and regression method

A logit model was developed to explain what can influence the probability of an angel investor changing their investment criteria. Logistic regression is used when the dependent variable is categorical. Logistic regression is regularly used when there are only two categories of dependent variable. This is exactly the case in this research. The investment decisions were classified into three clusters, and the dependent variable was defined by fixing the respondent and looking at their investment decisions. Another reason to use logistic regression is the fact that the independent variables are a mix of continuous and categorical variables.

The two main contributions of the logistic model are:

1. Since the logistic regression calculates the probability of changing occurring, it enabled researchers to predict group membership;
2. The model highlights the associations and strengths between variables.

All the assumptions are satisfied and the model used as predictors both investor characteristics and investment attributes. The set of assumptions satisfied was:

- Not a linear relation between Dependent Variable and Independent Variable
- Dependent variable must be a dichotomy
- No requirement for Independent variable (normality, etc.)
- The categories were mutually exclusive and exhaustive
- A minimum of 50 cases per predictor

As it was previously mentioned, this study has no preceding research. Hence, this is an exploratory research where is not hypothesis to be tested. Additionally, the aim of the study is not to test a specific theory (Agresti and Finlay, 1986; Menard, 1995). This method can be extremely valuable to uncover relationships that have not yet been under scrutiny. The findings can lead the researcher to raise questions about the rationality of some relationships. The goal of this research was to set a new discussion and to highlight that variability exists within the same individual. Hence, scholars should acknowledge individual variation when addressing the dynamics of angel investing. As a consequence, the choice of regression method was stepwise backward Likelihood Ratio method (probability for stepwise entry 0.05 and removal 0.10).

The backward method is preferable to forward method because it has a lower chance of making a type II error (Field, 2009). The initial model of this method included all of the predictors. Then tests were run to remove the variables that have the smallest effect on how well the model fitted the observed data. This iterative process started by removing the predictor with the least impact, and stopped when it minimized the likelihood ratio. This method is particularly useful when a small number of predictors are used. The choice of a Likelihood Ratio method was based on the objective of fitting the overall model to the observed data, which is considered to be the criterion least prone to error (Field, 2009). This choice can also be justified by the lack of research on criteria change. Hence, the method is suited for the exploratory research of criteria change. Osborne (2014) defended the use of this method as an exploratory technique.

This method does not come without criticism. It is extremely dependent on statistical significance, which can be seen as putting the important decisions on the software instead

on the researcher. Additionally, this approach can generate unstable models that are hard to replicate in other studies (Pett, 1997). Osborne (2014) emphasized that one of the features of this approach is the possibility of reaching unexpected results, which can be extremely useful to develop an understanding of a specific phenomenon since it can identify relations that otherwise would not be identified. One of the possible applications suggested by Osborne (2014) is in data mining. This is consistent with the aim of this study of finding relationships that have not previously been discovered between investment/investor characteristics and changes in investment criteria. All analyses were performed using SPSS v.22 (IBM Corp, 2013). Three levels of individual significance were used 0.01, 0.05 and 0.10. This procedure is in line with Labovitz (2006) suggestion for exploratory research.

6.4 Analysis and empirical results

6.4.1 Overview

As it was previously mentioned, the model was run using a stepwise backward method with the Likelihood Ratio as criteria. After the elimination of the missing values, four variables were automatically excluded from the model for being constants (synd1, Syndicated, INV1 and DE). This indicated that, in this study, all participants were: (i) in an angel group for a longer period than a year; (ii) investing for more than one year; (iii) had both individual and collective investment experience. The iterative process of elimination had 20 steps and, ultimately, resulted in the elimination of 19 variables. Appendix 10 provides additional information on each of the 20 elimination steps.

The last interaction is taken as the reference model. The backward stepwise process eliminated both investor characteristics and investment features. There is a clear propensity for the variables that measured investor characteristics not to be removed from the model, particularly, the ones associated with investment experience. Half of the variables in the final

model (5) measured investment experience. Out of the initial nine variables that measured changes in the investment features, only two were not eliminated, which represents just 22% of the total number of variables linked with investment features.

Table 6-4: Logistic regression outcome

Variable	B(SE)	95% CI for Odds Ratio		
		Lower	Odds Ratio	Upper
CNDD	-1.1(0.31)***	0.181	0.332	0.609
CIE	-0.48(0.28)*	0.354	0.618	1.078
CIPP	-0.73(0.3)**	0.269	0.484	0.869
Age1	-1.53(0.82)*	0.043	0.217	1.083
Age3	1.15(0.37)***	1.530	3.161	6.529
Age4	-1.05(0.37)***	0.169	0.350	0.722
INV10	-1.61(0.49)***	0.077	0.199	0.518
NINV1	-1.63(0.61)***	0.060	0.197	0.645
Synd10	-1.27(0.54)***	0.097	0.282	0.819
YTI	1.84(0.4)***	2.903	6.313	13.727
Education	0.6(0.35)*	0.924	1.823	3.600
When_Syn	0.18(0.05)***	1.075	1.197	1.332
Invest_Others	***			
Invest_Others(1)	-0.85(0.61)	0.128	0.425	1.418
Invest_Others(2)	0.004(0.53)	0.353	1.004	2.857
Invest_Others(3)	-1.81(0.72)**	0.040	0.164	0.676
Invest_Others(4)	0.12(0.53)	0.402	1.124	3.149
Invest_Others(5)	-1.12(0.52)**	0.117	0.327	0.913
Invest_Others(6)	-1.2(0.51)**	0.110	0.301	0.820
Constant	-359.15(109.46)***		0.000	

Note: 0.241 (Homes and Lemeshow), 0.216 (Cox and Snell), 0.299 (Nagelkerke). Model $\chi^2 = 10.360$
 *** significant at $p < 0.01$; ** significant at $p < 0.05$ * significant at $p < 0.10$

The classification table enables a comparison of the null model (block 0), only with the intercept, and the last step of the backwards process. The final model correctly classified the outcome for 74.3% of the cases. This represented an improvement of 8.6% percentage points. Through the iterative process, the prediction accuracy ranged from 73.7% to 76.1%. Although it is not the model that maximized the predictive power, the increase of 8.6 percentage points can be seen as a positive outcome. The suggested model is able to predict correctly 46.4% of the cases where a change occurred and 88.8% of the situations where the criteria were the same. Table 6-4 provides the outcome of the logistic regression. Although the criterion used was to minimize the Likelihood Ratio, all the variables that survived the elimination process are statistically significant.

The variables in the model represented both angel characteristics and investment features. The results are slightly surprising since investment features seemed to explain less of the change in investment criteria. Only three variables associated with the investment features were included in the model. Changes in the level of IP protection, the number of due diligence sources and industry experience are able to explain the probability of an investor modifying his/her investment criteria. On the investor side, the variables of the suggested model can be divided in two groups. The first block has a strong link with the experience of the investor. Variables measuring age, education, years investing and number of investments are included in the model while the second block of variables can be associated with syndication. Motivation to invest with others when joining an angel group, angel origin and years in a syndicate are the variables included in this latter group. The next section presents the analysis of the odds ratio to verify how plausible the solution presented is. Figure 6-1 provides a representation of the different groups of variables.

6.4.2 Interpretation of the odds ratio

In the investment features the reference class chosen was not altered in the pairwise comparison. That is, the analysis of the odds ratios took into account the same level of investment attributes between the two deals. The odds of a change in the investment criteria occurring when the number of due diligence sources remained the same are about 0.332 smaller than when they differ. A similar result is found for the industry experience of the angel investor. The odds of a change in the investment criteria occurring when the industry experience is the same are about 0.618 smaller than when differences took place. Lastly, the odds of a change in the investment criteria when the level of IP protection did not vary are about 0.484 times smaller than when a variation occurred. For these variables, the three odds ratio indicated that variability between projects increased the odds of a change in the investment criteria. Hence, the likelihood of an angel investor changing the weights of the investment criteria increases if projects have different levels of IP protection, differ in years of industry experience and use unequal numbers of sources of due diligence..

Investments where the business angel used different numbers of due diligence sources were most likely to be accepted for different reasons. This can be associated with the type of issue being researched. An investor might have to use a high number of sources to evaluate a nascent entrepreneur, while the opposite might occur if the market is being investigated. A similar result was found for the level of IP protection. This can be explained with the strong link IP protection has with technology and with the product/market. Hence, it is expected that projects with IP protection might lead the business angel to invest due to product/market⁴⁹. The last reason was the industry experience of the investor. Again, investments in different industries increased the likelihood of a change in the investment

⁴⁹ A positive and significant correlation was found between IP protection and the product/market score at 0.01

criteria occurring. This finding can be related to the importance of specific criterion, such as: product/market or even the business plan. It would be expected that investors with a long experience in a specific industry would put less emphasis on the business plan since most of the information would be known⁵⁰.

Regarding investor characteristics, as it was previously mentioned, the ten variables included in the model can be divided into two groups. The first group of variables that survived the elimination process and were statistically significant are associated with experience. Four variables are included in this group, three associated to age and one to education. Interpreting the odds ratio of the first variable associated with age (Age1), it was possible to conclude that the odds of a change in the investment criteria for investors younger than 35 years are about 0.217 smaller than for their counterparts. Analysing the next variable (Age3), it was possible to state that the odds of a change in the investment criteria for investors younger than 54 were 3.161 greater than investors older than that age. From the last variable that measured age (age4), it was possible to acknowledge that the odds of a business angel older than 65 changing his/her investment criteria were 2.859 greater than those investors younger than 65. These last two effects could be associated with the learning process, older investors have experienced a wider range of situations which enable them to be more “flexible” regarding what “works for them”.

The three variables measuring age are statistically significant and provided an interesting mapping of age in terms of the likelihood of change. Older investors were more likely to change their investment criteria. Two reasons can justify this effect. First, typically, younger

⁵⁰ A negative and significant correlation was found between industry experience and the business plan score at 0.05

investors will have made fewer investments⁵¹. Hence, there are fewer opportunities to identify a change in investment criteria. Second, younger investors will have learned less from their investment experience, which can result in a smaller propensity to change their investment approach. These arguments can also be used for the older investors, but with opposite effects. An interesting effect was that investors younger than 54 had greater odds of a change in the investment criteria than their older counterparts. This result is slightly less intuitive. One possible justification for it could be associated with investment returns. Investors might find a specific “type” of investment that provided satisfactory returns, and which would make them less inclined to change their approach.

The last variable to be included in the personal experience group measured education, more precisely, if the angel investor had a university degree. The odds of a business angel with a university degree changing in the investment criteria were 1.823 higher than those who did not have a degree. This result seems very intuitive and can be associated with the intellectual development of achieving a university degree (Król and Dziechciarz-Duda, 2013). Investors with a university degree might have an additional set of skills compared to those who did not have a degree. This finding might not be particularly important since the great majority (75%) of angel investors have a university degree (Ramadi, 2009)⁵². However, it is important to identify which investors are more likely to change their investment criteria.

The following set of variables were also grouped under experience. However, contrarily to the previous subset measuring personal experience, this group is associated with investment experience. The first variable measured if the investor had made more than three

⁵¹ From the five age groups, the class with the smallest number of investments was the under 35 group.

⁵² A similar result was found for this sample – 76% of the investors had a university degree.

investments. The odds of an investor who made three or less investments changing their investment criteria were 0.197 smaller than those business angels who had made four or more investments. This seems to indicate that if an investor has made four or more investments, the likelihood of a change in the investment criteria is greater. This is a very intuitive result, and it reinforces the findings of previous research on the effect of investment experience in the weights given to specific criteria (Feeney et al., 1999). The other variable that was labelled under investment experience measured if an investor had been investing for more than ten years. The model suggested that the odds of an investor who had less than ten years of investment experience, changing the investment criteria were 0.199 smaller than those of an angel who has ten years or more of investing experience. This finding is consistent with the previous result on number of investments. These two odds ratios therefore provide clear evidence that the level of investment experience impacts the likelihood of different criteria weights being given across investment opportunities. This was initially identified by Feeney et al. (1999). The novelty of these findings is in providing a threshold level for both the number of investments and for the years investing.

The four remaining variables that survived the elimination process were labelled under the subgroup Syndication. Sequentially, the variables were organized as follows: three under the label of Time and one under Motivations. Within the first sub subgroup (Time) is a variable that evaluated the origin of angel investing (YTI). This variable assessed whether an investor started on their own or with an angel group. The odds of a change of the investment criteria were about 6.313 greater for investors that started investing with an angel group than those that made the initial investment on their own. Two reasons can explain this result. First, one of the benefits of being in an angel group is an increase in the quality and quantity of the deal flow (Mason and Botelho, 2014). For this reason, angels in groups will be exposed to a wider number of opportunities, which can result in a greater likelihood of changing the

weight of the investment criteria. Second, solo angels have different investment approaches to syndicated angels (Kelly and Hay, 1996; Van Osnabrugge, 2000). Kelly and Hay (1996) show that solo angels have closer relationships with the entrepreneurs when compared with syndicated angels. This could lead to solo angels having a specific set of criteria that syndicated angels do not have. Therefore, syndicated angels would be flexible while making investment decisions.

The second variable labelled under Syndication time is *Synd10*. This variable measured if an investor has been part of a group for more than ten years. The results indicated that the odds of an investor changing their investment criteria that has been part of an angel group for less than ten years were 0.282 smaller than those who have been part of one for ten or more years. An equivalent result can be found with the last variable in this group - the number of years in a syndicate (*When_synd*). An additional year as a member of an angel group increased the odds a change of the investment criteria. Both results denoted the positive effect of being in an angel group on alterations in the investment criteria. The first finding emphasized that investors with ten or more years investing in a group were more likely to change their investment criteria. The second finding identified that the longer an investor stays in an angel group the more likely a change of investing criteria will become.

Previous research has identified the learning advantage of being part of an angel group (San José et al., 2005). Hence, one of the learning outcomes could be flexibility in terms of the weights of the investment criteria. This could be the result of the pool of experience and knowledge that exists in an angel group (Mason and Botelho, 2014). Members of angel groups share their experience and knowledge for the common benefit. Additionally, being part of an angel group allows business angels to see a greater variety of deals (Mason et al.,

2013) which would make investor to have to keep adjusting their investment criteria. Hence, one would expect that this two effects would result in a greater propensity for changing the investment criteria used across different investment opportunities.

The last subgroup, Syndication motivations, has only one variable – Invest_Others. Participants were asked to rank the statement “I only became a business angel because of the opportunity to invest with others” in a Likert scale (1- strongly disagree to 7 – strongly agree). The objective was to capture if the motivation to be a business angel was associated with joining a group and consequently, if this motivation would have any impact on the likelihood of a change in the investment criteria occurring. Before stating the interpretation of the odds ratio for this variable, it is important to highlight that not all categories were statistically significant. Hence, the interpretation will only be made for the three cases where statistical significance was found.

The odds of a change in the investment criteria were about 0.301 times smaller for angels that agreed with the phrase (6) compared with investors that strongly agreed with it (7). A similar interpretation can be made for investors that somewhat agreed with the statement (5). In this case, the odds of an investor who ranked the sentence as five, changing the investment criteria were about 0.327 times smaller than those that strongly agreed with it (7). These two results indicated that the propensity of changing the investment criteria is associated with joining a group to become a business angel. This is further supported by the odds ratio for the somewhat disagree ranks. That is, the odds of an angel who somewhat disagreed with the statement, changing their investment criteria were about 0.164 smaller than those of an investor who strongly agreed with it (7). These results presented clear evidence that joining an angel group has a significant effect on the likelihood of changing the investment criteria.

The results are extremely intuitive both for investment features and investor characteristics. All reported effects occur after controlling for the other predictors. However, some of the variables excluded from the model can be seen as a surprise, e.g. amount invested or stage of investment. The findings emphasized the impact of three areas in the likelihood of a change in the investment criteria occurring. First is an area related to the investment features. This can be seen as the specificities of the investment opportunity and the impact on the weight given to the investment criteria. Second is an area associated with the investor experience. This area can be seen as the individual effect on change. Decisions are personal and have a strong link with the system of beliefs of an individual. Hence, this can be considered as an expected result. The last area is associated with investing within an angel group. This could be seen as the group effect on change, in particular, to the effect of others on the way individuals decides on their investments.

The first area that is associated with the investment features can be seen as the dimension that is project specific. The results are slightly surprising, particularly with respect to the variables excluded from the model. Variables that measured the stage of investment or the amount invested were not included in the model. On the one hand, this can be seen as very intuitive – business angels typically invest in an early stage. Regarding the amounts invested, it is known that angel investors only invest a small portion of their wealth (Gaston, 1989). This would result in a lack of variation, which would lead to a small capability to explain the variations in the investment criteria. On the other hand, it would be acceptable to assume that investing within an angel group would increase the variability of the investment approach. Nonetheless, this area represents the specific associations to the investment opportunity.

The second area is associated with individual experiences. This dimension is strongly linked with the experience as an angel investor and prior to the first investment. It can be seen as the individual characteristics that make an investor more open to change their investment criteria. An alternative way to read this finding is to identify which investor characteristics will make his/her investment approach more flexible. On the one side, there is the impact of personal experience with age and education. On the other side, there is the effect of investment experience with the number of investments and years investing. The significance of this area is noteworthy, since these variables measured investors' investment and personal experience, which can be associated with a learning process. In particular, the investment experience results have indicated that from a point onwards, angel investors are more likely to change their investment criteria, which in turn, can be seen as an outcome of the learning process.

The last area represents the collective nature of angel investing. This dimension captures the motivations and the length of time as a member of an angel group. Additionally, the investment experience can also be included in the group area of the model. The rationale for this decision rests on the increased importance of the visible side of the angel market⁵³. Investing in groups can have a positive effect on the number of projects an investor has in the portfolio. This area can be strongly associated with learning with others and with improved deal flow. As it was previously mentioned, angel groups are very important instruments for nascent and novice angels willing to learn from more experienced investors and see different opportunities.

⁵³All the participants in this study were part of an angel group.

6.4.3 Overall fit of the model

This subsection will report the statistics that were calculated to assess (i) the goodness of fit of the model (ii) how useful the independent variables are in predicting the dependent variable (effect size) (iii) how well the model was able to discriminate between the two outcomes of the dependent variable. In terms of goodness of fit, chi square test and Hosmer and Lemeshow test were calculated. To evaluate effect size, two R^2 were calculated: Cox and Snell and the Nagelkerke R^2 . The last procedure was to plot a receiver operating characteristic curve.

The first test completed was the chi-square test. At each step this test evaluates the difference between the -2 Log Likelihood of the previous model and the next step with one less variable. The model chi square has 13 degrees of freedom, a value of 79.736 and a probability of $p < 0.000$. This has indicated that the model is statistically significant because the p-value is less than .05 or .01. Hence, it is possible to conclude that the final model has improved significantly over the previous model. Appendix 11 gives further details.

The following calculation conducted was the Hosmer and Lemeshow test of the goodness of fit. In this particular case, the final model has a good fit to the data as $p = 0.241 (> .05)$. Hence, we fail to reject the null hypothesis that there is no difference between the model predicted values and the observed values. This has indicated that the numbers of changes of investment criteria do not differ from those predicted by the model. This denotes that the overall fit of the model is good. It is important to notice that this test is extremely dependent on the sample size. Hence, this result cannot be interpreted in isolation from the size of the sample.

The second set of tests evaluated the effect size. Contrary to the linear regression, the logistic regression does not have an equivalent to the coefficient of determination R^2 . This study has used two pseudo- R^2 statistics to evaluate the effect size. The first, the Cox and Snell's R^2 , calculated the proportion of unexplained variance that is reduced when new variables are added to the model, and it ranges from zero to less than one. The value obtained was of 0.216. The Nagelkerke R^2 is a transformation of the Cox and Snell's R^2 with the advantage that values obtain range from 0 to 1. This model achieved a value of 0.299. These statistics were reported on according to Hoetker (2005) recommendations.

These measures are not easy to be interpreted and have several limitations (Maddala and Lahiri, 1992). The analysis of values obtained for the pseudo R^2 should not be done on their own, that is, these measures are specific to the model. Hence, to achieve a better understanding of these values, one should compare them with other pseudo R^2 of the same class, keeping the same dataset and trying to model the same dependent variable. While comparing models, the higher pseudo R^2 the better – it implies better ability to predict outcomes.

The stepwise procedure enabled an easy comparison between models. The final model did not maximize the pseudo R^2 . It is important to emphasize that the criteria used did not maximize the pseudo R^2 but minimized the likelihood ratio. Hence, by excluding variables from the model, one expected result would be a decrease in the pseudo R^2 value. Osborne (2014, page 258) suggested that “depending on your goal, it might be more important to have good classification than strong R^2 analogues”. Appendix 12 provides additional details of the pseudo R^2 result for each step of the estimation.

The discrimination of the final model was also evaluated. The analysis allowed the evaluation of how well the model was able to distinguish investment decisions with the same criteria from pairwise comparisons that belong to the same cluster membership. The accuracy of the model is measured by the area under the receiver operating characteristic (AUROC) curve. The value of the AUROC curve ranges from 1 (perfect discrimination) to 0.5 (worthless test). The area under the curve of the suggested model was 0.673 with a 95% confidence interval (C.I.) of 0.6085 to 0.738. This suggested a poor model with the 95% C.I. indicating a model situated between fair and poor. This can be seen as a reasonable result given the exploratory nature of this study. This information is shown in Appendix 13.

To summarize, the tests performed have addressed different considerations. The model selected using the stepwise backward Likelihood Ratio achieved satisfactory results in terms of the goodness of fit tests. Both tests presented did not raise any apprehension. In terms of effect size, the other model evaluation did not maximize the pseudo R^2 . However, part of this is a result of variable reduction. Lastly, with 95% of confidence the model achieved a classification between poor and fair in terms of discrimination. Given the exploratory nature of this research, it is important to emphasize that these results should not be a cause for concern.

6.5. Discussion and implications

6.5.1 Limitations

Angel research is constrained by the lack of datasets which, in turn, limits the depth of the analysis conducted. Data collection can generate several problems that have been widely documented by scholars. In what respect these issues are a major limitation of this research

regards the fact that all investments were made by members of angel groups. This could be considered as a potential bias since it would not reflect the visible and the invisible markets. However, it is important to acknowledge that there is a high level of complementarity between both markets. Typically, business angels operate simultaneously in the visible and the invisible market⁵⁴. This can minimize the impact of having a sample that comprises only participants that belong to angel groups.

The previous limitation can generate a second issue. The importance of syndication to the likelihood of a change in investment criteria might be seen to some extent as an artificial result, since the sample consists only of investors that are members of angel groups. As it was previously mentioned, 73% of the investments reported were conducted through angel groups. Although the variable measuring variations in the level of syndication was excluded from the model, a possible solution would be to have investors that would not be involved with a group. However, there is no clear notion of how both markets (visible and invisible) overlap.

A slightly less significant limitation is related to the amount of information collected. The results showed that when more information was reported by participants, a higher proportion of investors changing the investment criteria was found. Hence, future studies should try to focus on the entire investment history, rather than just a limited number of deals or period of time. This would enable scholars to fully assess to what extent business angels change their investment decision.

⁵⁴ From the initial data set 27% of the investment decisions reported were made in the invisible market.

The exploratory nature of the research can also be seen as a limitation. The use of a criterion (stepwise backward LR) that is strongly computer dependent can be criticized. However, the advantages and disadvantages of this procedure were evaluated versus the alternative model. The lack of previous research on changes in investment criteria of business angels did not help in the definition of the variables to include, neither in which would be the best criteria to use. Two additional limitations can be drawn from the choice of the criteria used. The first is the surprise of the elimination of some investment feature variables. The second is that the results for the Pseudo R^2 can be considered as low which can be seen as a drawback.

Only 38% (three out of eight) of the initial variables that measured investment features were included in the model. Some of the eliminations could be seen as an unexpected result, in particular, in terms of the variables that measured the amount invested and the stage of the investment. Previous research has identified that business angels typically invest in a wide range of stages and different amounts. Hence, one would suppose that these variables would be included in the model. The exclusion of such variables may be seen as a limitation of this study.

As it was previously mentioned, the results for the Pseudo R^2 are low. Although the importance of such indicators can be questioned, the reality is that higher results would be considered better. However, depending on the goal of the research, these indicators may not be fundamental. For example, achieving a good classification might be more relevant than a higher R^2 . Osborne (2014) suggested that one alternative is to report the -2 log likelihoods and chi-square change statistics. In terms of these indicators the results are satisfactory and would not generate any apprehension.

This research opened a new area of discussion in terms of decision making criteria of business angels. Consequently, it has presented a wider set of limitations when compared with other studies in extensively examined fields. As a result of the exploratory nature of this study, the likelihood of identifying limitations is higher. Although the limitations recognized do not represent significant concern, they should be acknowledged and the results should be viewed with caution. Future research should acknowledge the shortcomings of this study and try to improve them.

6.5.2 Implications for future research

This chapter has explored the extent to which business angels change their investment criteria and what influences the likelihood of this change occurring. The results have indicated that angel investing is a dynamic activity no matter what is the measurement used (investor or investment). The likelihood of a change of investment criteria is both dependent on investor characteristics and investment features. By being the first study on changes in investment criteria, this study aimed to motivate future discussion on this topic. Four direct implications can be emphasized.

First, this research has presented clear evidence that angel investing is not a constant practice. Riding (2005) was the first to call attention to the dynamic nature of angel investing. Avdeitchikova (2008) substantiated this point by demonstrating that business angels change investment roles. The results of this study have demonstrated that future research needs to take caution in the categorizations used. Previous research has heavily relied on the investor characteristics as control variables to understand particularities of business angels. However, if investors change their behaviour, then these studies are not capturing variations within the

same “class” of angels. Hence, one of the implications of this study for future research concerns the unit of analysis. It has become clear that scholars should focus their attention on the investment rather than on the investor. This is particularly important for typology studies where the great majority of research has been on the investor characteristics.

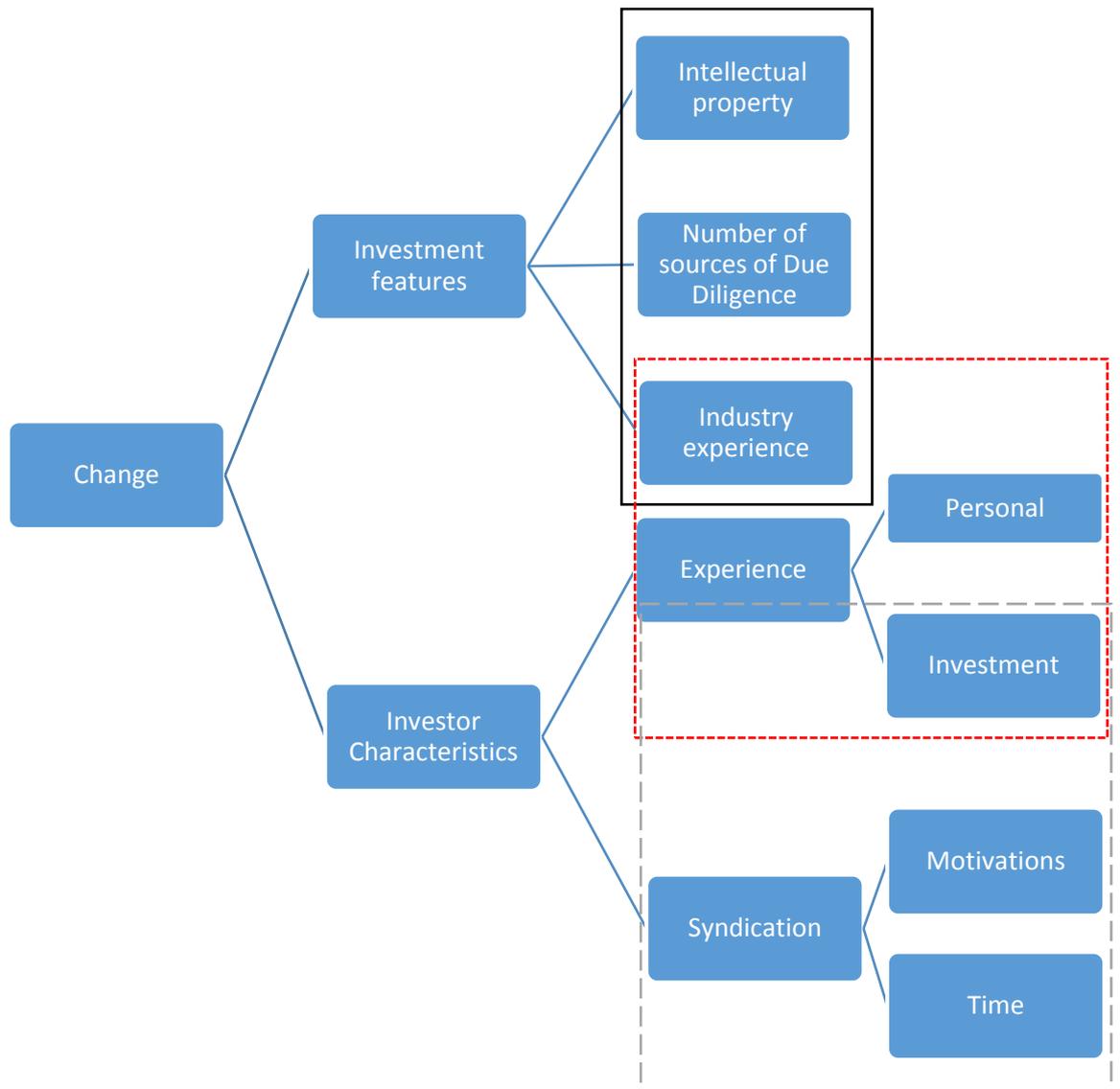
Second, the likelihood of a change occurring is significantly influenced by the investment experience. This result can be separated in two different components. The first is an individual component and it is mainly linked with the length of the investment experience and with the number of opportunities invested, while the second element is associated with the interaction with an angel group. On this topic, the stronger effect is related with the time investing with a group. While the effect of the motivations to invest with others is not conclusive, this raises important implications on how business angels make decisions. It has become clear from the results that there is a learning ingredient involved in angel investing. Harrison et al., (2015) have suggested that business angels learn from the experience of others, in particular in their investment approach. The results of this study have validated this claim and take it a step further. The longer an angel investor is in a group the more flexible would be his/her approach to invest. This has raised important questions regarding the impact of group learning/thinking. Future research should question to what extent this effect is significant in terms of performance, rejection rates, yield rates and so on.

Third, the results show that the quantity of data collected has an impact on the level of variability. This is not a surprising result. If more data are collected on an investor history the greater the chances of variations to occur. However, scholars do not know to what extent increasing the amount of data collected per participant could influence the results. This research has showed that variability in investment behaviour is considerably underestimated

when less information is collected. An example where the participant only reported two observations showed a much lower level of variability (7%) than when three investment decisions were appraised (35%). Hence, it becomes clear that there is a need to collect richer data on investment decisions which should include the whole set of opportunities invested. This would enable scholars to fully map the variations occurred, which would result in a correct understanding of the dynamics of the angel market.

Lastly, the variables included in the model can be grouped under three distinctive areas. The three areas are: investment specific area (ISA), angel specific area (ASA) and group specific area (GSA). Different implications can be drawn from each of the three areas. The ISA is related to the direct features of the investment project. The ASA is the strongly linked with the investor experience. Lastly, the GSA is associated with the collective nature of angel investment. Future research should acknowledge this model and further develop these areas. This links with the learning process and whether the influence of others can be raised from model. The model is depicted in figure 6-1.

Figure 6-1: Map of the suggested model



6.6. Conclusions

The results of this research have highlighted the importance of the dynamics in angel investing. This research was able to expand the literature on angel investing by providing additional understanding of variations in the investment criteria used by business angels. Relying on a decision criteria categorization suggested in the fifth chapter of this thesis, this study has provided clear evidence that the angel investors change their investment criteria

across investment opportunities. The results showed that 43% of the investors gave different weights to the set of investment criteria. This is particularly important since it gives an additional dimension to the dynamics of the angel market. Scholars have focused on discussing variations across the angel population assuming that a specific ruling would be enough to explain the heterogeneity of business angels. However, scholars also need to recognize that although individuals might have static characteristics (education, entrepreneurial experience, number of investment, and so on), this does not mean that their behaviour will not change. Hence, research needs to reflect this variability.

The second contribution of this research has been to present a model that explained alterations in investment criteria. The model showed that angel investors will use different investment criteria and the probability of changing is dependent on investment and investors' characteristics. On the investor side, two subgroups can be identified - the first represented the experience (personal and investment), while the second represented syndication (motivations and time). The probability of changing investment criteria is explained by the age of the business angel, university degree, the number of investments made, years investing, the way the angel started investing (in a syndicate or by him/herself) and the motivations to invest with others. These findings have a clear link with investment experience. On the investment features, changes in the level of IP protection, the number of due diligence sources and the industry experience can help to explain the probability of a change occurring. This result seems intuitive. The first effect is directly linked with characteristics of the product, while the second is associated with the investment process.

This research is the first to open the "black box" of changes in investment decisions. Scholars should acknowledge that more needs to be done to fully understand what influences

variations in the investment behaviour of business angels. The results showed that change can be associated with investment experience. This finding supports previous research that has shown that the investment decision can be associated to a learning process (Harrison et al., 2015). However, more needs to be done to address the particularities of different learning processes. The results showed that variables measuring syndication (time and motivations) can help to explain change in investment behaviour. Hence, scholars should focus more on understanding the learning process of business angels and how this impacts their investment decisions.

Chapter 7. Conclusion and discussion of results

7.1 Introduction

This final chapter summarizes the key contributions of this research. It reviews the empirical, methodological and theoretical based findings, with the aim of highlighting the implications for the academic community and practitioners. Additionally, the limitations and delimitations of the research are discussed with the aim of presenting the research trade-offs that were encountered during the several stages of this thesis. The final two sections discuss the policy implications and make suggestions for further research for how the study might be extended

7.2 Aims of the thesis

Wetzel's (1983) pioneering study identified the heterogeneity of the angel population. However, this has not been fully addressed in subsequent angel research. Few exceptions have been made. The only research area that has fully acknowledged this characteristic has been the categorization studies. However, the great majority of categorization studies have suggested topologies that are focused on a static approach, and so do not fully reflect the dynamic nature of angel investing. Recent research has introduced a more dynamic approach by concentrating the discussion on the investments rather than on the investor. However, neither approach has looked at the decision making criteria. This is surprising, since scholars have made considerable efforts to identify what makes a business angel invest or reject an investment opportunity.

The investment criteria literature has developed significantly since Wetzel's (1981) study. Initial studies, (Mason and Harrison, 1996a; Mason and Harrison, 1996b; Mason and Rogers, 1996, 1997) did not take into account the heterogeneity of the angel population when studying business angel decision making. However, this has been recently acknowledged with scholars including this characteristic in the research design (Harrison et al., 2015; Mitteness et al., 2012a). This later approach allowed scholars to highlight the criteria variations across the business angels' population. However, these studies have not fully addressed the heterogeneity dimension in terms of the investment criteria. First, no categorization studies have differentiated the angel population in terms of the investment criteria used. Second, just a few of the decision studies have acknowledged the heterogeneity of the angel population. These have been investor rather than investment driven. However they do not fully represent the dynamics of angel investing because these studies do not address investment criteria variations by the same investor. To address this omission it was necessary to take a more dynamic approach to understanding how heterogeneity affects the criteria used by angel investors.

This thesis started by showing that the decision making literature has conflicting results. The relative importance of the investment criteria, at the screening stage, has varied across the different studies. Some criterion are more susceptible to variation than others. Two possible justifications are suggested: (i) methodological differences; (ii) heterogeneity – impact on sampling. The review of investment criteria studies allowed the identification of the different methodologies used by scholars. This enabled the research to identify two trends across that literature which provided additional understanding of the differences. First, some criteria are more significant in some methodologies than in others. For example, the entrepreneur is not highly scored in studies based on real time methods, while in interview based studies it

obtains some of the highest scores. Hence, the method used has an impact on the relative importance of the criteria.

Second, studies that have used the same methodologies have provided comparable results. This indicates that when the methodology is fixed, sample composition has less impact on the results obtained. For this reason the fourth chapter applied four methodologies commonly used to study decision making to a fixed sample of 51 business angels. The findings of this chapter helped to understand that the results are methodologically dependent. However, the research is not able to explain if the source of the inconsistencies is solely attributed to the methodological differences or cognitive limitations of the participants. This has had further implications on the approach taken in subsequent chapters. A decision was made to focus on the investment rather than on the investor because in the presence of cognitive limitations it is better to focus on the decision rather than on the decision maker.

The remainder of the thesis addressed the question whether the weights given to investment criteria followed a specific pattern. That is, can investment decisions be grouped by the combination of weights given by investors? This debate is particularly important for an understanding of type of decision model that angel investors use. The fifth chapter concluded that some of the decisions used compensatory models, while others non-compensatory models. This is not surprising, since these models are complementary. Additionally, this chapter highlighted the effect of investment experience in business angel investment decision making. This extends the findings of Harrison et al. (2015) by stressing that experienced investors have a more discriminatory decision model.

The study also identified the importance of influence on the decision making process of business angels. There is a clear negative relationship between the way the investor discriminates the investment criteria and the level of influence of others in the investment decision. The more an angel investor is influenced by others in their choice, the less he/she is able to differentiate the investment criteria supporting the decision. This is one of the key findings of this thesis. It has been suggested that the nature of angel investing is becoming more speculative, with indications of herd behaviour (Banerjee, 1992, 1993; Bikhchandani et al., 1992).

The vast majority of studies conducted in angel research has assumed a static approach in terms of investment behaviour. In particular, categorization studies have assumed that there is no possibility that investor might change their approach over time. The only exception was the study by Avdeitchikova (2008) which showed that depending on the investment, the role of the investor changed. All other studies classified investors at a specific moment in time without acknowledging that the same business angel could belong to a different group under other conditions, e.g. time, investment, solo vs syndicated among others. The sixth chapter questioned this key assumption of previous studies by developing Avdeitchikova's (2008) work further. The study used the cluster membership of the groups identified in the fifth chapter and examined what can impact the likelihood of an investor changing their investment criteria. The study showed the need for a dynamic approach when conducting research on business angels. Almost half (46%) of the investors invested for a different combination of investment criteria. The chapter suggested a model to explain what impacts the likelihood of this change occurring. Three key areas explain the likelihood of a change occurring: investment specific area (ISA), angel specific area (ASA) and group specific area (GSA). Within each area several variables were found to be statistically significant, with the odds ratios providing foreseeable relations. However, the most surprising result was that one

group specific area was associated with investing with others. As in the previous chapter, the model suggested that being part of an angel group has significant repercussions on the way investors make decisions.

A simple way to summarize this thesis is to understand that it links two important areas of business angel research. The thesis sought to reinforce the need of extending the heterogeneity discussion while at the same time analyzing the decision making criteria employed by business angels. The key contributions will be discussed in greater detail in the next section. However, at this moment, the reader should have a clear notion that this thesis has been able to highlight several factors that can impact scholars understanding of the heterogeneity of the angel population. This is particularly evident in the case of business angels investing with angel groups.

7.3 Contributions of the thesis

The following sections review the key findings of this thesis. This will begin with a focus on the three methodological contributions, followed by the empirical contributions that cover the findings from the three empirical studies. Lastly, the theoretical contributions will be highlighted, in particular, the suggestions for the use of new theoretical frameworks.

7.3.1 Methodological contributions

The study makes three methodological contributions. The first is provided in the third chapter. This is based on the review of the business angel literature since 2008. The following contribution results from the fourth chapter. This can be easily understood since

this chapter was mainly focused on the use of different methods while studying the investment criteria of an angel investor. The last methodological contribution can be found in the sixth chapter which suggests a method to measure variation in terms of behaviour. The following paragraphs will review these contributions in detail.

Business angel literature has changed across the years. The initial angel studies relied on very small samples while the most recent research has used larger ones that are typically recruited with the use of syndicates. The third chapter reviewed the business angel literature since 2008 and presented a discussion on how scholars have ignored the sampling suggestions previously mentioned in earlier research (Avdeitchikova et al., 2008; Farrell et al., 2008; Harrison and Mason, 2008; Mason and Harrison, 2008; Riding, 2008). Recent research has used business angel groups as the key approach to collect data. This is clear evidence that scholars are not overly concerned with convenience samples. However, this is not the only problem associated with this approach. When this approach is followed, how can response rates be calculated?

The first methodological contribution called attention to the different ways that response rates have been measured in angel research. Scholars have used two distinct approaches. First, they have calculated response rates based on the number of groups that decided to support the research (Sohl, 2006). Second, the calculation represented only the number of members of the angel groups supporting the research (Wiltbank and Boeker, 2007). This has presented two key limitations. On the one hand, the use of different procedures to measure response rates has reduced the likelihood of comparing studies regarding sampling bias. On the other hand, either of the measures can provide misleading representations of the angel population. Hence, it is necessary to have a standardized procedure to calculate response

rates when the recruitment process involves angel groups. A suggestion is to calculate response rates more accurately which takes into account the particularities of group membership. The chapter defended the use of such procedure in future research when studies target angel groups.

The second methodological contribution is found in the fourth chapter. This chapter is based on a study that used a sample of fifty one angel investors. It has provided insights related to the methodologies used to evaluate the decision making criteria of business angels. Two methodological findings from this chapter can be considered. First, and possibly the most surprising result, is that different methodologies do not provide the same results. Hence, it is possible to state that the results are methodologically dependent. This has a direct implication in terms of research design and literature reviewed. The second finding has highlighted methodological similarities in terms of the results produced. Methodologies that did not present a list of investment criteria produce similar results when compared with other methods that did not restrain participants to a fixed set of options. Future research also needs to take this finding into account when designing research instruments. Using a fixed list of options not only restrains participants' choices, but it can also bias the results. However, not doing so might also constrain the information collected.

The third methodological contribution can be found in the sixth chapter. The study evaluated if business angels invest in different business proposals for the same reasons, that is, whether the weights given to the list of investment criteria by investors do not vary across investments. The study used the cluster membership for investment decisions, generated in the fifth chapter to evaluate the variation in investment patterns. Hence, the methodological contribution is associated with the way the variation is measured. A change occurs if for the

same investor, two investment decisions have different cluster membership. This suggestion to measure pattern variation is particularly useful when it is not possible to have a time series database.

As it was previously mentioned, throughout this thesis, data is one of the key issues in angel research. Hence, finding alternative ways to understand investment behaviour is important. This is not a new way to measure variation. Avdeitchikova (2008) had previously used a similar approach using the variation of resources provided in each of the investor roles. However, that study is not using the cluster membership to measure change. It did not reveal how many times the same investor was observed, neither how the variation in the investment variables were calculated. In this study it was possible to verify that the likelihood of an angel investor changing their criteria increased with the number of investments reported. Hence, it is possible to conclude that richer data sets are required since more information allows researchers to better identify patterns within the data.

7.3.2 Empirical contributions

This discussion highlights what this research has been able to add to the literature in terms of what is known about business angels and their investment behaviour. This will cover the three empirical chapters - from the fourth to the sixth chapter. The fourth chapter of this thesis evaluated the use of different methods to study decision making criteria. As it was previously mentioned, the study showed that the results are methodologically dependent. However, the findings go beyond the inconsistent results across methods. The sample of the study consisted of two sub-samples. A first sub-sample comprised twenty one gatekeepers, and the second sub-sample consisted of thirty individual business angels. Both samples presented very similar results in terms of inconsistency across the methodologies used. One can see this as a less intuitive result, since gatekeepers are perceived as more experienced

investors, which in turn could result in a lower propensity for methodological variation. This indicates that even if a control variable is used, in this case the level of investment experience, the results are still going to be methodologically dependent.

According to some practitioners and scholars (Gray, 2011; Mason and Botelho, 2016; Mason et al., 2015; Waddell, 2013), achieving an exit is becoming one of the key problems for business angels. Hence, it would be expected that angel investors would consider the exit to be an important investment criteria. Contrary to what Sudek (2006) identified, UK business angels do not rank the exit as a central criterion. The study in chapter four has showed that in all the methods used the exit always ranks below the fifth position for both sub-samples. This somewhat surprising result is further developed in Mason and Botelho (2016). The authors found that whereas in discussions gatekeepers emphasized that they take into account the exit while investing, this is not supported in the results of the real time methodology (VPA). Hence, the chapter in this thesis showed that although angel investors mention the exit as a key issue, this does not appear to influence their investment decisions.

The fifth chapter has provided three key empirical findings. It is the first study to highlight the impact of the heterogeneity of the angel population in terms of the decision making criteria. The great majority of business angel investment decision literature has not taken this characteristic into account. In particular, this research focused on the investment decision rather than the investor. This emphasis on the investment decision was to enable further evaluation of individual (investor) decision making variations. The study showed that the weights of the investment criteria are different across investment opportunities. The key contribution of this finding is that business angels do not always invest for the same reasons. The heterogeneity of the angel population therefore needs to be acknowledged by scholars

in future business angel decision making research. The importance of this finding can also be reflected in entrepreneurial training. Entrepreneurs are given a list of *do* and *do not*s in terms of business angels investment criteria which varies across investment opportunities.

A second finding is related to the decision models used by business angels. The three clusters of business angel's investment decisions suggested that investors use both compensatory and non-compensatory decision models. One cluster consisted of decisions where all the investment criteria were scored as important. This finding is consistent with previous research (Maxwell et al., 2011) that supports a non-compensatory decision model, elimination by aspect (Tversky, 1972) as a reasonable approach to explain the investment decision process of business angels. In the remaining two clusters angel investors classified specific criterion as important, while other criteria were considered as less significant. One characteristic of compensatory models is that, "a shortfall on one attribute may be compensated by a good rating on another attribute" (Avery et al., 2013, p. 270). Hence, this highlights that business angels might use compensatory models while in other situations they will use non-compensatory models.

A third empirical contribution, also reported in the fifth chapter, has provided additional insights into one of the key implications of the transformation of the angel market (Mason et al., 2016). Business angels are increasingly investing within angel groups and/or networks. This change in the investment behaviour of angel investors was discussed in the second chapter of this thesis. However, scholars have not acknowledged the implications of this new investment context. Previous research had noticed that business angels could be influenced by business acquaintances (Stedler and Peters, 2003) in terms of deal flow. However, to a large extent, until this research, scholars have ignored the importance of others in the

investment decision process of business angels and how the group interactions could influence a decision, which until now, was seen as individual. In a group setting, other factors can influence individual decision making. The results indicate that a business angel investment decision can be influenced by peer investors and/or by the gatekeeper or leading investor. This finding can be directly associated with two theoretical suggestions that will be discussed in the following subsection. Additionally, the results have also indicated that the group of investment decisions with the highest level of influence by others are those in which the investors considered all criteria as important. One of the consequences of being influenced by others may therefore be that investors are not able to recall the reasons why they have invested.

The final two empirical contributions can be found in the sixth chapter and emerge from the discussion on the heterogeneity of business angels and their investment decisions. The study built on the findings of the previous chapter and evaluated to what extent angel investors change the investment criteria, and modeled what can impact the likelihood of this occurring. The first contribution concerns the dynamics of angel investment activity. The construct of change used in this study provided a clear notion that business angels are not static in terms of the investment criteria they use. Approximately, half of the sample (46%) used different weights of the investment criteria when undertaking different funding opportunities.

This is the first study that evaluates investment criteria dynamics in business angel decision making literature. There is only one prior study that has evaluated the dynamics of angel investing. Avdeitchikova (2008) presented a similar approach to evaluate whether the post-investment contributions provided by angel investors would vary across investment opportunities. The last empirical contribution of this thesis regards what impacts the

likelihood of a change of the investment criteria occurring. The results have indicated that the likelihood of a business angel changing their investment criteria between investments depends on three key areas: investment specific area (ISA), angel specific area (ASA) and group specific area (GSA). The first two areas are not surprising. One would expect that individual characteristics and attributes of the investment opportunity to play a role in terms of the reasons to invest. However, the last area raises the importance of others in the investment process. Again, the importance of angel investors acting within a group context has an impact on the way in which they make their decisions. This contribution is consistent to one of the findings of the fifth chapter. While investing with others, business angels may be influenced by peers and by the gatekeeper which can encourage them to change the reasons why they invest.

7.3.3 Theoretical contributions

The great majority of the contributions of this thesis are empirical. Two of these empirical contributions have suggested that the investment decisions of business angels are no longer an individual activity and it is becoming a collective exercise. The findings have indicated that this is happening in two dimensions (i) in the way angel investors' weigh the investment criteria (ii) in how they can change the weights of investment criteria. Of course, these findings are natural implications of the rise of angels groups. However, recent business angel literature has not reflected this new dimension. Hence, it has become clear that a theoretical framework that could reflect this new reality should be suggested.

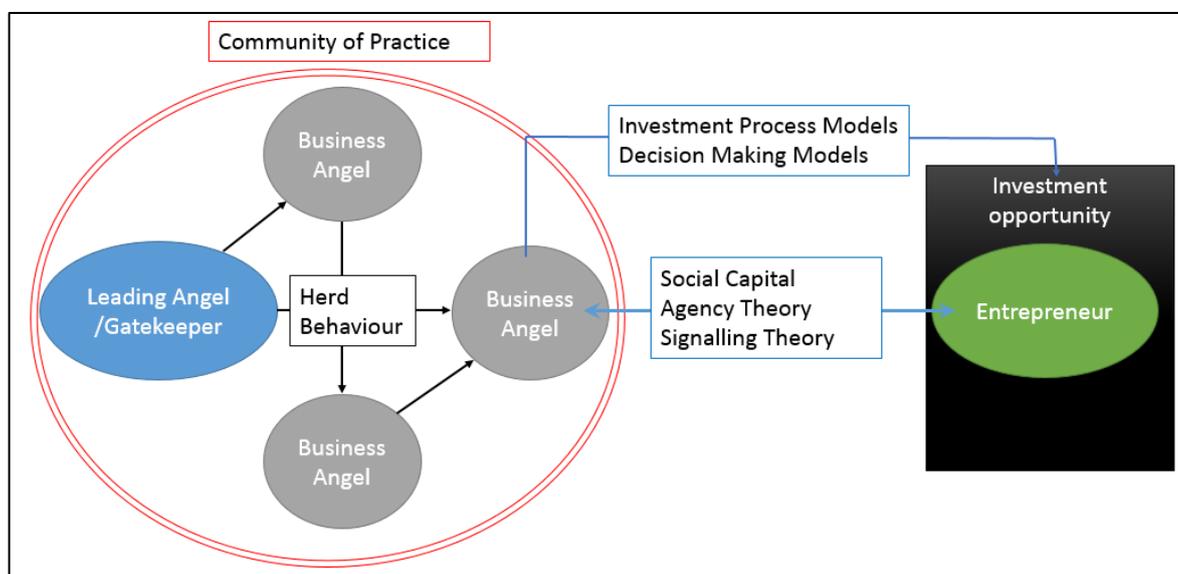
The first theoretical contribution is associated with the suggestion to use herd behaviour as a framework to model the influence that others have on the reasons why business angels invest. Herd behaviour (Banerjee, 1992, 1993) has been widely used in the financial

literature, particularly in terms of investors in publicly traded firms. However, this type of behaviour has not been discussed in a business angel context, where investments are made in unquoted companies and the level of asymmetries of information is higher. In an angel group context, herd behaviour can be identified in two situations. First, in the group meetings, after the entrepreneurs pitch, during the questions and answers section, the desire of some investors to know more about the investment opportunity can influence others. In a very similar way to that identified by Cont and Bouchaud (2000), business angels may observe the interactions of other investors with the entrepreneur to infer their thoughts about that opportunity. Second, the interactions between investors (peers and/or gatekeepers) can reveal additional information that can be used by some regarding their investment decisions. Shiller (1995, p. 181) observed that “people who interact with each other regularly tend to think and behave similarly”. This effect is also reflected in the second theoretical suggestion provided in this thesis.

Business angel groups are promoting higher levels of interactions between investors. This can have an impact in terms of investment practices and learning processes. This thesis has highlighted that the interaction between investors can impact (i) the investment criteria used in investment decisions; (ii) by changing the reasons to invest. This suggests that the use of communities of practice (Lave and Wenger, 1991) may be an appropriate theoretical framework to explain investment decisions made within a group context. At the first glance, the fit of this theory with the reality is high. Wenger (1998) suggested that a coherent community of practice should hold on three foundations: mutual engagement, joint enterprise and shared repertoire. All of these are identified within the angel group context. It is therefore clear that the rise of angel groups and networks creates a new context for the investment process this will require different theoretical frameworks to be used.

This thesis therefore highlights the need for new conceptual frameworks to research the investment decision making of business angels in a group context. The previous decision making literature used a conceptual framework that mainly focused on explaining: (i) the relationship between the entrepreneur and the investor (e.g. social capital, agency theory and signaling theory); (ii) how the business angel made his investment decision (e.g. investment process model and decision making models). However, this conceptual framework has to be revised to include the contextual effect of investors interacting with others. First, at the more broad level, the conceptual framework should include the effect of the interactions between group members and the gatekeeper. These interactions can reflect how members sustain relationships, how members identify themselves with the group and how members learn from each other. Hence, the suggestion made is to use the theory of communities of practice (Lave and Wenger, 1991). Second, at the decision making level, the conceptual framework needs allow for individual investment decision to be impacted by others (e.g. gatekeeper/leading angel and/or other business angels). The impact of others in this context can lead less informed decisions resulting from herd behaviour (Banerjee, 1992, 1993). Figure 7-1 depicts the suggested conceptual framework.

Figure 7-1: Conceptual Framework



7.3.4 Overall contributions summary

This thesis aimed to study to what extent the heterogeneity of the angel population impacted the investment decision criteria. This was largely achieved and the key contributions will be summarized in the following paragraphs. However, this research has also discussed the phenomenon of business angels investing alongside one another in groups. The effect of angels groups in the investment decision is present throughout the thesis and has also been highlighted in the section on the theoretical contributions. This research highlights the importance of adding the effects of angel syndication to the conceptual model of business angel investment decision. On one hand, the findings supports Sohl (2012a) concerns on how syndication would lead to business angels acting venture capital funds. Investors are less in control of their investment decisions, there is a set of rules, following a fix procedure, with less hand-on contributions and a much more professionalized context. On the hand, the thesis is also able to highlight that several investment decisions are highly individual, that is, are not significantly influenced by others. Hence, although the intention of the thesis was not to examine the impact of syndication on the investment decision criteria, it has emerged as an important feature of angel investing.

Table 7-1 summarizes the contributions of this thesis. These contributions enrich three areas of business angel research. The first is associated with research methodologies for business angel decision making. The findings help to understand the level of comparability across the most common methodologies used in the business angel decision making literature. The second is directly related to the heterogeneity of the angel population. The focus of the research was to study how much variability there is in the business angel's investment decisions. The last area of research that this thesis has contributed to is the implications of business angels investing in a group context. This is evaluated in terms of the decision

making criteria. To summarize, this thesis has brought new insights on angel research by linking two key areas of the literature: (i) decision making (ii) heterogeneity of the angel population. By doing so, this research is able to conclude that the investment criteria employed by angel investors is a valuable option to analyse the lack of homogeneity of the angel population.

Table 7-1: Thesis contributions

Chapter	Type of contribution	Description of the contribution
Chapter 3	Methodological	Measure to evaluate response rates when groups are involved in the recruitment process.
Chapter 4	Methodological	The results in decision making studies are methodologically depend.
Chapter 4	Methodological	In decision making studies some methods provide closer results than others. Hence, easier to be comparable.
Chapter 6	Methodological	How to measure variations of changes in investment criteria using the results of cluster analysis.
Chapter 4	Empirical	Investment experience does not impact how consistent are the results across different methodologies.
Chapter 4	Empirical	The exit is not consider an important investment criterion.
Chapter 5	Empirical	Heterogeneity of the angel population needs to be recognized in decision making studies.
Chapter 5	Empirical	Business angels used different decision making models (compensatory and non-compensatory).
Chapter 5	Empirical	In a group context, business angels can be influence by other investors (peer and gatekeeper/lead)
Chapter 5	Theoretical	Evidence of Herd behaviour (Banerjee, 1992, 1993) can be found in angel investments.
Chapter 6	Empirical	The reasons to invest can change across different investment opportunities.
Chapter 6	Empirical	In interaction within the group can change the way a business angel evaluates an investment opportunity.
Chapters 5 and 6	Theoretical	Communities of practice (Lave and Wenger, 1991) should be applied in business angel research as a theoretical framework to explain the interactions of group members.

7.4 Limitations and Delimitations

The aim of this section is to discuss the limitations and delimitations of this thesis and what is its impact on the contributions. The first part of this section will focus on the key limitations, while the second part will discuss the delimitations of this research. Typically, research limitations are associated with potential weaknesses of the research that are to a great extent out of the control of the researcher. Delimitations, in contrast, are under the control of the researcher and reflect the characteristics of the research that defined the scope of the study. In a simple way, when a researcher defines the boundaries of their study they are limiting the scope of the research by delimitating the findings.

The limitations of this thesis can be structured into two types: (i) empirical (ii) statistical. In terms of the empirical limitations, this research has not been able to explain if the inconsistent results are the result of cognitive limitations of the investors or of epistemological differences of the methods under analysis. This limitation has impacted on the choice of the unit of analysis in the second and third empirical studies. The reason for modifying the unit from the investor to the investment decision was to allow for variability in the results per investor. This has enabled the thesis to evaluate variations of investment decision across the same investor. The second empirical limitation is associated with the generalization of the results. The great majority of participants were members of angel groups. This raises the question whether the findings of this research can be applied to the whole of the angel population. Are angels who are members of angel groups distinct from solo angels? To a large extent, business angels operate both in the visible and invisible markets; this behaviour is confirmed in this research. Although the vast majority of participants belonged to angel groups and/or networks (94%), they also invest independently

of these organizations (27%). This could be seen as a strength of the research rather than a shortcoming.

The final limitation of this research is associated with statistical issues. According to the measures of goodness of fit used in the fifth and sixth chapters, the models are considered poor or fair. The values obtained for the average Silhouette coefficient in the fifth chapter is considered low and indicated a poor cluster structure. The values of the Pseudo R^2 in the sixth chapter are also considered low. In this particular case, the low results of the Pseudo R^2 can be overlooked by the -2 log likelihoods and chi-square change statistics which have presented satisfactory results. Additionally, the exploratory nature of the research with no preceding support can help to counter balance the poor goodness of fit results.

This thesis has five key delimitations that should be highlighted. First, it only takes business angels as object of study. However, several funding sources can be found in the alternative finance context. The choice to only study the decision making of business angels reduced the capability of this thesis to explain the interaction between the several funding sources in the funding escalator. This decision was based on the importance of business angels in the alternative finance context⁵⁵, and in the level of literature development. Additionally, the decision making process of other funding agents are significantly different, which would create problems in terms of research design and comparability of findings.

The second delimitation is associated with the lack of a theoretical approach, undertaken in this thesis. The theoretical delimitations of this thesis are less to do with a lack of theory

⁵⁵ According to EBAN (2016), business angels represented 71% of the total European early stage investment. The values for equity crowdfunding are considerably lower, representing only 5%.

testing, but rather, that theoretical frameworks could support the findings. Although this approach might be seen as moving backwards rather than progressing forwards, this is not the case. Just a small number of decision making studies have acknowledged the heterogeneity of the angel population. Hence, one needs to take a step back to understand to what extent this heterogeneity is also reflected in the investment decisions, in particular, in the criteria used to invest. The lack of an initial theoretical framework was subsequently offset by the suggestion of a number of theories that could help interpret the findings of this thesis.

Third, this thesis did not include any link with financial outcomes. This point can be seen as the third delimitation. When the research was initially designed there were no objectives to evaluate whether the variability of the decision making criteria would imply better or worse financial outcomes. With the lack of research on the heterogeneity of investment decision making of business angels, it was more important to identify the phenomenon. Subsequently, the thesis aimed to understand what could influence the variations in the investment criteria used by the same investor. Previous research has identified that asking angel investors for financial information can be something very problematic (for example: Mason and Harrison, 2004). This was the key driver for not studying how the variations on decision making were linked with financial outcomes. With the benefit of hindsight, asking for portfolio behaviour and financial returns could have generated valuable insights for practitioners and scholars. However, the risk of deterring participants by asking these types of questions could have jeopardized the quality of the survey responses.

Fourth, the focus of study of this research is the angel investor. This has downgraded the importance of the investment opportunity, particularly in terms of the data collected. The

vast majority of variables focused on the investor characteristics rather than the investment features. The thesis could have given more emphasize to a wide set of investment features such as location, size and shareholder structure to enable an understanding of other dimensions of angel investment. However, this information is not always easy for participants to recall, particularly in syndicated investments where the business angel is more likely to have a low level of interaction with the investee venture. Hence, the decision was to focus on firm features that would be easier to recall.

The last delimitation is associated to how angel syndication is evaluated in the thesis. The research was designed to evaluate how the lack of homogeneity of the angel population impacted the decision making criteria. There was an assumption that the rise of angel groups could have an impact on the way investment decisions were made. Hence, several variables were included to try to understand the impact of syndication in terms of the investment decision. However, there was no attempt to try to evaluate the effect of syndication on the heterogeneity of the angel population. The research is able to show that there is an impact in terms of investment decision, but to what extent this effect increases or decreases the heterogeneity of the angel population is not clear.

7.5 Practical implications

This section will cover the different stakeholders who might be interested in the practical implications of this thesis. The discussion will start by looking at how policy makers can be influenced by this research. Then, it will discuss the implications for entrepreneurs, followed by an overview of the contribution for angel groups/networks. The section will finish by highlighting the practical implications for entrepreneurial teaching.

7.5.1 Policy-making

It was in the 1990s that the academic community first raised awareness of the importance of business angels. Scholars have argued that policy-makers should help promote business angel activity (some examples: Aernoudt, 2005; Lerner, 1998; Mason, 2009; Mason and Harrison, 1997, 2008, 2015; Mason et al., 2015; Murray, 2007; Sohl, 2007). In a similar tradition, this section will highlight the two findings of this thesis that are particularly important in terms of policy. First, the research reinforced the idea that business angels are not a homogenous population. Notably, in terms of the investment decisions or the criteria used. Hence, policy-makers need to acknowledge this when designing incentives to attract angel investment. The range of incentives to invest need to be wide-ranging to be able to attract the whole angel population. In particular, the reasons to invest vary. Hence, tax incentives are an effective way to directly create a general encouragement due to its monetary nature. However, more specific incentives will have to be tailored to the specific “type” of investment.

The second policy implication is associated with the levels of influence identified in chapters five and six. The proliferation of angel groups/networks across the UK has led to collective thinking and investment decisions being influenced by others. However, it is not clear if this level of influence improves the screening quality of angel investors and enables them to make better investment decisions. The findings in the fifth chapter indicated that the less an investor is influenced by others, the more he/she is able to differentiate the reasons to invest. If business angels are influenced by others then it is important that policy-makers support the training of investors. This would increase the pool of knowledge of the angel community. This could lead to two effects. On the one hand, it would increase the critical thought across the investment community, which possibly could result in more independent investment

decision makers. On the other hand, it would reduce the heterogeneity of the angel population, leading to more predictable investment behaviour.

7.5.2 Entrepreneurs

Entrepreneurs looking for angel funding can find three valuable lessons from this research. The initial advice that entrepreneurs can take from this thesis is the identification of what are the key investment criteria of angel investors. The fourth chapter raised uncertainty about the validity of previous research on the investment decision making of business angels by indicating that they were influenced by the methodology used. Chapter five showed that in all three clusters of investment decisions, two criteria (the people and product/market) were consistently scored as very important. By looking at the investment rather than the investor, the fifth chapter produces important findings for entrepreneurs. This allows a deeper understanding of the investment decision making criteria of business angel since it allows for opportunity specific reasons rather than a very general criteria ranking.

Second, the findings highlight that the level of heterogeneity of the angel population creates variety in the nature of their investment decisions. Hence, entrepreneurs need to recognize that there is no fixed combination of investment criteria that they must satisfy to guarantee angel investment. It therefore follows that being rejected by one angel investor does not mean that another business angel will also reject the opportunity. Moreover, the sixth chapter shows that the same investor can change the relative weights of their own investment criteria across different opportunities. Entrepreneurs need to be aware of this variability and should not believe there exists a “golden rule” in achieving angel funding.

The third contribution for entrepreneurs identifies contextual factors in terms of the business angels' decision making. The rise of business angel groups and networks has direct implications in terms of investment decision making. This is reflected in the weights business angels give to investment criteria and how they change these weights from one investment to another. Entrepreneurs need to recognize that when pitching to a group of angel investors they need to be able to identify who are the "leading" members driving the investment process and potentially influencing other investors in the group. Getting a positive response from them will increase the likelihood of being successful in raising finance. Although each angel investor will make his/her own decisions, they are subject to the influence of others and this is an additional element that entrepreneurs need to take into account.

7.5.3 Angel groups/networks

This thesis has also provided important insights into the investment process of business angel group and networks. The research has shown that investors in groups and networks interact with each other influencing decision patterns. To create sustainable angel groups/networks the managers of such organizations, also known as gatekeepers, need to acknowledge the importance of this effect. Gatekeepers should reflect on the findings of this thesis in three areas: (i) the membership recruitment/composition; (ii) managing member's personalities and expectations; (iii) facilitating less experienced members to learn from more experienced angel investors in the group. Groups and networks need to recruit experienced investors to ensure high quality of the comments, discussions and investment decisions. If the membership of such organizations lack experience and knowledge, then it might result in deficient investment decisions or a low number of investments. This in turn could lead to the loss of members, or in the limit, the cessation of the group/network.

With respect to the way that gatekeepers manage their group/network, the findings highlighted that angel investors can be influenced by others. Hence, it is important for gatekeepers to ensure that the views of strongly “opinionated” investors do not dominate discussions and allow a diversity of views to be expressed. This is a particularly important at the screening stage. However, gatekeepers need to acknowledge this throughout the investment process. One can speculate the extent of group interaction. Members can disagree in terms of managerial issues, e.g. recruitment strategy, level of visibility of the group, number of members and so on. Divergences can also occur in terms of the investment portfolio, e.g. timing to exit a specific investment, who should be the non-executive board member, how much diversification is necessary and so on. All of these issues can create conflicts that could ultimately result in members leaving the group/network.

Additionally, this thesis has highlighted the variability of the investment criteria used by business angels. Gatekeepers should acknowledge that being part of an angel group has a significant impact on members in terms of changing the reasons why they invest. Hence, gatekeepers should take this into account while evaluating the likelihood of an investment proposal to be fully funded. Accepting this can speed the investment process. Regularly, gatekeepers have to bring in additional co-investors to be able to complete the deal. Typically, this type of behaviour increases costs, both measured in time and money. Hence, gatekeepers should be more conservative while evaluating the likelihood of an investment opportunity being funded. An alternative solution would be to recruit experienced angels who act as “lone wolfs” or that have been part of angel groups for less than 10 years. As noticed in chapter 6, these investors with these characteristics are less likely to change their investment criteria and can be considered more predictable. In therefore allow gatekeepers to better predict the likelihood of an investment opportunity to be funded and reduce the costs previously mentioned.

7.5.4 Entrepreneurial teaching

Teaching materials on entrepreneurial finance need to incorporate and reflect the heterogeneity of the angel population. Normally, entrepreneurial finance courses present entrepreneurs and students with a fixed set of “best practices” when searching for angel investment. This is a very simplistic way of looking at angel investing. Typically, business angels give significant importance to issues associated with the entrepreneur and the product/market. However, in some cases, other criteria are equally important. This thesis has called attention to the heterogeneity of the angel population in terms of decision making. This needs to be reflected in teaching.

Entrepreneurial teaching should also incorporate the results of this thesis that have highlighted the changes in terms of context of business angel investment decisions. Much of what is taught reflects the era of the solo angel making individual investment decisions rather than the result of a group discussion. The popularization of angel groups has brought a new contextual reality that is not reflected in teaching materials. The investment process of angel groups is distinctive with their roles being played by gatekeepers and leading investors. The findings of this thesis showed that these actors can have a significant influence on the investment decision making of other group members. Students need to be alert to this specificity in business angel groups/networks. In summary, entrepreneurial teaching needs to reflect this new reality by emphasizing the importance of gatekeepers/leading investors and exploring their decision making and influence effect.

7.6 Suggestions for further research

The three empirical chapters have provided new insights to business angel literature. However, there are still questions that scholars could address in future research. The fourth chapter has highlighted that the weights of the investment criteria given by angel investors vary across different methodologies. One of the findings of this study is that some methodologies provided closer results than others. However, the research was not able to identify what is the source of the inconsistent results. Hence, future research should try to identify and evaluate what is the source of the variations across the methodologies used in business angel decision criteria. Are the differences a result of cognitive limitations of the participants? In particular, is this the reflection of bounded rationality? Or, are the inconsistencies due to the epistemological differences of the methodologies used?

The fifth chapter presents a discussion of the heterogeneity of the angel population. The study has expanded both the categorization research as well as the decision making literature by identifying three different clusters of investment decisions. The findings have highlighted important effects (i) investment experience (ii) influence of others. Further research should expand this discussion by trying to identify if the variability of decisions depends on the level of investment experience. This would enable scholars to understand if, as an investor becomes more experienced, the closer his/her decisions would be from others with the same investment track record, implying that, the population would be more homogenous with higher levels of investor experience. This could provide additional insights to support the use of communities of practice as a model to explain the business angel investment process, to explain the investment process of business angel groups. This can be associated with the levels of influence identified in this thesis. However, there are still questions to be answered regarding the effect of others in terms of business angel decision making. First, what causes

an angel investor to have a higher propensity of being influenced by others? To what extent does investment experience play a role in this? Second, what causes an angel investor to have a higher propensity of influencing others? Is this an issue of the investment process (deal flow), or is it linked with specific industry knowledge? Or even with reputation.

The sixth chapter investigated the variation of the investment criteria used by angel investors. The research has two important implications that should be further pursued by scholars. Business angel investment activity is not static, rather it changes and evolves. This initial implication can be divided into two parts. The first part evaluates the development of the angel investors. Scholars need to understand what the key drivers of this evaluation are. Do business angels learn on their own? Does the group context play an important role? The second part evaluates the dynamic argument across the investment process. Only two studies have looked at how business angels change their approach at a specific stage of the investment process. Hence, future research should assess which stages are more susceptible to behavioural changes. Additionally, scholars should identify what impacts variability across the investment process. The study has also shown that the likelihood of change is impacted by individual characteristics of the investors and the investment features. Further research should try to identify and evaluate the importance of all investment features. Additionally, this work should be linked to returns. Scholars should explore the link between the investment criteria and the financial return. Is the use of some investment criteria more likely to be associated with a superior investment performance?

Appendix 1: Tests of proportions for all methods – gatekeepers (n = 21)

Test	Business Plan	The people	Product/Market	Financial Attributes	Attributes of the Business	Investment Attributes	Exit
Interview vs VPA	-117311.10	-144913.80	-75907.21	-124211.80	-131112.50	-103509.80	-144913.80
Interview vs RP	-131112.5	-82807.87	-82807.87	-124211.8	-124211.8	-138013.1	-138013.1
Interview vs Pairwise	-144913.8	-75907.21	-96609.18	-131112.5	-117311.1	-131112.5	-117311.1
VPA vs RP	-117311.1	-138013.1	-89708.52	-124211.8	-131112.5	-124211.8	-110410.5
VPA vs Pairwise	-110410.5	-144913.8	-103509.8	-124211.8	-117311.1	-138013.1	-124211.8
RP vs Pairwise	-75907.21	-69006.55	-82807.87	-89708.52	-103509.8	-62105.9	-96609.18

Each cell ij is the Z-statistic for the comparison of tests in row i and factor in column j

Appendix 2: Tests of proportions for all methods - angels (n = 30)

Test	Business Plan	The people	Product/Market	Financial Attributes	Attributes of the Business	Investment Attributes	Exit
Interview vs VPA	-138564.1	-138564.1	-80829.0	-144337.6	-144337.6	-144337.6	-173205.1
Interview vs RP	-144337.6	-103923.0	-138564.1	-138564.1	-144337.6	-161658.1	-150111.1
Interview vs Pairwise	-132790.6	-80829.0	-138564.1	-155884.6	-144337.6	-161658.1	-121243.6
VPA vs RP	-132790.6	-144337.6	-127017.1	-138564.1	-144337.6	-155884.6	-144337.6
VPA vs Pairwise	-115470.1	-132790.6	-98149.5	-150111.1	-138564.1	-155884.6	-150111.1
RP vs Pairwise	-69282.0	-63508.5	-63508.5	-103923.0	-92376.0	-63508.5	-80829.0

Each cell ij is the Z-statistic for the comparison of tests in row i and factor in column j

Appendix 3: T-tests for equality of means for all methodologies for 21 gatekeepers

Test	Business Plan		The people		Product/Market		Financial Attributes		Attributes of the Business		Investment Attributes		Exit	
	CI_L	CI_U	CI_L	CI_U	CI_L	CI_U	CI_L	CI_U	CI_L	CI_U	CI_L	CI_U	CI_L	CI_U
Interview vs VPA	0.158	1.651	2.136	3.293	-0.382	0.668	-0.619	1.000	-1.029	0.934	0.356	2.025	2.469	3.721
Interview vs RP	1.019	2.791	-0.613	0.232	0.384	1.140	0.548	2.214	1.079	2.730	0.364	2.303	1.216	2.594
Interview vs Pairwise	0.873	2.555	-0.473	0.283	0.442	1.558	0.816	2.803	0.105	1.705	0.606	2.441	-0.315	1.744
VPA vs RP	0.124	1.876	-3.594	-2.216	0.017	1.221	0.448	1.933	0.797	3.108	-1.064	1.350	-1.947	-0.434
VPA vs Pairwise	-0.119	1.738	-3.447	-2.172	0.092	1.623	0.681	2.557	-0.139	2.044	-0.839	1.506	-3.393	-1.368
RP vs Pairwise	-0.479	0.860	-0.500	0.309	-0.616	0.140	-1.127	0.270	0.161	1.839	-0.637	0.256	0.420	1.961

Each cell ij contains the lower and upper bound of the CI for the comparison of tests in row i and factor in column j

Appendix 4: T-tests for equality of means for all methodologies for 30 business angels

Test	Business Plan		The people		Product/Market		Financial Attributes		Attributes of the Business		Investment Attributes		Exit	
	CI_LB	CI_UB	CI_LB	CI_UB	CI_LB	CI_UB	CI_LB	CI_UB	CI_LB	CI_UB	CI_LB	CI_UB	CI_LB	CI_UB
Interview vs VPA	0.723	2.077	1.528	2.938	-0.821	0.088	-0.265	1.199	-0.302	1.035	0.454	1.746	2.044	3.289
Interview vs RP	1.228	2.438	-0.340	0.407	0.179	1.287	0.492	1.774	0.689	2.178	1.709	3.358	1.162	2.305
Interview vs Pairwise	1.161	2.572	-0.150	0.817	-0.102	1.102	0.690	1.777	0.337	1.730	1.687	3.313	0.907	2.159
VPA vs RP	-0.331	1.197	-2.853	-1.547	0.597	1.603	-0.049	1.383	0.276	1.857	0.515	2.352	-1.576	-0.291
VPA vs Pairwise	-0.364	1.297	-2.538	-1.262	0.350	1.383	0.009	1.524	0.044	1.289	0.525	2.275	-1.832	-0.435
RP vs Pairwise	-0.39	0.327	-0.729	0.129	-0.056	0.522	-0.508	0.308	-0.023	0.823	-0.299	0.366	-0.159	0.559

Each cell ij contains the lower and upper bound of the CI for the comparison of tests in row i and factor in column j

Appendix 5: List of seven criteria

CRITERIA	DESCRIPTION
<i>THE PEOPLE</i>	Entrepreneur, Management team, etc...
<i>MARKET/PRODUCT</i>	Sector, Scale of the Market, Technical aspect of the product, IP aspects, etc...
<i>BUSINESS PLAN</i>	Quality of the written document
<i>EXIT</i>	Exit Value, Exit plan, Time to exit, Potential buyers, etc...
<i>FINANCIAL ATTRIBUTES</i>	Valuation, Funding requirements, Equity structure, etc...
<i>INVESTOR ATTRIBUTES</i>	Investment fit, Ability to add value, etc...
<i>ATTRIBUTES OF THE BUSINESS</i>	Business model, Strategy, Operations, Stage of development, etc...

Appendix 6: Results of auto-clustering

Auto-Clustering

Number of Clusters	Schwarz's Bayesian Criterion (BIC)	BIC Change ^a	Ratio of BIC Changes ^b	Ratio of Distance Measures ^c
1	10029.010			
2	9509.697	-519.313	1.000	1.498
3	9246.177	-263.520	.507	1.452
4	9142.695	-103.482	.199	1.232
5	9105.804	-36.892	.071	1.279
6	9131.569	25.765	-.050	1.137
7	9184.332	52.763	-.102	1.000
8	9237.143	52.812	-.102	1.132
9	9312.957	75.814	-.146	1.024
10	9392.922	79.964	-.154	1.026
11	9477.172	84.251	-.162	1.178
12	9586.449	109.277	-.210	1.014
13	9697.612	111.163	-.214	1.176
14	9829.591	131.979	-.254	1.030
15	9964.973	135.382	-.261	1.002

a. The changes are from the previous number of clusters in the table.

b. The ratios of changes are relative to the change for the two cluster solution.

c. The ratios of distance measures are based on the current number of clusters against the previous number of clusters.

Appendix 9: Dummy variables created

Variable		Description
Age1	(0 = 35 or younger, 1 = older than 35)	Dummy variable for Age
Age2	(0 = 44 or younger, 1 = older than 44)	Dummy variable for Age
Age3	(0 = 54 or younger, 1 = older than 54)	Dummy variable for Age
Age4	(0 = 64 or younger, 1 = older than 64)	Dummy variable for Age
NINV1	(0 = less than 4 investments, 1 = 4 or more investments)	Dummy variable for Investment experience
NINV5	(0 = less than 7 investments, 1 = 7 or more investments)	Dummy variable for Investment experience
NINV10	(0 = less than 10 investments, 1 = 10 or more investments)	Dummy variable for Investment experience
INV1	(0 = investing for less than 1 year , 1 = Investing for 1 year or more)	Dummy variable for Investment experience
INV5	(0 = investing for less than 5 years , 1 = Investing for 5 years or more)	Dummy variable for Investment experience
INV10	(0 = investing for less than 10 years , 1 = Investing for 10 years or more)	Dummy variable for Investment experience
Synd1	(0 = In a group for less than 1 year , 1 = In a group for 1 year or more)	Dummy variable for Syndication
Synd5	(0 = In a group for less than 5 years , 1 = In a group for 5 years or more)	Dummy variable for Syndication
Synd10	(0 = In a group for less than 10 years , 1 = In a group for 10 years or more)	Dummy variable for Syndication

Appendix 10: Elimination process

Variables not in the Equation				
		Score	df	Sig.
Variables	CAI	1.234	1	0.267
	CS	0.197	1	0.657
	CI	0.527	1	0.468
	CD	0.585	1	0.444
	CSY	0.048	1	0.826
	CRPS	0.362	1	0.547
	Age2	1.685	1	0.194
	INV5	0.291	1	0.59
	NINV2	0.421	1	0.516
	NINV3	0.56	1	0.454
	Synd5	0.398	1	0.528
	Gender	1.424	1	0.233
	Professional	0.013	1	0.909
	MB	1.068	1	0.302
	SME	0.244	1	0.622
	Board	1.178	1	0.278
	First_inv	0.111	1	0.739
	N_Synd	1.864	3	0.601
	N_Synd(1)	1.552	1	0.213
	N_Synd(2)	0.153	1	0.696
N_Synd(3)	1.104	1	0.293	
Crowdfunding	1.294	1	0.255	
Overall Statistics	16.552	21	0.738	

- a. Variable(s) removed on step 2: CSY.
- b. Variable(s) removed on step 3: Professional.
- c. Variable(s) removed on step 4: Synd5.
- d. Variable(s) removed on step 5: SME.
- e. Variable(s) removed on step 6: CS.
- f. Variable(s) removed on step 7: CRPS.
- g. Variable(s) removed on step 8: Gender.
- h. Variable(s) removed on step 9: CI.
- i. Variable(s) removed on step 10: N_Synd.
- j. Variable(s) removed on step 11: First_inv.
- k. Variable(s) removed on step 12: INV5.
- l. Variable(s) removed on step 13: CD.
- m. Variable(s) removed on step 14: Crowdfunding.
- n. Variable(s) removed on step 15: Board.
- o. Variable(s) removed on step 16: MB.
- p. Variable(s) removed on step 17: Age2.
- q. Variable(s) removed on step 18: CAI.
- r. Variable(s) removed on step 19: NINV2.
- s. Variable(s) removed on step 20: NINV3.

Appendix 11: Chi-square test - Block 1: Method = Backward Stepwise (Likelihood Ratio)

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	96.453	39	0
	Block	96.453	39	0
	Model	96.453	39	0
Step 2 ^a	Step	-0.001	1	0.978
	Block	96.453	38	0
	Model	96.453	38	0
Step 3 ^a	Step	-0.001	1	0.976
	Block	96.452	37	0
	Model	96.452	37	0
Step 4 ^a	Step	-0.001	1	0.97
	Block	96.45	36	0
	Model	96.45	36	0
Step 5 ^a	Step	-0.026	1	0.871
	Block	96.424	35	0
	Model	96.424	35	0
Step 6 ^a	Step	-0.092	1	0.762
	Block	96.332	34	0
	Model	96.332	34	0
Step 7 ^a	Step	-0.156	1	0.693
	Block	96.177	33	0
	Model	96.177	33	0
Step 8 ^a	Step	-0.294	1	0.588
	Block	95.883	32	0
	Model	95.883	32	0
Step 9 ^a	Step	-0.502	1	0.479
	Block	95.381	31	0
	Model	95.381	31	0
Step 10 ^a	Step	-2.706	3	0.439
	Block	92.675	28	0
	Model	92.675	30	0
Step 11 ^a	Step	-0.433	1	0.511
	Block	92.242	27	0
	Model	92.242	27	0
Step 12 ^a	Step	-0.887	1	0.346
	Block	91.355	26	0
	Model	91.355	26	0
Step 13 ^a	Step	-1.101	1	0.294
	Block	90.255	25	0
	Model	90.255	25	0
Step 14 ^a	Step	-1.421	1	0.233
	Block	88.834	24	0
	Model	88.834	24	0
Step 15 ^a	Step	-1.628	1	0.202
	Block	87.205	23	0
	Model	87.205	18	0

Step 16 ^a	Step	-1.3	1	0.254
	Block	85.905	22	0
	Model	85.905	17	0
Step 17 ^a	Step	-2.02	1	0.155
	Block	83.885	21	0
	Model	83.885	16	0
Step 18 ^a	Step	-1.719	1	0.19
	Block	82.166	20	0
	Model	82.166	15	0
Step 19 ^a	Step	-1.871	1	0.171
	Block	80.295	19	0
	Model	80.295	14	0
Step 20 ^a	Step	-0.559	1	0.455
	Block	79.736	18	0
	Model	79.736	13	0

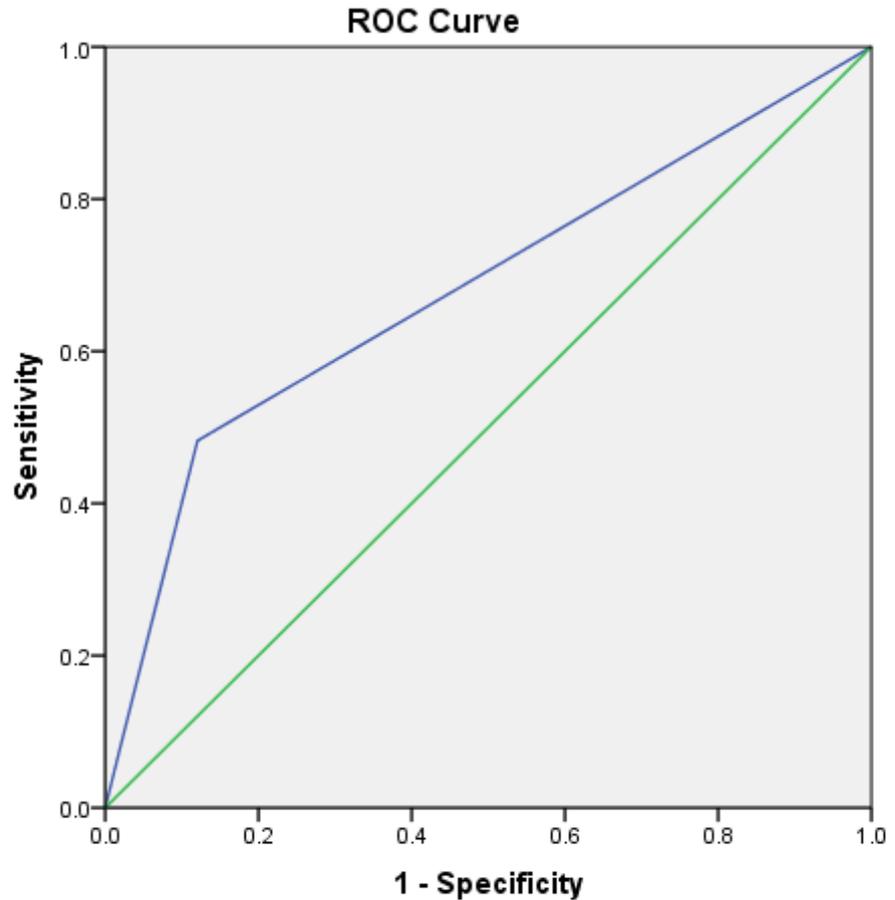
a. A negative Chi-squares value indicates that the Chi-squares value has decreased from the previous step.

Appendix 12: Pseudo R² for the 20 steps.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	4.752	8	0.784
2	4.566	8	0.803
3	4.568	8	0.803
4	4.339	8	0.825
5	8.402	8	0.395
6	9.734	8	0.284
7	11	8	0.202
8	6.642	8	0.576
9	3.395	8	0.907
10	7.256	8	0.509
11	2.977	8	0.936
12	13.187	8	0.106
13	7.015	8	0.535
14	7.291	8	0.506
15	8.278	8	0.407
16	6.075	8	0.639
17	8.723	8	0.366
18	8.526	8	0.384
19	9.817	8	0.278
20	10.36	8	0.241

Appendix 13: Roc Curve and Area Under the Curve statistics



Diagonal segments are produced by ties.

Area Under the Curve

Area Under the Curve

Test Result Variable(s): Predicted group

Area	Std. Error ^a	Asymptotic Sig. ^b	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
.673	.033	.000	.608	.738

The test result variable(s): Predicted group has at least one tie between the positive actual state group and the negative actual state group. Statistics may be biased.

a. Under the nonparametric assumption

b. Null hypothesis: true area = 0.5

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