Academic entrepreneurship and academics' careers: a multi-dimensional analysis in the UK, Australia and Italy

By

Giulia Giunti

A thesis submitted to the University of Birmingham
for the degree of DOCTOR OF PHILOSOPHY

Department of Management

Birmingham Business School

College of Social Sciences

University of Birmingham

March 2019

Abstract

This thesis aims to improve the understanding of *academic entrepreneurship, i.e.* academics' involvement in entrepreneurial activities, and how it is intertwined with academics' career prospects, interests, and orientations. To do so, the study adopts a micro-meso-macro level analysis, looking at individual variables, as well as how the individual interacts with the contexts in which is embedded. In order to enhance the possibility of exploring the role of each of the three dimensions and their interaction, the study has followed a cross-country comparative design; academics from the STEM sciences were recruited from three research-intensive universities, located in the U.K., Australia and Italy. A sequential mixed-method approach has enabled analysis of both the impact of individual attitudes upon AE, as well as how factors such as work-identity management processes, disciplinary norms, career stage, sex, support received, and career promotion criteria influence academics' perceptions of the boundaries of 'science and business'.

The outcomes provide valuable insight regarding the implications of the move towards an 'entrepreneurial university', by considering the heterogeneity found across groups of academics and the divergencies across national contexts, but also by taking into consideration the persistence of certain traditional values and ethos within academia, as found across all three countries.

Dedication

To my parents and my sister.

Acknowledgements

Having the possibility to embark in the present work has been an immense pleasure and an opportunity for which I want to thank various people who have contributed to it, in direct and indirect ways.

My first acknowledgements go to my supervisors. I would like to thank Prof. Jo Duberley, Dr. Matt Bennett, and Dr. Etlyn Kenny, for the invaluable support, from a professional and personal perspective. The suggestions, encouragement, and their positive attitude have nourished this work and sustained me during this journey. I also thank Dr. Victoria Hanna, for her support at the beginning of the project. I want to thank Prof. Leisa Sargent for having accepted me as visiting PhD student at the University of Melbourne, and for the inspiring meeting we had in Sydney, in which I realised the importance of 'different narratives'. Thank you to Prof. Angela Paladino and Dr. Sachiko Yamao for the time shared. A thank you also goes to Prof. Nigel King for the precious advices on template analysis; to Prof. Saunders for the tips on methods, Qualtrics, and many other suggestions; a thank to Prof. Briscoe for the useful information, and thank you Prof. Senis for the batteries!

I thank my mother, for her constant support, and the hugs in the morning. I thank my sister, because in the end she is the one who always believes in me, and she is my greatest fan. I thank my father, for everything, especially the critical thinking, for having taught me not to stop at the surface and the first information, but to search and substantiate my thoughts. I also thank him for the tepee, the spots on the moon, the acacia honey, the books, and that shrewdness that seems to characterise certain little birds. A special thank you to nonno Mario is unavoidable, because turning the light on and waiting for me at the door meant helping me to walk through.

I thank my friends and all those people who have been around for me. A special thank you to Lucrezia; sharing the moka for two in the morning was a metaphor of many things, ultimately our experiences. A big thank you to those special people, such as Gabriela, because being at my right side meant more than being desk mate (and I am not referring to those habits of us); thank you Sabina, I needed that hug, that day; you make your presence felt. Thank you Marie, for picking up the phone at night, and having being there for me, the right moment I needed it.Thank you Rohit, for your constant presence in my life, for the books (with unreadable dedications), for the dahl, for the famous nickname you gave me, and many other things. Thank you Francesca, an entire paragraph would be needed. I simply thank you here; for the rest, I will call you later. Thank you Mattia, I feel your hugs also when we are distant. A thank you to other friends: Andy, Carolina, Elisa, Valentina, Elham, Hedieh, and many other people who have contributed to my life, and with whom I will go have some wine; there is no need to list them here. This thesis was copy edited for conventions of language, spelling and grammar by Andy Jolly, Docuracy Ltd, Andrew Lowe, and Helen Joinson.

Table of Contents

Chapter 1. Introduction 1
1.1 Background 1
1.1.1 Analysis of the micro-dimension 3
1.1.1.1 Micro-factors 3
1.1.1.2. Analysis of micro-processes 6
1.1.2 The micro dimension ‘in contexts’ 7
1.2 Research questions 10
1.3 Contributions of the study 11
1.4 Thesis structure 13
Chapter 2. Literature Review 14
2.1 Introduction 14
2.2 The entrepreneurial university 14
2.3 Academic entrepreneurship: a definition 16
2.3.1 The ‘good’ and ‘bad’ faces of AE and the role of the individual 18
2.3.2 Academic entrepreneurship: influential factors 21
2.3.4 The individual dimension 22
2.3.4.1 Entrepreneurial alertness 22
2.3.4.2 Boundaryless careers: a theory in practice 26
2.3.4.3 Boundaryless careers: the concept and its development 26
2.3.4.4 Boundaryless career theory: a framework for academics’ careers 29
2.3.4.5 Boundaryless career mind-set as facilitating boundary crossing? 30
2.3.4.6 Analysis of micro-processes 33
2.3.4.7 Boundaries of academic work identity 34
2.3.5 Academic entrepreneurship: other influential factors 39
2.3.5.1 Academic entrepreneurship and discipline 39
2.3.5.2 Academic entrepreneurship: male and female academics difference 42
2.3.5.3 Academic entrepreneurship and seniority 44
2.3.5.4 Interaction terms 46
2.3.5.5 Academic entrepreneurship: hard and soft activities 47
2.3.5.6 Sex differences relating to soft forms of entrepreneurship 47
2.3.5.7 Seniority and soft forms of entrepreneurship 49
2.4 Summary 50
Chapter 3. Cross-Country Analysis 52
3.1 Cross-country design 52
3.2 The cases 54
3.2.1 U.K. 56
3.2.2 Australia 58
3.2.3 Italy 61

3.3 Summary 64
Chapter 4. Methodology 66
4.1 Mixed-methods approach 66
4.1.1 Philosophical assumptions 67
4.1.2 Sequential explanatory mixed-methods approach 69
4.2 Cross-cultural equivalence 73
4.3 Ethics 76
4.4 Summary 77
Chapter 5. Quantitative Investigation 79
5.1 Methods 79
5.1.1 The survey 79
5.1.1.1 The survey in Italy 82
5.2 Sampling and samples 82
5.3 Quantitative data analysis 86
5.3.1 The variables 86
5.3.1.1 Dependent variables 86
5.3.1.2 Independent variables 87
5.4 Analytical strategy 90
5.4.1 Regression models 91
5.5 Findings 92
5.5.1 Bivariate relationships 92
5.5.1.1 Scatterplots and correlations 92
5.5.1.2 T-tests and ANOVA 98
5.5.2 Regression 102
5.5.2.1 Academic entrepreneurship: a broad perspective 102
5.5.2.2 Academic entrepreneurship: hard and soft activities 107
5.5.2.3 Hard (or formal) activities 107
5.5.2.4 Soft (or informal) activities 109
5.5.3 Regression assumption 112
5.5.3.1 Heteroschedasticity 112
5.5.3.2 Multicollinearity 112
5.6 Discussion 113
5.6.1 Academic entrepreneurship: a broad perspective of its predictors 113
5.6.2 Hard and soft activities: differential effects 118
5.6.3 Interaction effects 121
5.7 Summary 122
Chapter 6. Qualitative Analysis 124
6.1 Methods 124
6.1.1 Semi-structured interviews 124
6.2 Sampling and samples 126

6.3 Qualitative data analysis: analytical approach 134
6.3.1 Thematic analysis 134
6.3.1.1 Template analysis 135
6.3.1.2 Template development 136
6.3.2 Quality check 141
6.4 Summary 142
Chapter 7. Qualitative Analysis: Findings 143
7.1 U.K. 144
7.1.1. Academics with entrepreneurial experience 144
7.1.1.1. Academic entrepreneurship: drivers and benefits 145
7.1.1.2. Constraining factors and downsides 148
7.1.1.3. Typologies 151
7.1.2. Non-entrepreneurial academics 160
7.2 Australia 163
7.2.1 Academics with entrepreneurial experience 163
7.2.1.1 Academic entrepreneurship: drivers and benefits 163
7.2.1.2 Constraining factors 166
7.2.1.3 Typologies 167
7.2.2 Non-entrepreneurial academics 172
7.3 Italy 175
7.3.1. Academics with entrepreneurial experience 175
7.3.1.1. Academic entrepreneurship: drivers and benefits 175
7.3.1.2. Academic entrepreneurship: constraining factors 176
7.3.1.3 Typologies 178
7.3.2 Non-entrepreneurial academics 183
7.4 Summary 185
Chapter 8. Typologies of scientists 187
8.1 Work identity and boundaries of identity 187
8.2 Typologies identified across countries 189
8.2.1 The academic and entrepreneur 193
8.2.2 The open academics 199
8.2.3 The mixed 206
8.2.4 The distant/instrumental 213
8.2.5 The leavers 218
8.2.6 The curious 221
8.2.7 The reluctant 225
8.3 Summary 226
Chapter 9. Quantitative and qualitative findings 230
9.1 A multi-dimensional perspective 230
9.1.1 Macro dimension 232

9.1.1.1 Government and policy-makers' initiatives 233
9.1.1.2 Socio-cultural aspects 235
9.1.1.3 Level of industrialisation 239
9.1.1.4 Research orientation 240
9.1.1.5 Labour market 241
9.1.2 Meso dimension 244
9.1.2.1 Training, support on practical aspects, and exposure 245
9.1.2.2 Workload 250
9.1.2.3 Recognition 253
9.1.2.4 Career stage 255
9.1.3 Micro dimension 258
9.1.3.1 Individual factors 259
9.2 Summary 271
Chapter 10. Conclusions 273
10.1 Introduction 273
10.2 Contributions 273
10.3 Practical implications 281
10.4 Methodological contribution 286
10.5 Limitations and future directions 289
Appendices 292
Survey AE and careers 292
Interview Guide 304
Bibliography 309

List of Figures

Figure 4.1. Cross-country sequential explanatory mixed-method approach 72
Figure 5.1. Scatter plot relating entrepreneurial alertness and academia-industry involvement 93
Figure 5.2. Scatter plot relating BC mind-set and academia-industry involvement..... 94
Figure 9.1. A multi-dimensional model of AE 230
Figure 9.2. Macro, meso and micro dimensions in detail..... 231
Figure 9.3. Macro dimension – main aspects 232
Figure 9.4. Meso dimension – main aspects..... 245
Figure 9.5. Micro dimension – main aspects..... 259

List of Tables

Table 1.1. Structure of the thesis 13
Table 5.1. Respondents and response rates 85
Table 5.2. Respondents and response rates by sex, discipline, and role 85
Table 5.3. Descriptive statistics for dependent and independent variables 89
Table 5.4. Correlation matrix between key variables 97
Table 5.5. T-tests between key variables 101
Table 5.6. Results of the linear regression models 106
Table 5.7. Results of linear regression for ‘hard’ and ‘soft’ entrepreneurial activities 111
Table 6.1. Interviewees from the British university 129
Table 6.2. Interviewees from the Australian university 131
Table 6.3. Interviewees from the Italian university 133
Table 6.4. First template for the U.K. 137
Table 8.1. Typologies of scientists (Groups 1 to 4) 191
Table 8.2. Typologies of scientists (Groups 4 to 7) 192
Table 8.3. The academic and entrepreneur (Group 1) 193
Table 8.4. The open academics (Group 2) 200
Table 8.5. The mixed (Group 3) 207
Table 8.6. The distant/instrumental (Group 4) 213
Table 8.7. The leavers (Group 5) 218
Table 8.8. The curious (Group 6) 222
Table 8.9. The reluctant (Group 7) 225
Table A1. Results of the robust linear regression models 302
Table A2. Results of the robust linear regression for ‘hard’ and ‘soft’ entrepreneurial activities 303
Table A3. Final template for the U.K. university 306
Table A4. Final template for Australia 307
Table A5. Final template for Italy 308

Abbreviations

AE	Academic Entrepreneurship
AIH	Academia-Industry Hard entrepreneurial activities
AIS	Academia-Industry Soft entrepreneurial activities
AURIL	Association of Research and Industrial Links
BC	Boundaryless Career
EA	Entrepreneurial Alertness
ERA	Excellence in Reseach Australia
IPRs	Intellectual Property Rights
NPM	New Public Management
OECD	The organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
TTOs	Technology transfer offices
RQs	Research Questions
RQF	Research Quality Framework
STEM	Science, Technology, Engineering and Matehmatics
TA	Template Analysis
TDM	Tailored Design Method
VIF	Variance Inflation Factor
VQR	Valutazione Qualità della Ricerca
VTR	Valutazione Triennale della Ricerca

Chapter 1. Introduction

1.1 Background

The past few decades have been characterised by increased interest from scholars and policy makers in what has been defined as *academic entrepreneurship* (hereafter AE). This refers to academics' involvement in knowledge and technology transfer activities and the commercialisation of science (e.g. Etzkowitz, 1983; Etzkowitz *et al.*, 2000; Shane, 2004; Siegel and Wright, 2015; Hayter *et al.*, 2018). This however is not a completely new phenomenon. In some disciplines, such as the natural sciences, evidence of these activities dates back to the 17th century (Etzkowitz, 1998); however it seems that this phenomenon has in recent years spread to more disciplines (e.g. Castro-Martínez, Molas-Gallart and Olmos-Peñuela, 2010; Philpott *et al.*, 2011; Cherney *et al.*, 2012; Hazelkorn, 2014; Olmos-Peñuela, Castro-Martínez and D'Este, 2014; Olmos-Peñuela, Benneworth and Castro-Martínez, 2015), expanding across countries (Wright *et al*., 2007; Göktepe-Hultén and Mahagaonkar, 2010; Grimaldi *et al*., 2011; Rolfo and Finardi, 2014; Baldini, Fini and Grimaldi, 2015; Kalar and Antoncic, 2015; Munari *et al*., 2016; Davari *et al*., 2018; Sá, Dias and Sá, 2018; Tseng, Huang and Chen, 2018). Etzkowitz (2001, p. 21) argues that universities have assumed a 'new entrepreneurial role', whereby 'academic science is being transformed into an economic as well as intellectual endeavour'. The *entrepreneurial university* (Etzkowitz, 1998; Etzkowitz *et al*., 2000, 2008) is characterised by closer academia–industry links and increasing emphasis on transferring knowledge and technology from academia to the *external world*, also defined as 'third mission'. According to Etzkowitz and Leydesdorff (1995), academia increasingly plays a central societal role, forming a 'Triple helix' along with the state and industry. The pillars of this tripartite academia–

industry–state model are considered to promote social growth and development (Etkowitz, 2003; Etzkowitz *et al*., 2008).

This transformation has attracted the interest of various scholars analysing the antecedents and outcomes of AE (e.g. D'Este and Patel, 2007; D'Este and Perkmann, 2011; Clarysse, Tartari and Salter, 2011; Grimaldi *et al*., 2011; Goethner *et al*., 2012; Perkmann *et al*., 2013; Kochenkova, Grimaldi and Munari, 2016; Abreu and Grinevich, 2017; Filippetti and Savona, 2017; Balven *et al*., 2018; Hayter et al., 2018). Scholarship on AE has long focused on contextual factors as catalysts of entrepreneurial processes within academia, such as specific policies and departmental-level support (e.g. Rasmussen, Mosey and Wright, 2014), and especially the role of technology transfer offices (TTOs) (Bercovitz *et al*., 2001; Debackere and Veugelers, 2005; Link and Siegel, 2005; Lockett and Wright, 2005; Muscio, 2010; Clarysse, Tartari and Salter, 2011; Algieri, Aquino and Succurro, 2013; Goel and Göktepe-Hultén, 2017).

Although these studies have shed light on the role of contextual elements in AE, the literature on the topic is patchy regarding the 'micro-foundations of academic entrepreneurship' (Jain, George and Maltarich, 2009, p. 922). However, previous studies suggest that individual scientists play a key role in the AE process (e.g. Mallon, Duberley and Cohen, 2005; Lam, 2010, 2011; Meek and Wood, 2016; Filippetti and Savona, 2017; Balven *et al*., 2018). In particular, these studies highlight the importance of individual abilities, skills and mind-sets (e.g. Clarysse, Tartari and Salter, 2011; Goethner *et al*., 2012; Miranda, Chamorro-Mera and Rubio, 2017), as well as how individual scientists themselves make sense of the possibility of embracing an entrepreneurial role which raises questions relating to work identity (Cohen, Duberley and Mallon, 2004; Pratt, Rockmann and Kaufmann, 2006; Dutton, Roberts and Bednar, 2010; Göktepe-Hultén and Mahagaonkar, 2010; Meek and Wood, 2016).

The literature has started to shed light on the critical role of these two aspects, although evidence is still patchy (Balven *et al*., 2018; Miranda, Chamorro and Rubio, 2018). This gap not only negatively affects the topic from a theoretical perspective, but also has important practical implications. The expansion of AE as a field of research and as a phenomenon in universities has resulted in investments by universities to foster this process, often focusing on the above-mentioned contextual factors, such as TTOs. However, studies have questioned the effectiveness of such services, emphasising the importance of analysing what happens at the micro level, since evidence suggests that this is a key dimension for AE (e.g. Clarysse, Tartari and Salter, 2011; Balven *et al*., 2018). Therefore, focusing exclusively on macro and/or meso factors may be ineffective for the promotion of an entrepreneurial university, and ultimately a waste of resources (Clarysse, Tartari and Salter, 2011; Balven *et al*., 2018).

The rise of this phenomenon, the speed with which it has diffused, and the increase in related literature (for a review, see Hayter *et al*., 2018), as well as how it affects academics' working lives (e.g. Harley, Muller-Camen and Collin, 2004; Duberley, Cohen and Leeson, 2007; Winter, 2009; Grimaldi *et al*., 2011; Philpott *et al*., 2011; Smith, 2012; Ylijoki and Ursin, 2013; Balven *et al*., 2018), make it timely to review the topic (Siegel and Wright, 2015). Insights from this study may help policy makers and governments to improve proposed initiatives in this regard. As this thesis will show, gaps in the implementation phase of the third mission are present in countries across continents, signalling a need for change.

1.1.1 Analysis of the micro-dimension

1.1.1.1 Micro-factors

In line with these considerations, this study aims to extend the literature by analysing the role of micro-factors and 'micro-processes' (Balven *et al*., 2018, p. 22) underpinning AE. The former includes individual-level variables, and particularly entrepreneurial alertness

(Kirzner, 1973; Tang, Kacmar and Busenitz, 2012) and the boundaryless career (hereafter BC) mind-set (Briscoe, Hall and DeMuth, 2006). Entrepreneurial alertness is defined as the ability to notice, evaluate and exploit opportunities with business potential, while BC mind-set as the ability to cross organisational and/or role boundaries. These two elements are considered to be interesting and relevant aspects for investigation, as both are connected with entrepreneurship. Recent studies of entrepreneurial alertness have particularly increased in the recent years, showing a significant effect of this attitude in promoting entrepreneurial behaviour (Langowitz and Minniti, 2007; Cui *et al*., 2016; Ho *et al*., 2018; Roundy *et al*., 2018; Neneh, 2019). However, specifically in regard to AE the literature is very scant on the topic. While emphasis has been placed on investigating individual factors, studies have tended to focus on individual features such as differences between sexes (e.g. Abreu and Grinevich, 2013, 2017) and seniority within the university (Haussler and Colyvas, 2011; D'Este and Patel, 2007), as discussed in more detail in Chapter 2, but have rarely investigated cognitive abilities and attitudes. Only more recently has research started to incorporate such a focus (e.g. Goethner *et al*., 2012; Miranda, Chamorro-Mera and Rubio, 2017). Regarding entrepreneurial alertness, Clarysse, Tartari and Salter (2011) demonstrate that the ability to notice and seize opportunities with business potential is a fairly strong predictor of academics' entrepreneurial behaviour. However, despite their positive evidence, their study is unique in making a contribution to the literature on AE regarding this individual element This constitutes a theoretical gap and suggests that further insight into this aspect may provide useful information from a practical perspective. For instance, studies have argued that specific training may be effective in improving cognitive skills and abilities (e.g. Markman and Baron, 2003), including entrepreneurial alertness (Valliere, 2013; *Ho et al*., 2018; Neneh, 2019). This may provide original practical insights by suggesting alternative

and innovative initiatives that might be implemented in universities to foster AE, in line with the previously-mentioned partial role of TTOs and the claimed need to re-focus on the individual.

Similar considerations relate to the BC mind-set (Briscoe, Hall and DeMuth, 2006). As briefly introduced above, links between boundaryless careers, academic careers and entrepreneurship are not new. Studies that have adopted the concept refer to entrepreneurship as a boundary-crossing activity (Hytti, 2010; Ylijoki and Ursin, 2013; Marshall, 2016), which implies moving across organisations, employers, and often roles, while acquiring new skills and abilities (Arthur and Rousseau, 1996). It has been argued that having a BC mind-set may sustain this process since 'a person with a boundaryless career attitude is characterized by high mobility and prefers to navigate physically and/or psychologically across many organizations' (Volmer and Spurk, 2011, p. 208).

It has therefore been hypothesised that a BC mind-set may also help academics in the process of knowledge and technology transfer by supporting boundary-crossing behaviour. Some studies confirm the link between boundaryless careers and entrepreneurial intentions (Chan *et al*., 2012; Uy *et al*., 2015; Marshall, 2016). However, despite promising results, empirical evidence is still scant, especially in the context of academia. The availability of a scale to measure the BC mind-set (see Briscoe, Hall and DeMuth, 2006), and the scope of this study to explore the micro-factors underpinning AE make this a relevant and insightful research direction. The results may not only contribute further empirical evidence to the literature (Marshall, 2016), but may also provide practical insights. Like entrepreneurial alertness, the BC mind-set is an attitude rather than a trait, and thus is subject to change, triggering consideration of how it might be developed (Briscoe, Hall and DeMuth, 2006).

1.1.1.2. Analysis of micro-processes

In this thesis, the term 'micro-processes' refers to individuals' sense-making of phenomena, in this case how scientists process and interpret the rise of an entrepreneurial ethos in universities, and particularly how they make sense of it in relation to their careers. As discussed in more detail throughout this work, previous studies have argued that the entrepreneurial university has had a significant impact on academics' working lives, involving not only a re-assessment of activities at work, but also a process of identity modification (e.g. Jain, George and Maltarich, 2009; Gulbrandsen, 2005; Meek and Wood, 2016). However, studies also report great variation among academics regarding the extent to which this process is enacted, with critical implications for individual scientists, AE outcomes, and universities as a whole (e.g. Ambos *et al*., 2008; Philpott *et al*., 2011; Balven *et al*., 2018).

In particular, it emerges that while some academics positively embrace the possibility of incorporating an entrepreneurial role into their academic roles repertoire, others reject it, questioning their role in the university and what it might entail, and ultimately also the role of universities in society (e.g. Duberley, Cohen and Leeson, 2007; Jain, George and Maltarich, 2009; Lam, 2010, 2011; Philpott *et al*., 2011; Gulbrandsen, 2005; Meek and Wood, 2016). The complexity, variety and sometimes contradictory findings of these works signal that academics are navigating through a tumultuous 'sea of change' (Meek and Wood, 2016, p. 1093): the 'entrepreneurial wave' (Etzkowitz, 2015, p. 9) has indeed opened the door to opportunities, but has also triggered new imperatives and challenges. A comprehensive evaluation of how individual scientists are, to continue the metaphor, 'swimming' in these waters is an urgent issue, given the recent rise and global expansion of this trend (e.g. Göktepe-Hulten and Mahagaonkar; 2010; Kalar and Antoncic, 2015; Huszár,

Prónay and Buzás, 2016; Fini and Grimaldi, 2017; Miranda, Chamorro-Mera and Rubio, 2017, 2018; Balven *et al*., 2018; Hayter *et al*., 2018).

1.1.2 The micro dimension 'in contexts'

While this study aims to shed light on the role of the individual, the analysis has been undertaken 'in context', or rather in multiple 'contexts'. As claimed by various scholars, AE is a complex and multifaceted phenomenon, influenced by a variety of factors (e.g. Lam, 2010, 2011; Grimaldi *et al*., 2011; Philpott *et al*., 2011; Filipetti and Savona, 2017; Fini and Grimaldi, 2017; Balven *et al*., 2018). While individual scientists, with their attitudes, skills (e.g. Clarysse, Tartari and Salter, 2011; Goethner *et al*., 2012; Neneh, 2019) and motivations (e.g. D'Este and Patel, 2007; Göktepe-Hulten and Mahagaonkar; 2010; D'Este and Perkmann, 2011; Lam, 2010, 2011; Philpott *et al*., 2011; Perkmann *et al*., 2013; Huszár, Prónay and Buzás, 2016; Balven *et al*., 2018), are indeed key actors, the contexts in which individuals work have the power to influence their actions (e.g. Giddens, 1984; Cohen, Duberley and Mallon, 2004; Duberley, Cohen and Mallon, 2006; Cohen and Duberley, 2015). The 'contexts', in terms of both national and institutional environments (specific universities), may shape the forms that AE assumes, through the support provided and the specific policies in place, as well as the structure of academics' careers and AE initiatives in different national contexts (e.g. Klofsten and Jones-Evans, 2000; Harley, Muller-Camen and Collin, 2004; Etzkowitz *et al*., 2008; Grimaldi *et al*., 2011; Kalar and Antoncic, 2015; Fini and Grimaldi, 2017). Failing to consider these macro-meso-micro dynamics will result in misleading and partial accounts of how AE unfolds.

The importance of contextual analysis is relevant not only to AE, but also to this study's focus on careers. Scholars highlight the importance of analysing scientists' pathways in relation to the various contexts (institutional, national, professional) in which careers unfold

(Cohen, Duberley and Mallon, 2004; Duberley, Cohen and Mallon, 2006). All these domains have been documented as influential on individual trajectories, shaping the degree to which careers are *boundaryless* (Rodrigues, Guest and Budjanovcanin, 2016). The idea that in recent decades careers have assumed a boundaryless nature, characterised by greater mobility across employment conditions, organisations and roles (Arthur and Rousseau, 1996; Sullivan and Arthur, 2006), has raised debate (Arthur, 2014) and attracted both positive (Briscoe, Hall and DeMuth, 2006; Briscoe and Finkelstein, 2009; Lo Presti, Nonnis and Briscoe, 2011; Gerli, Bonesso and Pizzi, 2015) and negative critique (Pringle and Mallon, 2003; Inkson, 2006; Dany, Louvel and Vallette, 2011; Inkson *et al*., 2012; Laudel, Bielick and Gläser, 2015; Rodrigues, Guest and Budjanovcanin, 2016).

As discussed later, neither the link between academics' careers and the BC theory, nor between the BC theory and entrepreneurship are new (Arthur and Rousseau, 1996). However, the rise of the entrepreneurial university has triggered emerging interest in the topic, with AE being seen as a boundary-crossing activity requiring academics to cross organisational and role boundaries (Ylijoki and Ursin, 2013). However, some scholars argue not only that academics' careers have always incorporated a degree of *boundarylessness* (Baruch and Hall, 2004), but also that the extent to which academics' careers are becoming more boundaryless owing to the rise of the entrepreneurial university must to some extent be re-framed. Aspects of national contexts (e.g. Harley, Muller-Camen and Collin, 2004; Kaulisch and Enders, 2005; Inkson, 2006; Duberley, Mallon and Cohen 2006), as well as individual elements (Arthur and Sullivan, 2006; Dany, Louvel and Vallette, 2011; Rodrigues, Guest and Budjanovcanin, 2016, Ylijoki and Ursin, 2013; Ylijoki and Henriksson, 2017) shape the boundaryless or 'bounded' (Dany, Louvel and Vallette, 2011, p. 971) nature of careers. Studies show that the extent to which AE is perceived as boundary-

crossing is complex and multifaceted (e.g. Cohen, Duberley and McAuley, 1999; Lam, 2010, 2011) and cannot be fully understood in terms of a boundaryless or 'boundaried' duality (Dowd and Kaplan, 2005, p. 699), but must be considered as being on a continuum incorporating varying degrees of both (Cohen, Duberley and Mallon, 2004; Dany, Louvel and Vallette, 2011). This is due to the complexity of the discourse on 'science and business' (Lam, 2010, p. 317) and how these two worlds and their norms and values can be integrated (Cohen, Duberley and McAuley, 1999; Duberley, Cohen and Leeson, 2007; Lam, 2010). Thus, only a contextual analysis of these topics will provide the rounded picture required for a meaningful understanding of AE and how it relates to academics' careers (Cohen, Duberley and Mallon, 2004; Duberley, Mallon and Cohen, 2006).

This study therefore applies multi-dimensional analysis, as suggested by previous research (Phan and Siegel, 2006; Ambos *et al*., 2008; Glenna *et al*., 2011; Grimaldi *et al*., 2011; Urbano and Guerrero, 2014; Kalar and Antoncic, 2015; Filippetti and Savona, 2017), thereby addressing a 'significant gap in the literature' regarding a 'multi-level perspective' on AE (Fini and Grimaldi, 2017, p. 10). The analysis takes into consideration three dimensions: the individual (micro-level), the university context (meso-level) and the national context (macro-level). This multi-dimensional analysis is relevant to disentangling the role of various factors underpinning AE, while at the same time providing a much-requested holistic perspective.

In order to better appreciate the role of the various 'contexts', a cross-country comparative design was adopted for this study. As explained in detail in Chapter 3, three universities located in the U.K., Australia and Italy were selected as cases. Given the similar pressures toward entrepreneurial universities faced by these countries in recent decades, but with divergent institutional and national contexts, these cases were selected to provide insights

into macro-meso-micro dimensions. By looking at convergence or divergence in outcomes, the study aims to provide insights into the 'universality' or over-arching effect of certain factors in the case of convergence, or how certain dynamics and/or factors are context-specific in the case of divergence. Although, as previously mentioned, AE has diffused across various disciplines, this study focuses on the STEM sciences, within which there is a longer tradition (e.g. Abreu and Grinevich, 2017). This strategic decision was taken to enhance the possibility of appreciating the phenomenon and its multifaceted aspects, despite some limits to such an exclusive focus, as discussed in Chapter 10.

1.2 Research questions

In line with the research aims outlined earlier, the following research questions (RQs) were developed:

RQ1: What factors and processes underpin academic entrepreneurship?

RQ2: What is the influence of individual variables on academic entrepreneurship?

Given the focus on two specific individual factors, two sub-questions were formulated, linked to question 2:

RQ2a: What is the influence of entrepreneurial alertness on academic entrepreneurship?

RQ2b: What is the influence of a boundaryless career mind-set on academic entrepreneurship?

RQ3: How do academics experience and manage the possibility of involvement in entrepreneurial activities?

In order to address these questions, a mixed-methods approach was adopted (Tashakkori and Teddlie, 2003), which served to address the diverse nature of the research aims. Specifically, a sequential explanatory mixed-methods strategy was conducted (ibid.), starting with a

quantitative analysing, and continuing with a qualitative investigation. Given the dominance of mono-method studies in the literature, this mixed-methods approach may also make a methodological contribution to advancing understanding of the topic by overcoming the weaknesses of quantitative or qualitative methods alone (e.g. Miranda, Chamorro and Rubio, 2018; Mathisen and Rasmussen, 2019).

1.3 Contributions of the study

While some considerations have already been briefly mentioned, this study aims to make the following contributions:

- To provide further evidence on the influence of individual-level factors on academics' entrepreneurial behaviour, in order to fill the gap between the general literature on entrepreneurship and that on AE, while providing more solid knowledge of the factors underpinning AE, and expanding the focus from the meso to the micro level.
- To provide much-sought insights into academics' subjective understandings of the entrepreneurial university, and how they experience involvement in entrepreneurial activities, especially in relation to their careers.
- To furnish insights into the role of context(s) in shaping AE, as well as academics' careers, thus providing a multi-dimensional perspective on AE.
- To make a practical contribution through the outcomes to the issues above described. Policy makers might use the insights furnished to revise their AE initiatives. This might entail reconsidering their heavy investments in TTOs, and turning their attention to the micro level, i.e. the individual scientist. It might also entail amending their policies and practices in relation to how the entrepreneurial university model has been implemented, in light of gaps emerging from the study.

- Through cross-country comparative analysis, to contribute to a multi-dimensional model of AE, and to provide insights into issues that may affect universities and academics across different institutional and national contexts, in similar or diverging ways, and thereby shed light on appropriate levels for intervention.
- To make a methodological contribution, both through the less-frequently adopted multi-dimensional outlook and cross-country analysis, and also through the use of questionnaires adopted previously in other sectors and in other languages. As explained in detail in Chapter 4, the cross-country nature of the study required adaptation of the methods to differing contexts, specifically in terms of language spoken. In so doing, the study offers instruments translated, back-translated and used in different linguistic contexts, which may be of use to future studies.

1.4 Thesis structure

The remainder of this thesis is illustrated in Table 1.1.

Table 1.1. Structure of the thesis

Chapter 2 reviews the relevant literature and provides a background to the study. The chapter is divided into two parts. The first is dedicated to the quantitative aspect of the study, outlining the specific literature that supported the development of hypotheses. The second addresses the qualitative aspect, referring to additional and specific literature.
In **Chapter 3** the three universities selected for the study and the rationales underpinning their choice are discussed.
Chapter 4 sets out the characteristics of and rationale for the adoption of a sequential explanatory mixed-methods approach, and discusses the philosophical assumptions underpinning it. It also briefly considers ethical issues in the research and the challenges of conducting comparative studies, but does not provide information on the specific methods, samples and sampling procedures adopted in the study. For clarity, these are discussed in separate chapters relating to the quantitative and qualitative parts of the study.
Chapter 5 presents the quantitative analysis, aiming to test the hypotheses outlined in Chapter 2, and focusing on the effect of individual-level variables on academics' entrepreneurial behaviour. The chapter provides an overview of the survey implemented in the study, the samples recruited, and the sampling technique followed. It also explains the analytical strategy adopted and the variables included in the analysis and discusses the findings comparatively.
In **Chapter 6**, methodological and analytical aspects of the semi-structured interviews conducted in the study are outlined. This is followed by an explanation of the thematic approach adopted, and particularly of the template analysis method, including an overview of the template development process, concluding with some consideration of how to ensure quality in qualitative research.
Chapter 7 presents the findings from the qualitative interviews conducted in the three selected universities, with separate sections for each country to highlight the specificities of each case. It also compares the findings from the three cases to highlight differences and recurrent themes.
Chapter 8 compares the findings from qualitative analysis of the three cases. It presents and discusses the identified typology of academics across the three universities in relation to how academics perceive AE as relating to their work identity, and the strategies they enact to manage this new demand.
Chapter 9 draws together the findings from the quantitative and qualitative analyses, providing a model to explain micro-meso-macro factors influencing AE, and focusing attention on dynamics across the three dimensions.
Finally, **Chapter 10** provides a general overview of the main findings and their relevance to the topic of study. It also presents the theoretical, empirical, methodological and practical contributions of this work, describes the limitations of the study, and makes suggestions for future research.

Chapter 2. Literature Review

2.1 Introduction

In order to establish the context of this study, this chapter provides an overview of the main literature on AE and academic careers. It begins by explaining the concepts of the entrepreneurial university and AE. It then discusses the main literature on AE, explaining the grounds for the hypotheses developed for the quantitative and qualitative investigations.

2.2 The entrepreneurial university

In the last three decades, universities in various countries have undergone a series of modifications in the management and organisation of knowledge production (Etzkowitz, 1983; Slaughter and Leslie, 1997; Wright *et al*., 2007; Etzkowitz and Ranga, 2008). Despite differences between national contexts (Harley, Muller-Camen and Collin, 2004; Capano, 2010; Etzkowitz *et al*., 2008; Kalar and Antoncic, 2015; Sá, Dias and Sá, 2018), these changes are underpinned by similar, and often interconnected, drivers. The origins of this transformative process lie largely in the post-World War II period, when a substantial increase in students and university staff (Geuna, 1999; Kaulisch and Enders, 2005; Meek and Wood, 2016) led to a need for more resources to sustain academic activity. These changes were coupled with a rise in new management models, and particularly the so-called New Public Management (NPM; Hood, 1991), the core principles of which include accountability and performance evaluation. The introduction of these values into the public sector and the need to generate more resources meant a shift in the way knowledge was conceived, with greater emphasis on control, monitoring and efficiency (Cohen, Duberley and McAuley, 1999; By, Diefenbach and Klarner, 2008; Chandler, Barry and Clark, 2002; Deem, Hillyard and Reed, 2008), as well as more applied types of science (e.g. Deem and

Brehony, 2005; Mallon, Duberley and Cohen, 2005). The latter also resulted from the development and expansion of new disciplines, such as computer science and molecular biology, characterised by a high level of practical applicability. This brought about changes in knowledge production, as the applied orientation of such fields implied tighter linkages with industry. In parallel, both Western and some Asian societies have become more knowledge-based (Geuna, 1999; Etzkowitz *et al.*, 2008; Audretsch, Lehmann and Paleari, 2015; Tseng, Huang and Cheng, 2018).

A key implication of all these changes has been the introduction into academia of forms of research assessment that are used to determine ever more competitive funding allocations (e.g. Mallon, Duberley and Cohen, 2005; Martin, 2011; Deem, Hillyard and Reed, 2008). In the U.K., for instance, since the 1980s various types of research evaluation mechanisms have been developed and refined, culminating in the current Research Excellence Framework (REF, 2021), an assessment system aimed at evaluating the quality of universities' research performance. Once heavily focused on the outcomes of pure research, research is nowadays also assessed in terms of its *impact* or contribution to socio-economic issues, which accounts for 20 per cent of the overall assessment. Further details of these forms of assessment are provided in Chapter 3.

Etzkowitz and Leydesdorff (1995) argue that these changes also meant a symbolic shift for universities, and their assumption of a more central role in society. The authors introduced the idea of the 'Triple Helix', a tripartite and dynamic system composed of state, industry and academia, the synergistic work of which will contribute to innovation and social wealth. Etzkowitz *et al*. (2008, p. 681) argue that at the heart of this model lies the concept of the 'entrepreneurial university', whereby academia has assumed a critical role in innovation and societal growth, with 'an economic mission, next to teaching and research, able to generate

new knowledge and stimulate employment and productivity' (p. 683). This so-called 'third mission' of universities (Etzkowitz, 1998; Etzkowitz *et al.*, 2008) is connected with what Gibbons *et al.* (1994) consider to be a shift in knowledge production from being exclusively intellectual, where theory and practice are considered as separate dimensions (defined as Mode 1), to a more practice-oriented and 'contextualised' production of knowledge (Mode 2) that is able to serve multiple and context-specific purposes within and outside academia, and is characterised by a combination of theory and practice. In Mode 2, knowledge production has become 'socially accountable' (Gibbons *et al.*, 1994, p. 3), being mutually related with the wider society to which must contribute.

All these transformations form the context for AE, in terms of academics' involvement in various forms of knowledge and technology transfer and science commercialisation activities (e.g. Siegel and Wright, 2015). The next section provides an overview of various scholars' development and use of the term. Differing terminologies are used in the literature; thus, to avoid confusion, the next section also explains how the term is used in this study and what it refers to.

2.3 Academic entrepreneurship: a definition

As stated by Clark (2007, p. 137) 'the expectation on universities to generate economic utility is now explicit, and this requires in large measure the commercialisation of university output'. The *commercialisation of science* is one terms used to describe the transfer of research discoveries into products that may have wider uses outside academia, and where economic returns are contemplated (Perkmann *et al.*, 2013). Whilst often used interchangeably with the term AE, in recent years many authors have observed that the transfer of knowledge and technology between academia and external organisations may pass through different channels, and that classic forms of the commercialisation of science,

such as patenting and licensing, are only *some* forms of AE (Fini, Lacetera and Shane, 2010; D'Este and Patel, 2007; Bercovitz and Feldman, 2008). Klofsten and Jones-Evans (2000) state that AE may refer to all activities that 'are outside the normally accepted duties of academics' (p. 300), i.e. teaching and research. Therefore, not only patenting and licensing, but also contract research, consulting, sales and testing products for non-academic partners can be grouped under the label of AE. However, the authors also distinguish between 'soft' and 'hard' entrepreneurship on the basis of the degree of formalisation required by the process of knowledge transfer. 'Soft' activities, as the term suggests, are characterised by less formalisation (as for contract research), compared with, for instance, the development of a patent (a 'hard' entrepreneurial activity), which requires strict following of rules and regulations and reliance on TTOs. A similar conceptualisation is proposed by Link, Siegel and Bozeman (2007) and Abreu and Grinevich (2013), who use the terms 'formal' and 'informal' activities. Perkmann *et al.* (2013) use an alternative definition, adopting the term 'academic engagement' to refer to what other authors label as 'informal' or 'soft', in order to differentiate from 'academic entrepreneurship', which they use exclusively for 'formal' or 'hard' types of activity.

While acknowledging these different terms and uses in the literature, in the present study, the generic term 'academic entrepreneurship' has been chosen as an umbrella term to refer to both 'formal' *and* 'informal' types of knowledge and technology transfer activities. This is because the study maintains a broad outlook on the topic, looking not only at certain activities, such as patenting, but at the vast range of knowledge and technology transfer activities in which academics may engage. Such a wide perspective is in line with the mainstream literature on the topic, which has often underlined the need to look at various activities, as a narrow focus may limit understanding of the broad-ranging trend that often

entails a variety of activities (D'Este and Patel, 2007; Link, Siegel and Bozeman, 2007; Perkmann and Walsh, 2007; D'Este and Perkmann, 2011; Abreu and Grinevich, 2013; Grimpe and Hussinger, 2013).

Nevertheless, the study does differentiate between activities because, as previously mentioned, different knowledge transfer activities imply different mechanisms. Previous studies report that the factors hypothesised as influencing AE may play different roles in the various entrepreneurial activities. Thus, looking in more detail at the different activities may prove insightful. In this regard, the present study also adopts the term 'hard' (or formal) activities for types of technology and knowledge transfer processes such as patenting, spinning out and licensing characterised by a high degree of formalisation and structure, which often require reliance on TTOs for 'knowledge protection' (Abreu and Grinevich, 2013). It uses the term 'soft' (or informal) activities to refer to all activities that pass through personal interactions rather than structured channels, such as consulting, contract research and joint research collaborations with industrial partners (Klofsten and Jones-Evans, 2000; Abreu and Grinevich, 2013). Chapter 5 provides more detail on the different types of activity.

2.3.1 The 'good' and 'bad' faces of AE and the role of the individual

As previously mentioned, among the main factors that have played a role in the expansion of the entrepreneurial university has been the need to overcome the shortage in resources for research that many universities worldwide have started to face in recent decades (e.g. Etzkowitz, 1983; Etzkowitz *et al.*, 2008; Rubens *et al.*, 2017). Studies have confirmed that, for scientists, increased funding for research is among the principal beneficial outcomes of AE (Gulbrandsen and Smeby, 2005; Van Looy, Callaert and Debackere, 2006; D'Este and Patel, 2007; Etzkowitz *et al.*, 2008; Geuna and Muscio, 2009; Nilsson, Rickne and

Bengtsson, 2010; Wu, Welch and Huang, 2015; Huszár, Prónay and Buzás, 2016; Tseng, Huang and Cheng, 2018). In some countries, economic returns from AE may also go direct to individual academics, for instance through royalties from patenting and licensing (Link and Siegel, 2005; Geuna and Nesta, 2006; Wood, 2011) or through the formation of spin-offs (e.g. Wood, 2011). The resources accessed may not only be monetary; for example, collaboration with industry may also enable academics to access equipment unavailable in their universities, which may in turn support research activity (e.g. Buenstorf, 2009; D'Este and Perkmann, 2011). Along with these 'tangible' benefits, it has been argued that academia–industry links may also serve a more intellectual function (Murray, 2002; Perkmann and Walsh, 2009; D'Este and Perkmann, 2011; Lam, 2010, 2011) and provide research with a more applied focus (Nilsson, Rickne and Bengtsson, 2010; Lam, 2011; D'Este and Perkmann, 2011; Huszár, Prónay and Buzás, 2016), opening the doors to potential research collaborations (Buenstorf, 2009; D'Este and Perkmann, 2011; Wood, 2011), as well as opportunities in industry for students (Lam, 2007, 2011; Huszár, Prónay and Buzás, 2016).

Notwithstanding the benefits associated with AE, critical views are also expressed in the literature. Baskaran and Boden (2004, p. 6) argue that increased pressure for knowledge and technology transfer activities signifies that knowledge is being transformed into a 'commodity', 'increasingly commercialised or marketised', with erosion of its traditional ethos of the open creation and dissemination of knowledge (Merton, 1968; Dasgupta and David, 1994). The rise of the entrepreneurial university has been criticised as leading to a permeation of academia by industry, with the risk that science shifts too far toward the applied side and the research focus is orchestrated by the needs of industry (Gulbrandsen and Smeby, 2005; Langley and Parkinson, 2009). This, in turn, is associated with a series of

detrimental consequences, such as delays in the publication of issues as a result of industrial disclosure agreements (Campbell *et al.*, 2002; Geuna and Nesta, 2006; Buenstorf, 2009), trade-offs between basic and applied research (Baskaren and Boden, 2004; Geuna and Nesta, 2006), and ultimately a transformation of the role of academics themselves (Jain, George and Maltarich, 2009; Lam, 2010, 2011; Gulbrandsen, 2005), who are now asked to 'align multiple roles within a single person' (Etzkowitz *et al.*, 2008, p. 691).

The 'good' and 'bad' faces of AE seem to be reflected in the variety of positions assumed by academics in relation to the entrepreneurial university. Studies report that while some scientists conceive AE as an opportunity and activity that may serve some of the purposes mentioned earlier and as compatible with their academic role, others perceive a dichotomy between science and entrepreneurship in terms of their values, scope and ethos (Duberley, Cohen and Leeson, 2007; Lam, 2010, 2011; Philpott *et al.*, 2011), and also their work identity (Pratt, Rockmann and Kaufmann, 2006; Winter, 2009; Lam, 2010; Dutton, Roberts and Bednar, 2010; Göktepe-Hultén and Mahagaonkar, 2012; Gulbrandsen, 2005; Meek and Wood, 2016).

This study extends the literature on this topic, with the aim of shedding light on the underlying factors and processes that make AE such a contentious process. As specified in Chapter 1, the core objective is to analyse the roles of individual scientists in AE, what may motivate whether or not they become involved in entrepreneurial activities, and what may facilitate or hinder this involvement. In order to shed light on the role of micro-factors underpinning AE, the next section discusses the literature on this aspect to explain the grounds for the hypotheses developed and the qualitative investigation. While the two analyses were conducted in sequence, as explained in Chapter 4, there are clearly overlaps

in the literature, and the hypotheses are embedded in discourses that also serve as background for the qualitative investigation.

2.3.2 Academic entrepreneurship: influential factors

As the emphasis on knowledge and technology transfer activities has expanded across countries, scholars have examined various factors that may facilitate or hinder these activities. Attention has long focused on contextual factors, and especially TTOs (e.g. Bercovitz *et al.*, 2001; Debackere and Veugelers, 2005; Lockett and Wright, 2005; Siegel, Veugelers and Wright, 2007; Muscio, 2010; Algieri, Aquino and Succurro, 2013; Munari *et al.*, 2016). This probably reflects the traditional way in which AE was initially conceived, referring to activities such as patenting and licensing (Siegel and Wright, 2015) for which formal mechanisms of knowledge transfer are required. Studies have also examined the size of universities' laboratories (Haussler and Colyvas, 2011), the availability of science parks (Siegel, Westhead and Wright, 2003; Degroof and Roberts, 2004; Phan, Siegel and Wright, 2005), policies and support at the departmental level (e.g. Rasmussen, Mosey, and Wright, 2014), levels of universities' scientific productivity (Van Looy *et al.*, 2011), entrepreneurial educational programmes (Grimaldi *et al.*, 2011) and departmental members' involvement in knowledge and technology transfer (Stuart and Ding, 2006; Bercovitz and Feldman, 2008; Tartari, Perkmann and Salter, 2014).

Although the evidence is indeed positive regarding the effect of context-related influences, some authors have called for reconsideration of factors that impact on AE, and one dimension that appears to have been omitted is the individual scientist. While the literature on general entrepreneurship has sought to capture the role of individual predispositions in entrepreneurship (e.g. Brockhaus, 1982; Baum and Locke, 2004; Baum, Frese and Baron, 2014; Antoncic *et al.*, 2015), the literature on AE has overlooked this aspect, at least in early

studies, although some research has emerged in this direction in recent years (Clarysse, Tartari and Salter, 2011; Goethner *et al.*, 2012; Obschonka *et al.*, 2015; Ferrero and Bessiere, 2016; Miranda, Chamorro-Mera and Rubio, 2017). This constitutes a theoretical gap, as introduced in Chapter 1, and insights into this dimension may also provide practical support. In line with these considerations, the analysis of this study focuses particularly on two individual attitudes – entrepreneurial alertness and the BC mind-set – as discussed in the next sections.

2.3.4 The individual dimension

2.3.4.1 Entrepreneurial alertness

The general entrepreneurship literature has tended to emphasise the role of individual factors, such as risk propensity (e.g. Zhao, Hills and Seibert, 2005), personal resilience (Stolz, 2000), self-efficacy (Chen, Greene and Crick, 1998; Zhao, Hills and Seibert, 2005), ability to tolerate ambiguity (Bhidé, 2000), and a proactive personality and creativity (Hansen, Shrader and Monllor, 2011), as positive predictors of successful entrepreneurship. These elements still dominate the literature on entrepreneurship, but in recent decades increasing emphasis has been placed on the concept of entrepreneurial alertness, which is described by Cui *et al.* (2016) as 'one of the most prominent influential factors of entrepreneurial capabilities' (p. 171). First introduced by Kirzner (1973), entrepreneurial alertness is conceived as a special 'attitude of receptiveness' (Kirzner, 1997, p. 72) or a special 'antenna' (Kirzner, 1973) which enables individuals who possess it to notice opportunities that have business potential. Crucial to this conceptualisation is the fact that these opportunities are not created in a vacuum; they already exist in the environment, but are largely ignored if the individual is not equipped with the necessary cognitive skills, such as alertness, to capture them. Elaborating on Kirzner (1973), Gaglio and Katz (2001) suggest

that entrepreneurial alertness is a mental schema that enables some individuals to notice changes and disequilibrium in the market, which may become a ground for business opportunities. Importantly, this mental schema is flexible and adjusts to environmental changes. According to the authors, typical of such a mind-set is a tendency to recognise patterns and look for accurate information. The tendency to search for information and ideas as part of entrepreneurs' alertness was already present in Kaish and Gilad's (1991) theorisation of 'opportunity identification', a term which often appears in conceptualisations of entrepreneurial alertness, and the two overlap with regard to the activities to which they refer. In analysing the behaviour of managers in the financial sector and entrepreneurs (founders of business companies) in the U.S., Kaish and Gilad (1991) noted that what significantly differentiated the latter from the former group was more information-seeking activity, often during off-work times such as on airplanes, and with non-familiar people. This activity has the effect of triggering unconventional ideas, which may lead to entrepreneurial ventures. For Baron (2006), the ability to identify opportunities is also linked to another process, pattern recognition, which is the ability to connect apparently unrelated objects, information and/or events into meaningful patterns (Matlin, 2002). According to Baron (2006), once information in the environment is identified, the next step leading to opportunity identification is the assembly of cues and information into prototypes, patterns or sets, which takes place only if the person possesses a particular cognitive framework.

McMullen and Shepherd (2006) further elaborate entrepreneurial alertness theory by introducing the idea of entrepreneurial action. They maintain that entrepreneurial behaviour involves not only noticing opportunities, but also making critical evaluations or judgments of their worth, on which subsequent action depends: 'Entrepreneurial perception can only be considered "entrepreneurial" when it produces action' (p. 145). Embracing both early and

more recent perspectives, the concept of entrepreneurial alertness has recently been refined and enriched by Tang, Kacmar and Busenitz (2012), who develop a conceptualisation of entrepreneurial alertness that includes three elements: 1) ability to scan the environment for information; 2) connections between disparate and disconnected information; and 3) judgments of the relevance of information as potential opportunities. This model is the most up-to-date conceptualisation of entrepreneurial alertness, and the authors have created a scale to assess it, which is adopted in the present work (see Chapter 5).

As the literature suggests, the concept of entrepreneurial alertness has evolved and become more complex over time. However, what is common to these theorisations is that entrepreneurial behaviour is associated with a personal ability to notice profitable opportunities in the environment that other people do not appreciate. Over time, studies have expanded empirical evidence on the topic. For instance, Langowitz and Minniti (2007) report a positive relationship between entrepreneurial alertness and venture creation. Makhbul's (2011) analysis of various factors that may lead to successful entrepreneurship reveals that the 'entrepreneur's ability to seize relevant information' (p. 116) which, as previously discussed, is a core aspect of entrepreneurial alertness, is the most influential predictor of entrepreneurial success. Adopting Tang, Kacmar and Busenitz's (2012) scale discussed above, Karabey's (2012) study of the thinking styles of various types of professionals finds that entrepreneurs are characterised by higher entrepreneurial alertness than accountants, and similar conclusions are drawn by Allinson, Chell and Hayes (2000) in a survey study of entrepreneurs and managers.

Jiao *et al.* (2014) found that knowledge acquisition processes, through social networks or management practices, are crucial activities for innovation. The process of knowledge acquisition appears to be positively influenced by entrepreneurial alertness. In other words,

if entrepreneurs are active in the process of knowledge searching, they increase their chances of successful entrepreneurship and 'innovativeness' (p. 501). However, this process is mediated by entrepreneurial alertness, which entails active scanning and judgment of the environment in searching for the right knowledge and information. 'Opportunity perception' is also found to be a positive predictor of entrepreneurship, particularly for nascent entrepreneurs (Arenius and Minniti, 2005), and Roundy *et al.* (2018) maintain that decision makers with high entrepreneurial alertness exert a positive influence on organisational performance and decision making.

Notwithstanding the evidence reported above, the AE literature appears largely silent on the influence of individual dimensions such as attitudinal predispositions. While some studies have focused on personal characteristics such as sex, seniority and age (as discussed later), the role of entrepreneurial alertness in driving academics' entrepreneurial behaviour has been largely overlooked. Clarysse, Tartari and Salter (2011) attempt to fill this gap by analysing the role of contextual and individual factors, and discover that while environmental elements such as TTOs play a role in promoting AE, individual factors explain the largest variance in academics' entrepreneurial behaviour. Among these factors, ability to recognise opportunities with business potential, i.e. 'opportunity recognition capacity' (Clarysse, Tartari and Salter, 2011, p. 1085), an alternative terminology for entrepreneurial alertness, emerges as the strongest predictor. However, their study is unique in making a contribution to the AE literature.

On the basis of the findings of the literature on entrepreneurship and on AE, this study aims to contribute evidence by investigating the role of this individual variable on academics' entrepreneurial behaviour. This leads to the following hypothesis:

H1: *Academics with high entrepreneurial alertness will be more involved in entrepreneurial activities than those with low entrepreneurial alertness.*

2.3.4.2 Boundaryless careers: a theory in practice

In order to expand investigation of the 'micro-foundations of academic entrepreneurship' (Jain, George and Maltarich, 2009, p. 922), this study aims to investigate the role of the BC mind-set (Briscoe, Hall and DeMuth, 2006). This term refers to the 'propensity and preference for working with other people and organizations across one's own organizational boundaries' (Briscoe and Finkelstein, 2009, p. 244). Studies have connected such a predisposition with entrepreneurship. Before discussing these works and their usefulness for AE, the next section provides a brief overview of the BC concept and how it applies to AE, especially in light of changes toward an entrepreneurial model in academia.

2.3.4.3 Boundaryless careers: the concept and its development

The term 'boundaryless career' has developed in recent years in relation to transformations in employment conditions that have affected various sectors, and especially those in the so-called knowledge economy that rely heavily on knowledge and intellectual abilities rather than on manual competences (Timonen and Paloheimo, 2008). Increasing globalisation, a related increase in market competition (Kalleberg, 2000), the emergence of dual-career couples (Arthur and Rousseau, 1996) and technological advancements (Bagdadli *et al.*, 2003) seem to have introduced new societal needs and working dynamics (Sullivan and Baruch, 2009). It has been argued that these changes have eroded the traditional linear and hierarchical employment pathway, and that careers are becoming more fragmented and temporary, i.e. boundaryless (Arthur and Rousseau, 1996). This term describes career pathways that 'may involve sequences of job opportunities that go beyond the boundaries of a single employment setting' (DeFilippi and Arthur, 1994, p. 307). In their early theorisation

of the boundaryless framework, Arthur and Rousseau (1996) used the concept to refer to pathways characterised by a high degree of mobility across firms and employers, where career advancements no longer follow the hierarchical within-firm pathway, but rely on external marketability and networks. In this conceptualisation, personal interests and values are also considered to play an important role in career moves.

Whereas the original definition of BC refers mainly to physical mobility across organisations, Sullivan and Arthur's (2006) refinement of the term maintains that the concept should include both a physical and a psychological component (or mobility), which is 'the perception of the capacity to make transitions' (p. 21) that transcend the presence or absence of physical boundaries. Physical and/or subjective components are not separate but can be seen as two poles of a continuum, and every individual may be characterised by different degrees of physical and/or psychological 'boundarylessness'.

This redefinition of BC has made a significant contribution to subsequent development of the topic. For instance, adopting Sullivan and Arthur's (2006) theorisation, Briscoe, Hall and DeMuth (2006) have developed the BC mind-set scale to assess people's propensity for physical and/or psychological moves across the boundaries of firms, employment settings and roles. In line with Sullivan and Arthur (2006), they maintain the importance of including both dimensions in the definition of BC, as career actors will vary in the attitude that they hold toward initiating and pursuing work-related relationships across organizational boundaries. This does not necessarily imply physical nor employment mobility. Thus a person with a decidedly high 'boundaryless' attitude toward working relationships across organizational boundaries is comfortable, even enthusiastic about creating and sustaining active relationships beyond organizational boundaries (Briscoe, Hall and DeMuth, 2006, p. 31). The BC framework has thus emerged as a theory, or metaphor (Inkson, 2006; Briscoe

and Finkelstein, 2009), to explain changes to employment conditions in recent decades, and especially in knowledge-economy areas.

Academia is part of the knowledge-economy sector. It has been argued that the introduction of an entrepreneurial ethos into academia has led to profound changes to academics' working lives (Cohen, Duberley and McAuley, 1999; Brown and Humphreys, 2006; By, Diefenbach and Klarner, 2008; Chandler, Barry and Clark, 2002; Duberley, Cohen and Leeson, 2007; Deem, Hillyard and Reed, 2008; Winter, 2009; Clarke, Knights and Jarvis, 2012; McInnis, 2012; Smith, 2012; Ylijoki and Ursin, 2013; Balven *et al.*, 2018), leading to increased fragmentation and instability of working conditions (Kaulisch and Enders, 2005; Clarke, Knights and Jarvis, 2012; Huszár, Prónay and Buzás, 2016), and academics being asked to assume multiple roles (Etzkowitz *et al.*, 2008; Jain, George and Maltarich, 2009; Lam, 2010, 2011; Gulbrandsen, 2005; Smith, 2012; Meek and Wood, 2016) in working across different organisational environments, such as those of academia and industry. According to Kaulisch and Enders (2005, p. 137):

> *'more and more academics face a situation where they are kindly invited to move from a bounded world of academe to a project of academic career and work living in multiple worlds with blurred boundaries which encompasses a growing emphasizes on the quasi-entrepreneurial role of academics'.*

In other words, it has been argued that just as universities are becoming more entrepreneurial, so are academics. While this may be the case, scholars have also argued for this assumption to be revisited, at least with regard to the extent to which it applies to all academics, and to what degree. Academics' openness to embracing an entrepreneurial role has been reported by previous studies; however, controversies, tensions and contradictions have been also signalled (e.g. Mallon, Duberley and Cohen, 2005; Duberley, Cohen and Leeson, 2007; Jain, George and Maltarich, 2009; Winter, 2009; Philpott *et al.*, 2011; Lam, 2010, 2011;

Gulbrandsen, 2005; Smith, 2012; Meek and Wood, 2016; Ylijoki and Henriksson, 2017). Previous research indicates that the extent to which AE is a boundary-crossing activity and the boundaries between science and business are blurred has emerged as a rather 'polysemic' discourse (Cohen, Duberley and McAuley, 1999, p. 473). These previous works highlight insightful directions for gaining a better understanding of the multiple factors and processes that make AE such a complex phenomenon. In particular, the critical interplay between AE and academics' careers and work-identity appears to have been challenged by the rise of the entrepreneurial university (e.g. Jain, George and Maltarich, 2009; Winter, 2009; Smith, 2012; Meek and Wood, 2016). In order to expand the discourse on this phenomenon, this study adopts the BC theory as a framework to explore academics' sense making of the boundaries of different roles and organisations.

2.3.4.4 Boundaryless career theory: a framework for academics' careers

Increased 'entrepreneurialism' (Duberley, Cohen and Leeson, 2007, p. 483) and 'managerialism' (Harley, Muller-Camen and Collin, 2004, p. 329), which have diffused into the higher education systems of various countries (e.g. Etzkowitz *et al.*, 2008; Winter, 2009; Philpott *et al*., 2011; Ylijoki and Ursin, 2013; Kalar and Antoncic, 2015), linked with the third mission, have affected universities in different ways. It has been claimed that academics nowadays move within an unstable and fragmented environment, especially in working conditions. An increase in 'alternative contracts' has been documented (Enders and Kaulisch, 2006, p. 85), as well as various forms of temporary employment arrangements in academia (Chait, 2002; Gappa, 2002; Ylijoki, 2010; Rhoades, 2012; Ylijoki and Ursin, 2013; Allmer, 2018). However, a more profound change relates to the entrepreneurial role that academics may assume nowadays (Etzkowitz, 2001; Kaulisch and Enders, 2005; Duberley, Cohen and Leeson, 2007; Jain, George and Maltarich, 2009; Lam, 2010, 2011; Gulbrandsen,

2005; Smith, 2012; Ylijoki and Ursin, 2013; Meek and Wood, 2016; Dugas *et al.*, 2018). Although it is suggested that careers in academia are becoming increasingly boundaryless, it is also argued that academia has always included a degree of boundarylessness (Baruch and Hall, 2004), since temporary employment conditions and the need to cross organisations, such as various research-type institutions, have been typical practices among academics. Therefore, it might be argued that the real change has been the introduction of an entrepreneurial model of academia. However, it is also claimed that elements of this ethos have always been present in academia, to some extent, as the need to translate research into societal endeavours is part of the traditional university ethos (Etzkowitz, 2003). What can be affirmed is that this trend now pervades universities more widely across countries (e.g. Etzkovitz *et al.*, 2008; Fini and Grimaldi, 2017; Hayter *et al.*, 2018), and that this has undeniably been a 'wave' (Etzkowitz, 2015, p. 9) for academics.

Previous studies show that academics have assumed a wide variety of positions in relation to the rise and expansion of the entrepreneurial model. This heterogeneity appears to reflect both individual and contextual factors (e.g. Duberley, Cohen and Leeson, 2007; Grimaldi *et al.*, 2011; Philpott *et al.*, 2011; Fini and Grimaldi, 2017; Balven *et al.*, 2018). Therefore, this study adopts a multi-dimensional analysis in order to gain a comprehensive understanding of the phenomenon. In terms of the individual, in addition to entrepreneurial alertness, the study also investigates the role of the BC mind-set in relation to AE, as discussed in the next section.

2.3.4.5 Boundaryless career mind-set as facilitating boundary crossing?

As introduced earlier, the concept of the BC mind-set refers to an individual's attitude to moving across organisational and/or role boundaries (Briscoe, Hall and DeMuth, 2006), including not only physical boundaries, but also how the boundaries of organisations,

occupations and roles are perceived by the individual (Sullivan and Arthur, 2006). As reported in previous sections, the concept of BC has been associated with entrepreneurship since its early theorisation (Arthur and Rousseau, 1996), which conceived entrepreneurs in Silicon Valley as prototypical boundaryless workers. Studies have since used the BC theory as a framework to analyse various aspects of careers, such as success (for a review, see Guan *et al.*, 2019), and various types of careers and moves (e.g. Chudzikowski, 2012; Gerli, Bonesso and Pizzi, 2015), including entrepreneurship (Hytti, 2010; Lewis *et al.*, 2015). Marshall (2016) adopts a career perspective on entrepreneurship, while also drawing on entrepreneurial cognition theory (Mitchell *et al.*, 2002), and argues that a boundaryless view may foster entrepreneurial behaviour, and that having a BC mind-set may support entrepreneurial behaviour because it favours perceiving ease in crossing the boundaries of organisations and/or roles. The author maintains that three psychological mechanisms form the basis for a boundaryless mind-set and may favour organisational, occupational and role moves, especially into entrepreneurship. The first is a sense of confidence in employability opportunities, particularly in relation to re-entry into a previous employment situation in case of failure. In other words, the individual perceives the ease of moving not only from employment into entrepreneurship, but also back again, and is overconfident of the possibility of such smooth career moves and boundary crossing. This is linked to a second mechanism, which is a strong sense of personal control over career moves depending fundamentally on personal initiative, thus overlooking external forces. Third, trust in the law of small numbers may lead to ignoring some information, especially regarding failed ventures. Although Marshall (2016) adopts a somewhat critical view of BC, considering these three mechanisms as potentially leading to negative outcomes, in the case of entrepreneurial failure and consequent difficulties in re-employability under previous

conditions, for instance, they have been used to explain why having a BC mind-set may support inter-organisational roles and occupational moves.

Along the same lines, Hytti's (2010) study of Finnish entrepreneurs suggests that a boundaryless view and attitude toward one's own career may shape the direction of career transitions, particularly when moving from employment into entrepreneurship. This is because different perceptions of the barriers between separate employment settings may influence how and to what extent the move is ultimately enacted. Hytti (2010) argues that entrepreneurship may be seen as a career phase in somebody's life, 'a career move like any other' (p. 74), in relation to which having a boundaryless view 'is instrumental in shaping such a decision' (ibid.).

More recently, studies have used psychometric instruments to provide evidence of the connection between BC and entrepreneurship. Using the entrepreneurial professional and leadership scale and the BC mind-set scale (Briscoe, Hall and DeMuth, 2006), Chan *et al.* (2012) find that individuals with a highly boundaryless mind-set also report high levels of entrepreneurial motivation. Similarly, Uy *et al*. (2015) reveal that individuals with a high BC mind-set also score high for entrepreneurial attitudes.

In line with all these considerations and evidence, the BC view appears to be a useful framework through which to analyse entrepreneurship, particularly in the academic context Given the premises discussed earlier regarding the different positions and perceptions of academics in relation to entrepreneurship, it might be argued that a BC view, or more specifically a BC mind-set, shapes their propensity for involvement in entrepreneurial activities. Therefore, it is hypothesised that:

H2: *Academics with a highly boundaryless career mind-set will be more willing to be involved in entrepreneurial activities than those with a low boundaryless career mind-set.*

2.3.4.6 Analysis of micro-processes

As will be discussed in Chapter 5, this study adopts Briscoe, Hall and DeMuth's (2006) BC mind-set scale to test the association between the BC mindset and academics' entrepreneurial behaviour, in the hope that the findings will provide original insights into the effect of this element on AE, contributing to knowledge regarding the micro-foundations of AE, as well as furnishing much-requested empirical evidence on the usefulness of the BC theory and mind-set in a variety of contexts and professional settings (Marshall, 2016). However, the study also explores how academics ultimately perceive the boundaries between organisations and roles because, for academics, the process of entrepreneurship is not simply a matter of crossing organisations and being involved in additional tasks. Studies maintain that the rise of an entrepreneurial model of academia has created a 'schism' in academics' identity (Winter, 2009, p. 121), as they are now required to assume multiple different roles (e.g. Jain, George and Maltarich, 2009; Meek and Wood, 2016). Thus, crossing organisations for knowledge transfer and science commercialisation (Ylijoki and Henriksson, 2017) not only challenges academics' working practices, but also their work identity (e.g. Winter, 2009; Smith, 2012; Meek and Wood, 2016). Therefore, while having a BC mind-set may support boundary crossing, the study also aims to investigate the degree to which being involved in entrepreneurial activities is perceived as a crossing, how boundaries across sectors and roles are experienced by academics themselves, and what strategies they enact to make sense of such demands, especially in relation to their career and work identity. As will be discussed in Chapter 8, this study adopts the concept of work

identity to refer to the subjective meanings given by individuals in relation to themselves at work (Pratt, Rockmann Kaufmann, 2006; Dutton, Roberts and Bednar, 2010).

2.3.4.7 Boundaries of academic work identity

Jain, George and Maltarich (2009) maintain that when scientists become involved in entrepreneurial activities, they undergo a process of identity transformation because such activities are not part of their traditional roles repertoire. Studies suggest that in order to accommodate such new role(s) and adjust to the misalignment, academics undergo an identity management process (Jain, George and Maltarich, 2009; Meek and Wood, 2016). For instance, this may take the form of multiple role acquisitions, where new roles are added to a central identity (Settles, 2004). This position is maintained by Jain, George and Malatarich (2009, p. 923), who argue that scientists involved in entrepreneurial activities modify their core academic identity by assuming a 'secondary commercial persona'. The latter does not substitute for the former, but is additional; as the label suggests, it is a secondary, collateral role. In other words, academics tend to be loyal to their primary academic identity, but may accommodate it in a way that leaves room for additional identities.

Adopting the concept of boundary work (Gieryn, 1983, 1999, cited in Lam, 2010), Lam (2010) notes a variety of positions among academics involved in entrepreneurial activities. Similarly to Jain, George and Maltarich (2009), she identifies that some academics appear to assume an entrepreneurial role as part of their work identity. For this group, which she calls 'entrepreneurial scientists' (p.327), being involved in the commercialisation of science, and knowledge transfer more generally, is 'logical and compatible with their academic role' (ibid.), and ultimately beneficial. This echoes Duberley, Cohen and Leeson's (2007, p. 484) observation that for 'entrepreneurial academics' (defined as a group in their study of U.K.

scientists), science commercialisation is ‘entirely compatible with their scientific and social interests’ (p. 487). What emerges from both studies is that, among some academics, science and its potential commercial outcomes may co-exist, suggesting the presence of a process of modification of work-identity’s boundaries.

Along the same lines, Gulbrandsen (2005) finds a variety of positions assumed by scientists in relation to AE, and similarly to the studies discussed above, discovers the presence of both traditional and more entrepreneurially-oriented scientists. However, he points out that those in the latter group tend to position themselves ‘in-between’ (p. 1), rather than toward the ‘entrepreneurial side’. In other words, these interviewees do not assume a ‘dual identity/membership’ (p. 3), like the entrepreneurial academics reported in other studies who wear ‘different hats’ (Ashforth, Kreiner and Fugate, 2000, p. 472; Mathias and Williams, 2017). Those in Gulbrandsen’s (2005, p. 4) study are ‘liminal’: they do indeed distance themselves from more traditional colleagues, but at the same time are not part of the ‘business side’. This ‘nuanced picture of researchers’ (p. 30) suggests the presence of a more conflictual process of management of the identity’s boundaries. Gulbrandsen underlines that, while such an in-between position allows academics the freedom to engage in alternative roles, it may also be detrimental, as these academics may risk being excluded from certain practices and experiences in universities.

In this regard, it must be mentioned that while previous studies indeed report entrepreneurial profiles similar to those of Gulbrandsen (2005), they also identify ‘intermediate’ profiles. Lam (2010, p. 315) calls two sub-groups observed in her sample ‘traditional hybrid’ and ‘entrepreneurial hybrid’. These are characterised by a mixture of both traditional and entrepreneurial (‘new’ school) values. However, rather than assimilating the ‘old’ and ‘new’ schools’ (p. 317), these mixed profiles are characterised by tensions and contradictions,

which appear to reflect the underlying complexity of the discourse on science and business integration.

Similarly, Smith (2012) identifies various typologies of academics in relation to how they articulate their work identity vis-à-vis requests linked to the third mission. As in previous studies, she identifies entrepreneurial academics interested in the commercial exploitation of research outcomes, as well as 'policy advisors/policy-relevant researchers' (p. 160) who support the idea of research being conducted in line with the requests of policy makers as a way to provide knowledge of relevance to society. While underpinned by somewhat differing motivations, both these groups are generally positive regarding universities' third mission. However, like others, Smith (2012) also identifies the persistence of more traditional profiles of academics who aspire to maintain separation and autonomy from policy makers in their work. Interestingly, she also notices 'hybrid academic identities' (p. 167). Typical of this group is the construction of 'flexible personas', which:

> *'enabled them to undertake (at least to some extent) the kind of work they aspired to, whilst maintaining sufficiently high credibility with policy and funding audiences in order to maintain a successful academic career' (ibid., p. 168).*

In other words, these academics maintain their core academic identity and related interests, while at the same time adopting a flexible self according to different audiences, in order not to lose the benefits of each side (academia and policy makers).

Overall, all of these studies suggest that how academics react to and incorporate the third mission into their agenda, and more profoundly in relation to their work identity, is somewhat heterogeneous, which may imply 'entrepreneurial' or 'commercial' personas, but also hybrid or flexible identities, and ultimately the persistence of traditional scientists.

Similarly to Winter's (2009) notion of 'identity schisms' (p. 121), Meek and Wood (2016) maintain that the third mission may create a potential identity misalignment. The integration of an entrepreneurial role may be particularly challenging for some academics, since, similarly to Jain, George and Maltarich's (2009) claim, it may entail incorporating into their work identity roles that refer to values and norms diverging from those typical of science. Furthermore, the latter seem to be particularly strong in academic identity that develop through a long process of training and socialisation which imprints these values and norms (Van Maanen and Schein, 1979; Jain, George and Maltarich, 2009; Lieff *et al.*, 2012; Ylijoki and Ursin, 2013; Ylijoki and Henriksson, 2017; Dugas *et al*., 2018). Such identities is therefore relatively inflexible, risking a sense of misalignment when other roles have to be incorporated which may lower wellbeing (Bryan and Nandi, 2015; Dugas *et al*., 2018) and/or create cognitive dissonance (Festinger, 1957). Meek and Wood (2016) find that strategies of positive adaptation may indeed be enacted to lower the dissonance experienced, but the individual may also pursue other paths, for example opting out. Academics may decide not to engage in entrepreneurship in order to avoid demands that they do not perceive to be in line with their work identity.

All these conditions are clearly critical for individual scientists, as well as for universities as institutions. In analysing AE in different disciplines, Philpott *et al*. (2011) maintain that the third mission may create a schizophrenic identity within universities, because embracing an entrepreneurial role is a complex process. For example, different disciplinary sectors and 'internal disparity in the ability of each to engage in entrepreneurial activities … may breed academic disharmony' (p. 168), as also observed by other scholars (e.g. Lam, 2010). Philpott *et al*.'s (2011) study highlights that implementing an entrepreneurial ethos is a complex top-down strategy when applied to universities as units. These institutions encompass a

considerable heterogeneity of situations, ultimately reflecting meso and macro factors, which interplay and shape the possibility for individual academics to wear 'different hats' (Ashforth, Kreiner and Fugate, 2000, p. 472; Mathias and Williams, 2017). In this regard, Ambos *et al*. (2008) maintain that 'ambidexterity', i.e. the possibility of pursuing dual scopes in academia in terms of traditional academic tasks as well as forms of entrepreneurship, is more complex at the individual than at the organisational level. The former is embedded in various domains, such as those of the institution, of science, of the scientific community and of the profession, which may act as facilitators and/or barriers (e.g. Duberley, Cohen and Mallon, 2006). Thus, while at the organisational level 'ambidexterity' is resolved by providing certain structures and promoting initiatives, at the individual level 'tensions are more acute' (p. 1424).

This study aims to deepen understanding of these tensions by providing knowledge that may enrich the literature while also providing insights for policy makers. This appears timely, given the rise and rapid expansion of the entrepreneurial university across countries (e.g. Etzkowitz, 2015). A career and work-identity perspective may offer an interesting insight by shedding light on the micro-processes underpinning academics' entrepreneurial behaviour, which previous studies have highlighted as crucial for a comprehensive and deep analysis of AE (e.g. Jain, George and Malatrich, 2009; Lam, 2010, 2011; Balven *et al*., 2018), but on which the literature is still scarce. Furthermore, many of these studies have been conducted with a focus exclusively on certain contexts (especially the U.S. and U.K.). Insights from other national and institutional contexts, analysed simultaneously, may furnish an original and insightful perspective on the micro-meso-macro dynamics underpinning AE. Details of the specific contexts analysed are provided in Chapter 3.

2.3.5 Academic entrepreneurship: other influential factors

In order to enhance understanding of the topic, this section provides an overview of other factors identified in the literature as being influential on AE. The studies discussed below have inspired hypotheses subsequently tested through quantitative analysis, and also serve as a background for considerations regarding the qualitative analysis.

2.3.5.1 Academic entrepreneurship and discipline

Studies report that the discipline to which academics belong may influence AE (Abreu and Grinevich, 2013; D'Este and Patel, 2007). Not only are differences noted between arts and social sciences versus STEM fields (e.g. Philpott et al., 2011), but heterogeneity in the way AE takes place is also documented within the latter. Explained as an effect of cultural norms and perceptions, as well as practices shared within the same field (Owen-Smith and Powell, 2001b; Kenney and Goe, 2004; Philpott *et al*., 2011; Kalar and Antoncic, 2015), belonging to a specific discipline is reported to impact on AE. For instance, D'Este and Patel (2007) reveal that the likelihood of being involved in entrepreneurial activities is higher among academics in engineering than among those in maths and physics. D'Este and Perkmann (2011) note some discipline-related differences in preferred channels used to transfer knowledge. In mechanical engineering, for example, consulting and contract research are more diffused than in chemistry, whereas patents are used more in chemistry. This is because the type of knowledge produced in each field may suit certain channels better more than others. However, as the authors noticed, these are disciplines within which AE is generally diffused, despite divergencies in preferred activities.

Studies suggest that a critical issue is the type of research performed in each field. Calderini, Franzoni and Vezzulli (2007) find that academics in applied and user-oriented fields are more likely to be involved in AE, and particularly in certain types of activities such as the

hard types, than those in fields oriented toward more fundamental sciences. Similar considerations regarding the effect of the type of research undertaken (basic versus applied) are reported by other scholars (Lee, 1996; Landry, Amara and Rherrad, 2006; Arvanitis et al., 2008; Tartari and Breschi, 2012; Abreu and Grinevich; 2017). Applied fields may benefit more from academia–industry interactions, as these may provide stimuli for the research activity itself. This complementarity enhances AE in certain fields (Rosenberg, 2002). Abreu and Grinevich (2013) confirm this evidence in reporting greater involvement in a variety of entrepreneurial activities by academics in applied rather than in basic fields, regarding both hard and soft activities. Moog et al. (2015) corroborate these findings, confirming higher entrepreneurial intentions among scientists in applied than in basic research areas and in relation to a variety of entrepreneurial activities. It might thus be argued that more applied/user-oriented fields favour AE.

In addition to issues relating to the type of research conducted in each field, the disciplinary effect on AE may also arise from other aspects, such as data disclosure and conflicts of interest. While open science and dissemination of knowledge are imperatives in all areas of research (Merton, 1968; Dasgupta and David, 1994), and academics in various areas have to deal with the secrecy/disclosure dilemma, these may be particularly sensitive issues in some disciplines. The processes of science commercialisation and knowledge transfer in health sciences may be particularly challenging, as the industry's regulations and scope (marketisation) may clash with scientists' data sharing and knowledge dissemination (e.g. Nelsen and Bierer, 2011; Caulfield, Harmon and Joly, 2012). For instance, in health sciences, withholding information may have detrimental effects, especially because it may undermine the ability to reproduce others' work (Campbell *et al*., 2002), in turn negatively impacting on scientific progress, and thus seriously affecting opportunities for societal benefits from

discoveries such as new technologies and therapies. As also observed by other authors (Abreu and Grinevich, 2017, p. 777), the not-for-profit nature of some research conducted in health sciences makes some academics associate more closely with 'non-commercial organisations' than with the industry side. Notably, this may also create a sex gap in AE, as women tend to be employed in less commercially-oriented fields more than men, as discussed later.

Additional issues that may complicate science commercialisation in health sciences concern the complexity of the knowledge requiring protection. For example, patenting discoveries in genetics may be particularly challenging owing to the peculiarity of what this may entail, such as applying intellectual property rights to portions and micro-portions of DNA discovered (Chandrasekharan and Cook-Deegan, 2009), as well as other ethical considerations (Joly and Tonin, 2014). Studies have documented the negative effect of science commercialisation on, for example, the availability of genetic testing, and also on the perceived quality of research in medical areas (Mertz *et al.*, 2002; Cho *et al.*, 2003).

While some studies have documented the presence of AE in the health sciences (e.g. Bercovitz and Feldman, 2008; Philpott *et al.*, 2011; Tartari and Breschi, 2012; Abreu and Grinevich, 2017), Abreu and Grinevich (2013) discover a lower level of entrepreneurial involvement among scientists in health sciences than among those in engineering, physics and biological sciences, and Tartari and Breschi (2012) find medicine to be negatively associated with AE.

Overall, previous studies suggest that different disciplinary fields may exhibit differing patterns of AE, often interlinked with the type of research undertaken. Given the presence of a variety of STEM disciplines in the present study, there may have been differences

relating to discipline in regards to AE. Owing to practical constraints explained in relation to the quantitative analysis, it was not feasible to check for divergences across all the fields sampled. However, as medicine could constitute a reference group in all three universities, and given the premises discussed previously, it is hypothesised that:

> ***H3:*** *Academics in the natural sciences and engineering will be more involved in entrepreneurial activities than those in medical sciences.*

2.3.5.2 Academic entrepreneurship: male and female academics difference

In line with the general literature on entrepreneurship (e.g. Minniti, Arenius and Langowitz, 2005; Reynolds *et al.*, 2002; Sullivan and Meek, 2012), sex differences are also highlighted as an influential factor in AE. For instance, Murray and Graham (2007) find that female scientists are less frequently involved in patenting, joint publications with industry and industrial collaborations than their male colleagues. Clarysse, Tartari and Salter (2011) report a significantly lower level of female involvement in entrepreneurial ventures (around 40 to 50 per cent lower) compared with male colleagues. Similarly, Ding, Murray and Stuart (2006) find that the patenting rate of male academics in the life sciences is higher than that of their female counterparts. Using an Italian sample, Tartari and Breschi (2012) also find that female academics are less likely to be involved in collaborations with industrial partners than male colleagues. Goel, Göktepe-Hultén and Ram (2015) report lower entrepreneurial tendencies among German female scientists than their male colleagues, and other studies corroborate the presence of a sex difference in AE between female and male academics (Ding and Choi, 2011; Haussler and Colyvas, 2011; Colyvas *et al.*, 2012; Tartari and Breschi, 2012; Abreu and Grinevich, 2013; Moog *et al.*, 2015; Shane *et al.*, 2015; Bergmann, Hundt and Sternberg, 2016; Abreu and Grinevich, 2017).

Some studies consider the sex gap in AE to be linked to a series of issues relating to academics' careers (e.g. Abreu and Grinevich, 2017), which scholars suggest are still more challenging for women than for men (Le Feuvre, 2009; Duberley and Cohen 2010; Shaw and Stanton, 2012; Kalaitzi *et al.*, 2017; Naz, Fazal and Khan, 2017; Sarsons, 2017). These difficulties relate to various aspects, such as weak career advancement opportunities (Stephan and El-Ganainy, 2007; Duberley and Cohen, 2010; Abreu and Grinevich, 2017), stereotypes (Murray and Stern, 2007; Abreu and Grinevich, 2017; Kalaitzi *et al.*, 2017; Naz, Fazal and Khan, 2017; Rinaldi and Tagliazuchi, 2018), poor work–life balance (Stephan and El-Ganainy, 2007; Abreu and Grinevich, 2017) and a lack of flexible working environments (Kalaitzi *et al.*, 2017; Naz, Fazal and Khan, 2017), which may impact on AE. Duberley and Cohen (2010) relate the difficulties for women in science to issues such as accessing networks in specific fields or sub-fields owing to the genderisation of some areas of research. Abreu and Grinevich (2017) connect this differing presence of women and men in certain specialisations and sub-fields with AE, maintaining that as women tend to be concentrated in less entrepreneurship-oriented disciplines, such as less user-oriented and not-for-profit areas like health sciences, this fosters a sex gap. However, the authors also observe that the gap also persists in what they refer to as the 'right' disciplines for entrepreneurship (p. 775). This is because difficulties may also arise from other issues, such as female academics' lower seniority in universities, with a negative impact on the extent to which they are 'visible' (ibid.) and embedded in networks relevant for entrepreneurship, as explained later.

Barriers may also derive from work–family conflicts (Murray and Stern, 2007; Mo0g et al., 2015; Kalaitzi *et al.*, 2017; Naz, Fazal and Khan, 2017). Using the concept of 'domestic capital', Duberley and Cohen (2010, p. 193) discuss differences between men and women in home duties, and how the latter, who are often responsible for the greater proportion of

domestic demands, are penalised in their career progression. Rosa and Dawson (2006) make a similar observation specifically with regard to AE. They maintain that women's greater involvement in family and caring responsibilities compared with men deprives the former of precious time for involvement in entrepreneurial activities, and specifically in establishing connections and gaining experience, which may be crucial in AE. Experience is considered to be particularly relevant in fostering entrepreneurship (e.g. Goel, Göktepe-Hultén and Ram, 2015; Abreu and Grinevich, 2017), and appears to have a stronger impact on females than on men (Goel, Göktepe-Hultén and Ram, 2015). Thus, women sometimes appear to be trapped in a vicious circle in relation to entrepreneurship.

Issues relating to sex and entrepreneurship, regarding soft and hard entrepreneurial activities, are discussed in greater detail later in this thesis. However, on the basis of the general premises reported here, it is hypothesised that:

> ***H4:*** *Male academics will be more involved in entrepreneurial activities than their female colleagues.*

2.3.5.3 Academic entrepreneurship and seniority

Another important aspect for inclusion in analysis of AE regards scientists' seniority in their universities. Studies reveal differences in AE according to academics' career stage. While sometimes documenting contrasting findings, the mainstream literature on AE generally suggests that senior academics are more involved in entrepreneurial activities than junior colleagues. For instance, Clarysse, Tartari and Salter (2011) find that tenured professors have twice as much involvement in entrepreneurial activities as their junior colleagues. Professors' greater involvement in commercial activity compared with younger academics is found by Haussler and Colyvas (2011), who also report age as a significant factor in entrepreneurship, which may be considered to be generally correlated with university

seniority. However, D'Este and Patel (2007) find that while seniority is a positive predictor of entrepreneurial activity, age is negatively correlated with the variety of activities in which academics are involved. This may reflect the fact that knowledge transfer activities have received increasing attention in recent years; hence, junior scholars may have received greater exposure and training since their early career years to equip them to engage in these activities. Differences in the types of entrepreneurial activities in which junior and senior academics engage are also reported by Abreu and Grinevich (2013), as discussed later.

Apart from some diverging findings, the literature often reports senior academics more involved in entrepreneurial activity than the junior colleagues, explaining this evidence with the 'career life cycle argument' (D'Este and Patel, 2007, p. 1309), which maintains that senior scholars have an advantage in AE, given an 'accumulation effect' of both experience and status, which support the establishment of successful collaborations with industry (Haussler and Colyvas, 2011; Tartari and Breschi, 2012; Abreu and Grinevich, 2013, 2017). This issue is also discussed later in relation to differences between females and males in entrepreneurship.

The discrepancy between junior and senior academics may also be due to different objectives and career duties. Junior scholars typically focus on publications to secure positions in academia, leaving little time for other activities (Clarysse, Tartari and Salter, 2011; Tartari and Breschi, 2012). This point is crucial for this study, as it highlights that these activities may be hindered by weak integration of knowledge and technology transfer in academics' careers, and in terms of reward and promotion. Career stage and entrepreneurship are discussed further in Chapter 6, and especially in Chapters 8 and 9. However, based on the evidence discussed above, it is hypothesised that:

H5: *Senior academics will be more involved in entrepreneurial activities than their junior colleagues.*

2.3.5.4 Interaction terms

Given the hypothesised role of different factors influencing academics' involvement in entrepreneurial activities, interaction effects might be expected between these variables.

Hypothesis 1 postulates that having high entrepreneurial alertness may increase the likelihood of being involved in entrepreneurial activities, while Hypothesis 4 suggests a positive effect of sex, and specifically being male, on AE. Therefore, if having a predisposition to notice profitable opportunities increases entrepreneurial behaviour, this effect might be expected to be amplified in male scientists. In line with this reasoning, the following hypothesis is formulated:

H6: *The effect of entrepreneurial alertness on entrepreneurial behaviour varies by sex, i.e. males with high entrepreneurial alertness will be more likely to engage in entrepreneurial activities than female colleagues.*

In addition, Hypothesis 3 suggests greater entrepreneurial activity among academics in science and engineering. Keeping constant the positive effect of entrepreneurial alertness, it might be expected that this will be stronger for academics in science and engineering than for those in medicine (the reference group). Thus:

H7: *Academics in the natural sciences and engineering with a high level of entrepreneurial alertness will be more involved in entrepreneurial activities than those in medical sciences.*

2.3.5.5 Academic entrepreneurship: hard and soft activities

Thus far, AE has been conceived as a broad category of commercial and collaborative activities. As mentioned in Section 2.2, different types of activities can be distinguished within this broad categorisation. With regard to the level of formalisation of the process of knowledge and technology transfer, two sub-groups of activities can be distinguished: formal or 'hard' entrepreneurial activities, and informal or 'soft' entrepreneurship. The former comprises activities such as patenting, spin-offs and licensing, and the latter refer to activities such as contract research and consulting that imply less formalisation. This distinction helps structure a more comprehensive and detailed discourse around AE, and studies also show that the same factors that influence academics' entrepreneurial activities may have differing effects on formal and informal activities.

2.3.5.6 Sex differences relating to soft forms of entrepreneurship

As previously mentioned, male academics are reported to be generally more involved in entrepreneurial activities than their female counterparts. However, more fine-grained differences have also been found in involvement in soft or hard entrepreneurial activities according to gender. Abreu and Grinevich (2013, 2017) found that female scientists were are less likely to be involved in entrepreneurial activities than their male colleagues, and that the gender gap is greater for informal types of activities. Greater male involvement in informal technology and knowledge transfer activities is also found by Link, Siegel and Bozeman (2007).

This sex difference may be explained as the result of the challenges that women still encounter in establishing a career in academia, linked to both work and non-work issues as discussed earlier, which may negatively impact on AE. This may especially apply to soft forms of entrepreneurship, which require considerable time to establish interpersonal

connections with external partners. For example, Ding, Murray and Stuart (2006) maintain that female scientists tend to have weaker networks with external organisations than their male colleagues, and worry more about the potential negative consequences of commercialisation for their scientific careers. Murray and Graham (2007) echo these conclusions, confirming a difference in networking modalities between female and male academics which may underpin different levels of involvement in entrepreneurial activities. Specifically, they find that male academics tend to be given opportunities for commercial activities by peers, advisors and senior faculty, whereas women's opportunities come from the male colleagues with whom they have collaborated on other projects. They also note a sense of exclusion from such activities among female academics, who perceive that fewer opportunities are offered to them than to their male colleagues. Goel, Göktepe-Hultén and Ram (2015) also discuss divergences in social and organisational opportunities between men and women in academia, which are likely to impact negatively on both their academic careers and the possibility of involvement in AE. Stephan and El-Ganainy (2007) link the sex gap to issues relating to seniority in universities. They maintain that male academics tend to reach higher levels in the hierarchy, in turn benefiting from networks, contacts and experience which, as previously highlighted, help in AE, and particularly in informal types of activities. Furthermore, experience emerges as particularly key for women rather than for men in fostering entrepreneurial behaviour, as discussed earlier.

Abreu and Grinevich (2017) confirm women's smaller networks, weaker perceived support and generally lower seniority in academia. The latter, in particular, similarly to Stephan and El-Ganainy's (2007) finding, makes female academics less 'visible' in academia and to external organisations. Notably, Abreu and Grinevich (2017) also find that even when they are professors, female academics tend to be less entrepreneurially involved than their male

colleagues. However, this seems to apply more to formal types of activities, which the authors maintain is due to a mixture of issues, such as differing distributions of females and males in disciplines with more or less entrepreneurial orientation, as well as difficulties linked with lack of time and experience, as discussed previously. Thus, it seems that while female academics are generally less likely to be involved in entrepreneurial activities than men, especially with regard to informal activities, the main constraining factors are lower academic rank, which implies less visibility, networks and experience, and the other constraints discussed earlier relating to home–work balance and lack of time. On the other hand, regarding formal activities, female academics are penalised more as a result of their membership of less entrepreneurially-oriented disciplines, as well as other barriers relating to experience and time. While corroborating the idea that informal types of activities benefit from personal relationships and networks, these findings show the variety of factors that intervene in AE, and how these combine in intricate scenarios, as claimed by Abreu and Grinevich (2017). This is likely to explain why, for example, contrasting findings are reported regarding the differing involvement in various forms of AE between female and male academics (see also Haussler and Colyvas, 2011). While acknowledging the divergences identified in the literature, in line with the considerations discussed above, it is hypothesised that:

> ***H8****: Male academics will be more involved in informal (or 'soft') entrepreneurial activities than their female colleagues.*

2.3.5.7 Seniority and soft forms of entrepreneurship

The literature also reveals differences in involvement in hard and soft entrepreneurial activities relating to seniority in universities. Fini, Lacetera and Shane (2010) find that younger academics are more likely to start a company based on a patent, i.e. to adopt a formal

means of securing intellectual property rights, whereas senior academics tend to be more involved in less formal types of entrepreneurial ventures. Similar evidence is reported by Link, Siegel and Bozeman (2007). Abreu and Grinevich (2013) corroborate these results, showing a difference relating not only to seniority, but also to age. In particular, they reveal that older academics tend to be more involved in informal types of entrepreneurial activities, whereas younger scientists are more likely to be involved in formal activities. Using seniority as an explanatory factor, they also discover that the overall entrepreneurial activity of senior academics is higher than that of junior colleagues, and that the gap is greater for informal activities. This difference is explained as being due to the accumulation effect previously discussed: establishing networks with partners in external organisations, as well as experience in establishing such connections, may favour activities that rely more on personal interactions than formal mechanisms and the expertise of TTOs.

D'Este and Perkmann (2011) partially refute the finding of a generally positive impact of seniority on entrepreneurial involvement, as they find a positive impact of being a junior researcher on activities such as consulting and joint research. While acknowledging the presence of contrasting and ambiguous findings, and in line with the findings of the studies discussed above, it is hypothesised that:

> ***H9:*** *Senior academics will be more involved in informal (or 'soft') entrepreneurial activities than their junior colleagues.*

2.4 Summary

Expansion of the entrepreneurial orientation in universities in different countries has been accompanied by increasing interest from practitioners and scholars. While an initial stream of studies focused on the role of contextual factors, such as TTOs, interest has subsequently grown in the role of individual scientists, yet this literature is still patchy. To fill this gap,

this study aims to shed light on two aspects: the role of individual-level attitudes as predictors of academics' entrepreneurial behaviour, and academics' subjective experience of the entrepreneurial university. Particular attention is given to the interplay between AE and academics' careers, and how career prospects, interests and orientation may influence AE, and vice versa.

To answer the research questions, the study adopts a multi-dimensional perspective, investigating the individual within 'contexts'. This research objective led to the adoption of a cross-country comparative design, with the aim of shedding light on the effect of the three dimensions by looking at potential convergence and/or divergence in the results. Details of the contexts are provided in the next chapter.

Chapter 3. Cross-Country Analysis

3.1 Cross-country design

As explained in previous chapters, the complex nature of AE and the role of various factors in influencing academics' willingness to engage in entrepreneurial activities, led to the adoption of a multi-dimensional analysis and contextual aspects were considered important aspects to explore. Various authors have argued that AE a complex construct and phenomenon in which individual and environmental elements play an important role, often in an intertwined fashion (e.g. Grimaldi *et al.*, 2011; D'Este and Perkmann, 2011; Philpott *et al*., 2011; Filippetti and Savona, 2017; Fini and Grimaldi, 2017). While, for instance, the individual scientists are indeed at the centre of these dynamics, 'their involvement is in turn affected by country-level factors (institutional contingencies and local-context specificities) and by the university level' (Grimaldi *et al*., 2011, p. 1049-1050).

Regarding the former, while trend towards entrepreneurship within academia has been reported in various countries (e.g. Etzkowitz *et al*., 2008; Walsh and Huang, 2014; Sá, Sá, and Dias, 2017; Balven *et al*., 2018; Miranda, Chamorro-Mera and Rubio, 2018; Hayter *et al*., 2018) differences in the way it has permeated and developed were also noticed. Scholars (Slaughter and Leslie, 1997; Klofsten and Jones-Evans, 2000; Harley, and Muller-Camen and Collin, 2004; Kaulisch and Enders, 2005; Wright *et al*., 2007; Fini, Grimaldi and Sobrero, 2009; Kalar and Antoncic, 2015; Sá, Sá, and Dias, 2017; Fini and Grimaldi, 2017) maintained that universities in different contexts may face different challenges in promoting AE, and thus similar pressures and trends may be refracted in diverging ways.

In Europe for example, while common strategic purposes towards greater innovation are generally followed - see for example the 'Lisbon strategy' (Europe, 2020) - every country

has also adopted their own initiatives, which can be also appreciated at university-level in terms knowledge and technology transfer across European states (e.g. Mazgan, 2011; Guerrero *et al.*, 2014; Kalar and Antoncic, 2015; Sá, Sá and Dias, 2017). Therefore, a comparative analysis of AE appeared an optimal strategy to understanding the influence of the macro-context elements in shaping academics' tendencies towards entrepreneurship.

The analysis of the context also aimed to shed light on the meso dimension, i.e. the specific university setting. The literature maintains that institutional factors such as human capital management (rewards, promotion, staffing systems), leadership, entrepreneurial programmes, social capital (the networks each university has with either private or public organisations, or both) are all meso-context factors that may significantly impact on AE (e.g. Muscio, 2009; Philpott *et al.*, 2011; Tartari, Perkmann and Salter, 2014; Guerrero *et al.*, 2014; Kalar and Antonic, 2015; Balven *et al.*, 2018). Thus, analysing academics in different national but also institutional contexts may shed light on the potential influences of also the meso level on the micro dimension, as well as on the specific challenges that universities may face. Divergencies across countries and institutional contexts may for instance suggest context-specific issues, whereas conversely convergence may be attributed to over-arching elements, linked to the individual dimension.

Finally, a contextualised analysis was thought to be a meaningful framework not only in relation to AE but also for this study's focus on careers. Various authors have highlighted the importance of analysing career dynamics in a contextual fashion (e.g. Eaton and Bailyn, 2000; Duberley and Cohen, 2015). This seems also to apply to academics' careers. Duberley, Cohen and Mallon, (2006) argued that scientists' careers unfold in a variety of contexts, namely national, familiar, professional, disciplinary, and institutional, each of them contributing to the shape a career may take. Thus, while an individual possesses free will to

pursue his or her own interests, contextual influences, such as for example, professional norms, family issues, and national context's features appear to give a direction, by constraining or enabling those moves. In other words, they shape they degree of *boundarylessness* (Inkson, 2006; Inkson *et al.*, 2012; Rodrigues, Guest, and Budjanovcanin, 2016; Ylijoki and Henriksson, 2017).

In line with these considerations, as anticipated in Chapter 1, the study has conducted a cross-country comparative design (Bryman and Bell, 2015), according to which three universities located in Europe and Australia were selected as cases for comparisons. This was considered the best approach to investigate the effect of macro-meso-micro level processes and factors, in an attempt to address this study's RQs. The following sections report explanations about the cases selected and the rationales which underpinned their choice.

3.2 The cases

The cross-country nature of this work involved the selection of three universities as cases to analyse. For reasons of confidentiality, the identity of these institutions will not be disclosed, and only some general features of the institutions, which informed their selection, will be reported. In particular, the three universities were selected on the basis of their degree of *comparability*. The three institutions share, in fact, similarities in terms of educational profile, as they are all research-intense institutions, while also being comparable for size and rankings. At the same time, they differ with regard to the national context in which they are embedded. Particularly, two universities are in Europe, one in the U.K. and one in Italy, the other is in Australia. The choice of these countries was underpinned by some core aspects. First, historical elements make the U.K. and Australia similar in regard to the structure of the educational systems as well as cultural elements. However, as explained in the following sections, differences in the legislative and policy framework regarding the entrepreneurial

university are documented, with differences in the types of initiatives promoted, and the extent to which such a trend towards entrepreneurship has been effectively supported. Furthermore, a time-gap characterises the two countries in relation to the implementation of entrepreneurial-oriented reforms within universities, with the U.K. emerging as the pioneer of such initiatives. Thus, comparing the U.K. and Australia was thought to provide insight on how top-down initiatives may shape academics' activities, while also informing on potential convergence. This is also true in relation to the Italy. As located in Europe but characterised by a higher education system which differs in many aspects to the U.K. and Australia, Italy was thought to offer further hints on the influence of the meso and macro context. Regarding specific initiatives oriented towards AE, Italy appeared to be slightly further behind Australia in terms of temporal development and implementation of strategies in this direction. Differences in general cultural and socio-economic issues were also considered useful elements to exploit for comparative analysis. For instance, the Italian industrial sector is less tech-oriented. Such a characteristic, as ultimately confirmed by the qualitative findings at this study, may have an impact on the propensity of universities to knowledge and technology transfer activities (e.g. Algieri, Aquino, and Succurro, 2013).

Finally, the inclusion of Australia in the sample aimed also to add evidence to the literature from other countries, since much of the literature on AE derives from U.S. and U.K. or other European countries (Tartari and Breschi, 2012; Fini and Grimaldi, 2017; Hayter *et al.*, 2018), generally Western Europe (Mathisen and Rasmussen, 2019). Therefore, the present study aims to address the gap in the literature regarding the presence of cross-country studies in AE (Fini and Grimaldi, 2017; Mathisen and Rasmussen, 2019), expanding the breadth of the inquiry beyond the dominant focus on specific contexts.

Specific details about each country in relation to the development of an *entrepreneurial university* are below reported, following the temporal span in which such a trend has expanded, and thus starting with the U.K., followed by Australia and Italy.

3.2.1 U.K.

The U.K. makes for an interesting case to study as it can be considered among the first in Europe to have undergone changes in the higher education system since the 1980s (Geuna and Piolatto, 2016). Until the late 1980s, academia in the U.K. was a rather autonomous institution. Academics could enjoy a large degree of freedom in their work, and, although mainly state-funded, universities were not under the direct control of the government. An example is the funding allocation, which was managed through intermediary bodies, 'designed to avoid government control' (Nedeva and Boden, 2006, p. 272). In the late 1980s the situation started to change. Various authors (e.g. Boden, Cox and Nedeva, 2006) take the election of the Conservative government in the 1979 as the reference point to mark a transformation in the management of higher education, where the principles of the New Public Management began to be applied also to universities. The latter is a management style that replaced the old governance approaches in almost all the public sectors of the U.K., introducing concepts such as performance evaluation, accountability, and profitability that were before only typical of the private sector. Increasing emphasis was placed on 'economy, efficiency and effectiveness' (Boden, Cox and Nedeva, 2006, p. 7) which signified greater public expenditures restrictions and tied controls. For universities, this led to a series of changes. For instance, funding allocation became a more competitive process, due to a lowered amount of public funding for universities, along with economic crises that laid additional pressure on the need to control public expenditures. Furthermore, in 1992, 'polytechnics' acquired a new status of 'university' as a result of the *White Paper 1991*,

thereby increasing the competition for funding among academic institutions, which had expanded in number (Bence and Oppenheim, 2005).

It is in this scenario that the idea of *quality of research assessment* started to be introduced, as a way to manage funding allocation (Geuna, 1999). Between the 1980s and 1990s different programmes aimed at monitoring research outcomes started to be developed, implemented, and refined (Bence and Oppenheim, 2005). The most important are the Research Selectivity Exercise (1986-1989), successively called Research Assessment Exercise (RAE) (1992) (Bence and Oppenheim, 2005; Martin, 2011), which culminated in the modern version, still in place: the Research Excellence Framework (REF), with the first one taking place in 2014 (REF, 2014, 2021). The crucial difference between the early forms of evaluation and the modern REF entails the concept of *impact*. Whilst before, the main assessment criterion was 'quality of research' measured in terms of publications and citations, the REF evaluates the research activity based on three criteria: 1) outcomes of research in terms of publications), 2) impact of these outputs on socio-economic issues, 3) the environment supporting the research (REF, 2021). These types of periodic research assessment continued in the following years, with the recent 2016 White Paper stating that one of the aims of the UK government will be monitoring the quality of 'the U.K.'s research and innovation landscape through the pooling of multiple datasets and information sources, underpinning effective funding decisions' (p. 69). Applicability of research, translation of scientific outputs into 'tangible' and quantifiable indicators, demonstration of a contribution of research on socio-economic issues, all became new concepts introduced in the agenda of universities, influencing academics' activities.

In this scenario, characterised by increasing funding restrictions, 'selectivity' of resources allocated to research (Geuna, 1999, p. 90), and the concept of *impact*, university-industry

partnerships became ‘strategic policy instruments’ (OECD, 2016, p. 132), as sources of monetary support for universities, as well as in line with the new *applicability of research* imperative. It must be mentioned that along with the private sector, charities, philanthropists, and foundations have become increasingly diffused sources of funding, albeit often supporting very specific types of projects (OECD, 2016). This trend is still ongoing, as is clear in the latest White Paper (2016) that reported: ‘We are making support of business-university collaborations one of U.K. Research and Innovation’s priorities and expect it to identify further action as well as taking forward actions already underway in the current funding bodies’ (p. 77). Such a trend, however, does not uniquely pertain to the British context, as it has been signalled in other countries such as Australia for instance (Marginson and Considine, 2000; Watermeyer, 2014; Geuna and Piolatto, 2016), as the following section illustrates.

3.2.2 Australia

In the late 1980s, the Australian higher education system underwent a series of transformations. Hitherto, universities in Australia were mainly funded by grants from the Federal Government and they were managed with a traditional collegial management style where key administrative and decision roles were fulfilled by the academics themselves, operating in a collegial manner. Since the late 1980s and 1990s, the situation has changed. First, it was emphasised the pivotal role universities have in enhancing productivity. This imperative was linked to Australia’s economic stagnation in the 1990s, attributed to a great reliance on export and scarce revenues coming from the manufacturing sector, coupled with the emergence of economic competitors from Asia. This created a new relationship between university and government, where the former was seen as serving and supporting the latter (Mahoney, 1994), as ultimately theorised in the Triple Helix (see Chapter 2). This was

coupled by other transformations at the socio-economic level, such as an increasing globalisation, a rise in the number of students enrolled in university courses, and constraints in public funding for research. To give an example, in the period between 1983 and 1998, the share of funding provided to universities by the government declined from the 91 percent to 52 percent (Marginson, 2002). Marginson (2002) also underlined the role played by neo-liberal parties in the 1990s in shaping the Australian university sector on the US model, which led to the development of a new type of university, where a mix of public and private norms, regulations, and initiatives have started to coexist, similar to the New Public Management. In the 1990s Australian universities started, thus, to be under greater scrutiny, and some initiatives were developed to regulate the higher education system (Mahoney, 1994; Slaughter and Leslie, 1997). Among the first steps, was the reintroduction of students' tuition fees (Harman, 2005), and an increasing emphasis on entrepreneurial activities promoted within universities (Slaughter and Leslie, 1997).

Initiatives to increase knowledge transfer activities and commercialisation of science started around the mid-1980s when the Federal government realised that Australia was behind the targets for innovation (Harman, 2002). Among the principal programmes was the establishment of Advanced Engineering Centres, Collaborative and Strategic Partnerships with Industry-Research and Training, and the Cooperative Research Centre programme. More recently, through the 'Programme 2001', the Federal government has set a new strand of investments to support academia-industry collaborations (Harman and Harman, 2004). While these initiatives were targeted at both industry and universities, others were specifically for universities, such as supporting the creation of dedicated offices and structures to favour knowledge transfer activities, as well as re-evaluating policies and regulations regarding intellectual property rights.

Additionally, and much like the U.K., the Australian Federal government also started to develop performance assessment exercises. The most significant is the Research Quality Framework (RQF), which was firstly discussed in 2004, then revised and refined by two different Advisory Groups between 2005 and 2006, presented to the Minister of Education in 2006, re-adjusted during 2007, and planned to take place in 2008 (Haddow, 2007; Donovan, 2008). Core objectives of this system were the assessment of research activity in terms of its scientific level as well as in terms of impact, conceived in four ways: economic, societal, environmental, and cultural (for details see Donovan, 2008). However, there had been a change in government in Australia in 2007, and the election-winning Labor party decided for the RQF to not take place, as it was considered to be 'poorly designed, administratively expensive and relies on an 'impact' measure that is unverifiable and ill-defined' (IISR, 2007, cited in Donovan 2008, p. 58). The government proposed to replace it with the Excellence for Research in Australia (ERA), in which *impact* was not included, and which took place for the first time in 2010, with two rounds in 2012 and 2015, with the next one still ongoing (2018). Interestingly, the RQF can be considered a 'first attempt globally to comprehensively capture the socio-economic impact of research across all disciplines' (Penfield, 2014, p. 24), and although not implemented, seems to have informed the U.K. REF. Recent changes and proposals in Australia led to the re-introduction of *impact* as assessment criteria, in a separate evaluation program called Engagement and Impact Assessment, which was piloted in 2017, and implemented in 2018. The national report is available from 2019 (Australian Government, 2018).

All these changes, proposals, and reforms signal a period of transformation for Australian universities, which took place around the 1980s, but with evident and tangible modifications implemented only in the recent years. This is among the crucial differences with respect to

the U.K., where the first assessment exercises date back to the late 1980s, whereas in Australia it is only around the late 1990s and, more precisely, in the early 2000s that concrete proposals were formulated. Since then the trend towards an *enterprise university* (Marginson and Considine, 2000) has also diffused in the Australian context, promoted by a series of government initiatives such as 'The chance to change' (Commonwealth of Australia, 2000).

3.2.3 Italy

The Italian university system is fundamentally public, and until the very late 1980s the overall university management (courses, staff recruitment as well as any form of AE) was centrally managed by the State and in particular by the Ministry of Education in Rome (Baldini, Fini and Grimaldi, 2015). It was only towards the 1990s that the situation started to change, and universities began to gain more independence and autonomy. Particularly, in 1989, the government-initiated discussions regarding some changes for the Higher Education system, culminating with a pivotal reform in 1993: the establishment of the Ordinary Financing Fund by the Ministry of Education. This signified that Italian universities became 'autonomous state regulated institutions' (Geuna and Piolatto, 2016, p. 262), with a greater financial independency, thus in turn more responsibility over the university functioning and management.

In the years ahead, autonomy was also expanded towards not only budgeting but also curricula, staffing, scientific work, and any form of entrepreneurial activity. In particular, entrepreneurial initiatives received formal recognition in 1999 with the introduction of the Legislative Decree n.297/1999 that established the possibility for a single institution to manage knowledge and technology transfer and spin-off formation independently (Colapinto, 2011; Baldini, Fini and Grimaldi, 2015). The law also established that researchers involved in entrepreneurial activities could maintain their academic position and

wage (up to 8 years) (Baldini, Fini and Grimaldi 2015). While the decree was made immediately effective for all Italian universities, each institution proceeded autonomously, at a different pace (Colapinto, 2011). Another important legislative step was the introduction of the first research assessment exercise in 2003, namely 'Valutazione Triennale della Ricerca- Triennal Research Assessment' (Rebora and Turri, 2013, p. 1660) (VTR) by the Ministry for higher education, explicitly drawing on the U.K. model (Rebora and Turri, 2013; Geuna and Piolotto, 2016). The assessment covered a three-year period (from 2001 to 2003), and it involved universities, public and private research agencies, in a peer-review based evaluation. In 2011, VTR was replaced by VQR (Valutazione Qualita' della Ricerca-Evaluation of the Quality of Research), assessing the period from 2004 to 2010. The main changes between VTR and VQR concerned the possibility for panel members to opt for bibliometric or peer review assessments, and a more explicit link between the results of the evaluation and funding allocation, which was loose in the previous assessment. However, both VTR and VQR focus on quality of research in terms of originality, international standards, and relevance, as criteria. The concept of *impact* has not appeared in the Italian research assessments yet. However, it could be argued that the established forms of evaluation constitute a significant change in the management of Higher Education, once only based on 'ex ante respect for parameters and compliance' of legislative procedures (Franceschet and Costantini, 2011, p. 276) more than ex-post valuation of research quality.

While efforts towards a more entrepreneurially oriented university have been made in Italy, it must be also mentioned that over the last fifteen years the situation has been somewhat uncertain, especially from a legislative point of view in relation to intellectual property rights. Another difference in comparison to the U.K. for instance, is the absence of formal associations to support knowledge transfer until early 2000s. While AURIL was established

in 1995 in the U.K. (Parliament U.K., 2003) the Italian equivalent NetVal was established only in 2002 (Baldini, Fini, and Grimaldi, 2015). Notwithstanding, Italian universities show a discrete level of AE, with the North and Middle-North universities ahead in respect to the Southern, notably reflecting Italy's economic distribution (Baldini *et al.*, 2010). Interestingly, the expansion of such activities seems to reflect the legislative and policy scenario. Baldini, Fini, and Grimaldi (2015) indicated an increasing knowledge and technology transfer activities around 2001-2004, with a subsequent phase of stagnation in the years that followed, notably for universities that started earlier in the process. The authors explained this phenomenon as the result of the legislative uncertainty and changes that might have made difficult for single universities to find 'an internal configuration' (p. 16) to continue with entrepreneurial activities.

Notwithstanding, AE seems to have progressed in the following years, reaching its peak in 2007. Geographically, the Northern and Middle-Northern regions have the most extensive knowledge and technology transfer activities, in particular Piemonte, Reggio-Emilia, and Toscana. Again, this might reflect the legislative scenario, with Reggio-Emilia, Toscana (as well as Lombardy) as first movers in the implementation of norms to regulate patenting activity (Baldini, Fini and Grimaldi, 2010). Among the sectors which seem to be more involved in the process of research exploitation, the literature often reports examples taken from the STEM as well as information technology and communication (e.g. Colapinto, 2011).

In summary, Italy faced an expansion in academic entrepreneurial activities in the last decades, even though it started years after other European countries such as the U.K. While similar trends and forces seemed to have underpinned the process in the two countries, differences are also apparent. For example, forms of research assessment for funding

rationalisation in the U.K. started around 20 years before Italy (Rebora and Turri, 2013). Furthermore, whilst in the British context the results of such exercises have a strong link with the funding allocation, in Italy this connection is looser (see Capano, 2010). For some scholars (Rebora and Turri, 2013) this is linked to the lesser diffusion of the New Performance Management as political and institutional framework- compared to the U.K. for instance- thus concepts of accountability, performance evaluation, return of investment, have permeated the Italian public sector administration less. An uncertain legislative scenario has probably been one of the most effective factors to shape Italy's AE, which was developed in the early 2000s. Other authors have also called into question cultural issues, by talking about the traditionally strict separation between research and business that has long characterised the Italian academic system, which in turn might have influenced the later development of an entrepreneurial culture within academia (Colapinto, 2011).

3.3 Summary

The multi-dimensional analysis of this study led to the adoption of a cross-country comparative design, with the aim to shed light on the macro-meso-micro foundations of AE. In so doing, the study aimed to reach a comprehensive understanding of both individual and contextual factors underpinning AE as well as academics' careers. Three universities, located in Europe and Australia were, therefore, selected as cases for the analysis, basing the choice on their comparability. The U.K. was considered an elective choice for this study's aims as in Europe it can be considered the pioneer of entrepreneurially-oriented initiatives within academia, since the 1980s. Sharing a cultural heritage and similarities in the higher education system models, Australia was another case for comparison. As for the U.K., initiative towards an entrepreneurial university started to be evaluated also in the Australian system, around the late 1980s, however their concretisation took place more recently, and in

an unstable way, ultimately not leading to the same outcomes. In Australia, for instance, the impact agenda, for long discussed (preceding the U.K.), has been only recently (in 2017) re-introduced, and the process of assessment is still on-going.

As in other European countries, also Italy has witnessed changes in the Higher Education system in the last decades. Performance assessment exercises, and a focus towards knowledge transfer activities have started to be part of the new agenda for universities. However, compared to other countries, the expansion of such a trend seems to have started years later, and remains somewhat weak or patchy. In comparison with the U.K., the Italian Higher Education system is also characterised by a different management system. Cultural elements, such as a traditional separation between academia and industry for instance, have been also pointed out as having retarded the process of developing entrepreneurial universities

While being part of the methodology, the study's design was presented here, in a separate chapter, given the necessity to explain the complex cross-country nature of the study, and to provide an illustration of the countries selected, and a justification for the choice. Further elements regarding the methodology adopted are reported in the next chapter.

Chapter 4. Methodology

This chapter provides an overview of the methodology adopted in the study. Specifically, Section 4.1. reports explanations about the mixed-methods approach followed, whereas Section 4.2. includes notes about the main issues of cross-country research. To conclude, considerations about ethics in research are reported in Section 4.3., followed by a summary. Methods, samples, and sampling although part of the methodology will be discussed in two separate chapters, one for the quantitative part (Chapter 5), and one for the qualitative (Chapter 6), in line with the sequential mixed-methods strategy adopted.

4.1 Mixed-methods approach

The multi-faceted nature of AE inspired different research aims. In order to address the RQs developed and presented in Chapter 1, different methods were required. Specifically, RQ1, regarding the 'factors' underpinning AE and RQ2 (and the sub-questions 2a and 2b) were more suitably addressed with a quantitative approach, to provide the necessary type of data to test whether individual attitudes, and particularly, *entrepreneurial alertness* and a *BC mind-set*, have an impact upon academics' entrepreneurial behaviour.

On the other hand, the aim to investigate the 'factors' but also the 'processes', i.e. the 'how', underpinning AE (RQ1) and how academics perceive and experience the possibility of involvement in entrepreneurial activities (RQ3), required a qualitative approach, to enable the exploration of the *subjective dimension*, i.e. academics' sense-making and personal experiences (Johnson *et al.* 2006).

The different nature of these RQs led to the adoption of a mixed-methods approach (Tashakkori and Teddlie, 2003) combining 'quantitative and qualitative research within a single project' (Bryman and Bell, 2015, p. 641). The usefulness of this approach lies in the

possibility to tackle topics from different perspectives, thus supporting multi-purpose projects, such as the current study, with the goal of answering RQs which differ in their nature and orientation towards the phenomena studied. However, despite a claim of the advantages that such an approach may make to a study (Molina-Azorin and Cameron, 2010), there is still an on-going debate in the literature regarding the feasibility and legitimacy of mixed-methods approaches. Critics have been particularly concerned by the philosophical assumptions underpinning such an approach, along with how the findings are integrated and ultimately for which purpose (Biddle and Schafft, 2015). Given the critical issues around the use of mixed-methods, before proceeding into the explanation of the specific strategy here adopted, the following section reports a brief overview of the debate mentioned above, while also providing a discussion on the philosophical position assumed in this study.

4.1.1 Philosophical assumptions

Whilst regarded nowadays as a useful research approach, a debate is still open among scholars regarding the philosophical assumptions underpinning mixed-methods and the relationship between methods and their 'paradigmatic foundations' (Tashakkori and Teddlie, 2003, p. 4). These views are broadly represented by the *embedded methods* and *the paradigm argument* (Bryman and Bell, 2015). The former suggests that qualitative and quantitative research methods cannot be adopted within the same research because of their different epistemological and ontological foundations (Bryman and Bell, 2015; Molina-Azorin and Cameron, 2010), as they refer to two different and incompatible views of the world and phenomena under study. Similarly, the *paradigm argument* 'conceives of qualitative and quantitative research as paradigms in which epistemological assumptions, values and methods are inextricably intertwined and are incompatible between paradigms' (Bryman and Bell, 2015, p. 642).

Whilst these views still appear in the literature, various authors have tried to 'make peace between the major paradigmatic positions' (Molina-Azorin and Cameron, 2010, p. 96). One attempt was made by Reichardt and Cook (1979) and Mir and Watson (2000). The authors contended that there is no intrinsic link between a paradigm and a method, and different methods can be combined within the same study. Another attempt was the development of specific philosophical assumptions of reference for the mixed-methods approach. Within this framework, two main perspectives dominate the scene: *the multiple worldviews* and *the single paradigm approach*. The former is maintained by Greene and Caracelli (1997) who advocate for a 'multiple view' of the world, where phenomena can be approached with a positivistic *and* a constructivist lens, and different paradigms can be adopted as philosophical foundations of the mixed methods approach. In this perspective, the mixed-methods approach is considered a 'method' for data collection. The single paradigm approach, instead, sees in *pragmatism* the specific philosophical reference for the mixed-methods approach (Tashakkori and Teddlie, 1998, cited in Tashakkori and Teddlie, 2003, p. 20). This philosophical approach supports the possibility of combining qualitative and quantitative methods and data within the same study if necessary to answer the research questions. In practical terms, this approach advocates for the adoption of '"what works"' (Molina-Azorin and Cameron, 2010, p. 97) in relation to the specific focus and aims of the study. The reasoning behind the pragmatist view is that 'there are singular and multiple realities that are open to empirical inquiry and orient itself toward solving practical problems in the 'real world'' (Feilzer, 2010, p. 8). Pragmatists, thus, conceive the world as characterised by different forms of realities, towards which research may assume a multiple lens that best suits the differences of this reality, with the aim to 'resolve' what this reality brings into attention (Cherryholmes, 1992).

Pragmatism is often considered the 'philosophical partner' (Denscombe, 2008, p. 273) of mixed-methods research, and is ultimately the philosophical stance underpinning the present study. However, Denscombe (2008, p. 273) warns about the fact that mixed-methods do not 'operate on the basis of a unitary, agreed vision of pragmatism', and such a philosophical position may assume four assets, which provide the justification for the different visions and use of mixed-methods. For practical limitations, it is not possible here to explain in more details the various facets of pragmatism. It is important, however, to explain that the present study's use of mixed-methods was underpinned by a pragmatist stance that provided 'a basis for using mixed-methods as a *third alternative'* (p. 273), and that is when the use of qualitative or quantitative methods alone are not sufficient to answer the research objectives (Tashakkori and Creswell, 2007). Such an approach was in this study driven by the different nature of the RQs which required different methods of investigation (Newman and Benz, 1998; Tashakkori and Teddlie, 1998, cited in Onwuegbuzie and Leech, 2006) within the same research project, with an overall applied orientation of the study, another typical feature of mixed-methods approaches (Denscombe, 2008; Saunders, Lewis and Thornhill, 2016). This said, mixed-methods is not a unique strategy; qualitative and quantitative methods may be used and combined in various ways, depending on the sequentiality given to one or other component, and their priority and weight in the study (Creswell *et al.*, 2003). The following section reports explanations about the specific strategy adopted in the present work.

4.1.2 Sequential explanatory mixed-methods approach

The present work adopted a *sequential explanatory mixed-methods approach,* starting the data collection with the quantitative element and continuing with the qualitative. However, the priority here does not imply a higher weight of one part to the other, as equal importance was given to the quantitative and the qualitative elements, using thus a variation of this

strategy (Tashakkori and Teddlie, 2003). With the quantitative analysis, the study aimed to analyse the extent to which certain individual variables were predictors of academics' entrepreneurial behaviour. To follow, the qualitative analysis helped explaining why certain variables were or not significant predictors, along with providing further information on the underpinning processes. Particularly, the qualitative investigation aimed to shed light on how academics themselves perceive and experience the possibility of involvement in entrepreneurial activities, and which are the meanings attributed to such activities. Furthermore, whilst the quantitative analysis was also done in a contextual-fashion, the qualitative analysis sought to provide further and deeper insight on this aspect. Particularly, the effect of the proximal context, i.e. the university environment (meso-level) and the distal context (macro-level), i.e. the national context, were aspects explored in the interviews. In so doing, the mixed-method approach aimed to provide *complementarity* (Greene, Caracelli and Graham, 1989, p. 258) 'to measure overlapping but also different facets of a phenomenon, yielding an enriched, elaborated understanding of that phenomenon'.

The qualitative analysis also sought to investigate how AE was connected to scientists' careers. The study focused on providing an insight into if and how career interests and orientations influence academics' willingness to engage in entrepreneurship, and vice-versa. Whilst the quantitative component investigated some career-related issues, such analysis was specifically aimed at estimating the impact of a BC attitude on the extent to which academics engage in entrepreneurial activities. The interviews sought information on the subjective meanings attributed to entrepreneurial activities and how these were perceived as influential upon their career. Such analysis can be defined as an *expansion* strategy (Greene, Caracelli and Graham, 1989), where qualitative *and* quantitative methods are used 'to extend the breadth and range of inquiry by using different methods for different inquiry

components' (p. 259). Given however the presence of a complementary purpose- as earlier discussed- it would be most appropriate to talk about a 'higher order expansion design' (Greene, Caracelli and Graham, 1989, p. 269), where the overarching strategy was an expansion one, within which elements of other strategies were included, for instance, a *developmental* one (Greene, Caracelli and Graham, 1989). This is because the quantitative results were also used to purposefully select the interviewees according to certain criteria (Tashakkori and Teddlie, 2003),[1] a procedure defined as *participant selection model* (Creswell *et al.*, 2003). This is also why the mixed-methods here adopted followed a sequential model starting with the quantitative component.

The selection of the interviewees on the basis of the results of the survey also constitutes one of the main points of connection and integration between the two components of the study, defined by Ivankova, Creswell and Stick (2006) as the 'intermediate stage' (p. 11). The other two connection points are the beginning of the study, when its scope is defined (research questions and design stage), and the final discussion phase, when the findings of the entire study are elaborated and integrated (Ivankova, Creswell and Stick, 2006; Schrauf, 2018). Whilst the thesis reports separate analyses and interpretations for both the quantitative (see Chapter 5) and the qualitative components (Chapters 7 and 8), it also provides an overarching view of the study (Chapter 9) in which the various elements, perspectives and findings are integrated, providing 'breadth of the inquiry' and a richer and deeper insight on specific issues. Such integration strategy has been defined as *contiguous approach*, because the data from the two strands are analysed and interpreted in separate sections in an initial stage, and subsequently compared and integrated, at the inferential stage (Schrauf, 2018). This

[1] Green, Caracelli and Graham (1989) while providing to some extent precise and distinct strategies, each of them to most suitably combine with specific designs, they also recommend for their flexible use (this is especially the case for the expansion one). The frameworks they provided were, in fact, to be intended as 'working ideas rather than prescriptive models' (p.266).

approach allowed: (i) within-method quantitative comparisons between groups, where the results at the survey were compared among the three countries; (ii) within-method inter and intra group qualitative comparisons, where the findings from the interviews were analysed *per* country and among the three countries; (iii) cross-method comparisons among groups of combined data, with cross-country integration of quantitative and qualitative data. The following figure represents in a schematic way the mixed-methods approach here adopted.

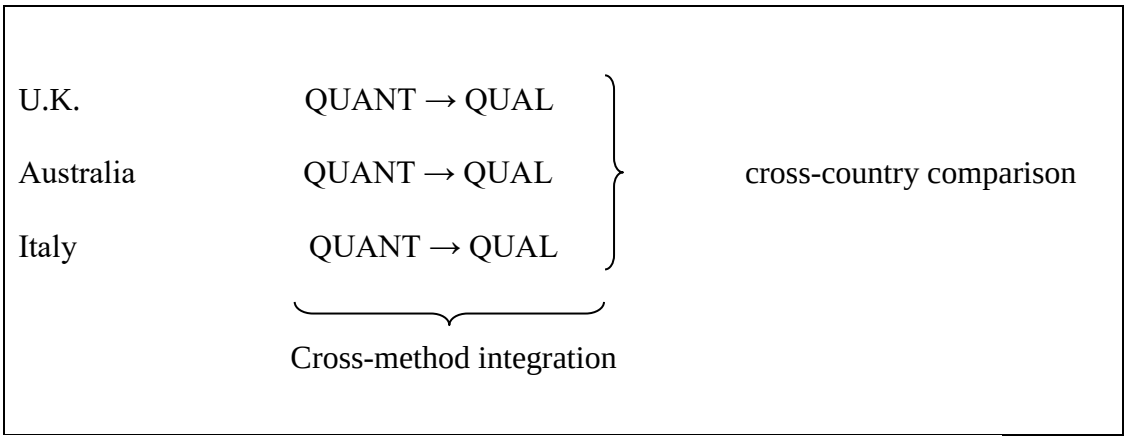

Figure 4.1. Cross-country sequential explanatory mixed-method approach

Adapted from Schrauf (2018). *Notes:* Borrowing Morse's (1991) notation system, the following abbreviations have been used to define respectively QUAN (for quantitative strand) and QUAL (for the qualitative strand). The arrows indicate the direction and sequentiality followed, and the use of capital or minuscule signals the weight each strand holds in the study, with the capital letters indicating higher importance of a strand. As clear from the figure, in the present study both the methods hold equal weight.

Whilst the variety and intertwined combination of strategies here adopted may seem as an intricate and complex way of conducting research, it must be acknowledged that this is not rare in mixed-methods studies, which ultimately are often underpinned by a variety of purposes (Greene, Caracelli and Graham, 1989). A single, *pure*, approach, in fact, would have not fit with the multi-scope orientation of the present work. At the same time, it must be also acknowledged that notwithstanding the usefulness of mixed-methods in this work, borrowing Ivankova, Creswell and Stick's (2006, p. 4) words: 'despite its popularity and straightforwardness, this mixed-methods design is not easy to implement'. Challenges were indeed encountered by the researcher while conducting the project. Whilst an overall

discourse on the study's limitations will be reported in Chapter 10, the next section reports some of the main challenges relating to the cross-country strategy here adopted.

4.2 Cross-cultural equivalence

The usefulness of conducting cross-country studies lies in the possibility to have data from different contexts that can be analysed in their similarities and differences. These in turn may provide insight on how certain phenomena remain constant and valid cross-country or whether divergence is present. According to the aim of a study, such as the present, this strategy could be a 'gold standard' to analyse the topics under examination from a multi-dimensional perspective, looking at the macro and the micro foundations of the phenomena, as well as the interactions between the two dimensions. Given the multi-faceted nature of AE as well as the complexity of the concept of career, a cross-country analysis was thought to provide the necessary elements and information to reach a rounded insight of the topic. However, in the usefulness of this method also lies its challenges. Comparing findings from different contexts present some critical aspects, such as the comparability of the evidence themselves. This might be due to differences in languages or data collection environments, for instance (Cohen and Ravishankar, 2012; Usunier, Van Herk and Lee, 2017). In order to overcome these issues, a series of rules and procedures have to be followed to ensure quality of the data. In the present study, to minimise biases and guarantee equivalence and comparability (Usunier, Van Herk and Lee, 2017) methods and data collection modalities were kept constant in all the three countries. Likewise, the same sampling procedures and criteria were followed in each university for both the survey and the interviews, recruiting equivalent types of participant in each context.

A critical issue to address was the divergence in language regarding the Italian group. As the researcher was a native Italian speaker, conducting the interviews in the language of the

interviewees was not an issue. Academics- the population targeted- generally have a good level of English- with it often being considered the lingua franca in academic circles (Cohen and Ravishankar, 2012). However, adopting the language of the country was thought to be the best approach, to ensure quality of the data. Intercultural research has suggested that this approach could favour richness in data, as people may feel more comfortable not only in speaking their own language (Cohen and Ravishankar, 2012) -in this case also the language of the country they were living in - but also to somebody seen as a compatriot (Soderberg, 2006). This raises also considerations about the insider/outsider status of the researcher, another issue in inter-cultural research. As an Italian but having lived in the U.K. for the past 5 years, and conducting research in Italy for an U.K. university, may raise some considerations about the status of the researcher, and how this may influence the interviewing process. Following the previous literature (Cohen and Ravishankar, 2012), it could be argued- and this was indeed the experience and perception of the researcher herself- that she was considered by the interviewees as an insider. This was due by the nationality, the fluent Italian spoken, and also the deep knowledge about the Italian higher education system- among the other things, topic of the study- given that part of the researcher' educational background was completed in an Italian university. These aspects made the participants feel at ease and interested in the study, as was evident by the high number of interviewees available for the study as well as the general positive and curious attitude demonstrated, with questions about the research often asked before and after the interview.

The researcher also noticed that knowing 'how things works here' and at the same time having an experience abroad made the participants particularly willing to make comparisons. During the interviews they were often highlighting the weaknesses, for instance, of the Italian context compared to other countries, while looking at the researcher as somebody

who could ‘understand what I am referring to’. At the same time, possibly because the researcher was not working for their institution, made them at ease sharing complaints, concerned, and frustration, which were guaranteed to be kept confidential, by religiously attaining to the ethical rules of the researcher’s institution of affiliation. It could be argued, in this case, the researcher was a mixture of an insider/outsider, which ultimately made the researcher able to gain useful insight for the study.

While interviews were, thus, conducted in Italian, the material was beforehand translated and back-translated (Brislin, 1980). Similar procedures have been adopted for the codes and themes derived from the qualitative analysis. Details about these technical issues are reported in the specific sections of this chapter.

While the Italian case was the one which presented more aspects to consider from an inter-cultural research perspective, considerations regarding the insider/outsider status of the researcher could be made also regarding the other two universities. Data collection in the U.K. was the one which raised less concern in this sense, as the researcher was, to some extent, an insider, being a PhD student in a U.K. institution, having lived in the U.K. for years, and speaking the language. No perceptions of being seen as an ‘outsider’ were noticed, perhaps also due to the generally international environment within U.K. universities, thus interacting with non-native English staff is considered the norm. The risk of being perceived as an ‘insider’ lies in the interviewees’ reticence in freely expressing themselves during the interviews. To mitigate for this, at the beginning of the interviews, participants were reassured about data being treated confidentially, ensuring that the thesis will not include specific details that may lead to participants’ identification. They were also briefed about data management and storage, and who had the access to the research materials. Informing about transparency and the commitment to maintain an ethic behaviour in the project was

considered the best strategy to establish trust, and therefore enhancing participants' involvement and 'truthfulness'.

Some issues could instead be mentioned regarding the data collection in Australia. The researcher could have been considered an outsider: not part of the institution where data was collected, of a different nationality, and not a native English speaker. However, language was not perceived to be an obstacle given the level of English spoken by the researcher, and the interviews were also conducted in English in the U.K. The only crucial issue was the membership of another institution. However, once provided with full information about the study's scope and procedures (in the information sheet), and being available for further inquiries, the interviewees generally appeared comfortable and very willing to take part in the study, as demonstrated by the high participation rate both for the interview as well as the survey. Possibly, this was precisely due to the 'outsider status' of the researcher, making the participants- ultimately academics- prone to help a junior academic, coming from 'far away'. The historical linkage between Australia and U.K., may have also favoured the connection with these group of participants, who in some occasions made references about the two higher education systems in a comparative fashion. They also often reported insight about their country, as the reason of certain outcomes, as if they needed to explain to an outsider 'what was going on there', from an historical perspective for instance. This provided crucial elements for the study, as will be illustrated in Chapter 7.

4.3 Ethics

Ethical approval was obtained from the University of Birmingham before commencing the data collection, and the study adhered to the University's ethical procedures throughout. Following the guidelines suggested in business and management research (Bryman and Bell, 2015), involvement was voluntary for all participants in this study. Consent was sought by

providing a form to sign both at the beginning of the survey and the interview. Participants were informed beforehand of the study's aims and procedures, as well as the right to withdraw through an information form introduced at the beginning of the survey and given-in paper format- before starting the interviews. The forms also contained the researcher's personal details to be contacted in case of queries and concerns.

The data collection sought to maintain confidentiality and privacy. The survey was conducted using the researcher's Qualtrics personal account. This was securely protected through password, therefore only the researcher could access the data. The participants received a web-link embedded in the invitation emails sent, and therefore they could access the survey when and where for them more convenient. The interviews were conducted in private spaces, and the audio-tapes safely stored in password protected computers and encrypted storage devices, only accessible by the researcher. Confidentiality was respected at all stages of the study; names and personal information were not included in the text to avoid participants' identification. For this reason, also the names of the universities in which data were collected are not disclosed. Information sheets and consent forms are provided in the appendix.

4.4 Summary

The different research purposes and questions led to the adoption of an explanatory mixed-methods approach. Driven by the aim 'to extend the breadth and range of inquiry' (Greene, Caracelli and Graham, 1989, p. 259), quantitative and qualitative methods were used to address the different RQs. Specifically, part of RQ1 (regarding the 'factors' underpinning AE) and RQ2 (and the related RQs 2a and 2b), aim to assess the extent to which individual attitudes, such as entrepreneurial alertness and BC, are predictors of academics' entrepreneurial behaviour. Such a research purpose was best suited to a quantitative

approach to gather a systematic, quantifiable, and large-scale evaluation of the impact of individual traits on scientists' entrepreneurial tendencies. RQs 1 and 3 aim to explore the processes underpinning AE, particularly academics' sense-making of their involvement in entrepreneurial activities. This type of exploration required a qualitative analysis to give voice to the subjective meanings and experiences.

Underpinned by a pragmatist stance, the mixed-methods approach here adopted followed a sequential pathway, starting the data collection with the quantitative component and continuing with the qualitative one. Such a strategy also helped in the recruitment of the interviewees according to certain criteria assessed at the survey.

The usefulness of a mixed-methods approach was not free of challenges, which were tackled by following the guidelines provided by the mainstream literature on research methods, and through the adoption of a rigorous and ethical approach towards the research. Guidelines were also needed to deal with the challenges posed by the adoption of a cross-country design. Whilst providing useful information on similarities and differences across contexts- thus enabling to shed light on the influence of the macro-meso-micro dimensions of AE and academics' careers- it also required some specific procedures to be implemented. Instruments, for instance, were back-translated from English into Italian, to be used in the Italian university, and considerations of the role of the researcher as insider and or outsider of the various settings were kept in mind. Nevertheless, the cross-country design and the mixed-methods approach enabled a rich and extended data set to be gathered, which ultimately allowed to address the RQs.

Chapter 5. Quantitative Investigation

The present chapter discusses the quantitative analyses conducted for this project. The initial sections report information about the methods, samples, and sampling procedures, whereas the remaining sections illustrate the variables included, the analytical strategies adopted, and the results. The chapter ends with a discussion of the findings.

5.1 Methods

5.1.1 The survey

The quantitative data in this study was gathered through an on-line survey, developed following the Tailored Design Method (TDM) that is a 'scientific approach to conducting sample surveys' (Dillman, Smyth and Christian, 2014, p. 16). The TDM consists of a series of techniques and procedures aimed at producing the most accurate survey outcomes. Underpinned by the Social Exchange Theory, the core concepts of this approach are *trust*, *reward* and *return*. This method assumes that taking part in a survey is a social exchange, and, as with other social behaviours, can be supported and enhanced by building a fiduciary relationship with the respondents through creating a sense of trust and providing a return for the cost involved in taking part in the survey (Dillman, Smyth and Christian, 2014). These simple concepts permeate the entire TDM, and, in relation to every single step of survey design, they imply that certain procedures should be preferred over others.

Translated into practical terms, to build trust between the researcher and the respondents in this study, as suggested by the TDM, detailed information regarding the study's scope, the sponsorship, the research team and the data treatment were provided to the participants in the invitation letter and at the beginning of the survey. The latter was presented professionally, paying attention to the visual presentation (for example by using the

University's template) and communication. Regarding the reward and return, a monetary compensation was considered inappropriate given the population targeted. Therefore, in an effort to leverage on 'social return', the potential benefits of the study's results for the participants were underlined in the invitation letter, where emphasis was placed on the importance of their contribution for the study, with the aim of stimulating altruistic tendencies. Participants were also informed in the reminders about other colleagues' participation in the survey, trying to influence, in this way, an imitative behaviour. Finally, to keep the perceived effort or cost of any action at its minimum, as suggested by social exchange theory, participation in the survey was made as simple as possible and the overall survey was kept relatively short (Dillman, Smyth and Christian, 2014).

The delivery mode was also carefully planned. The survey was sent via email, through a link embedded in the invitation email, in order to make the participation quick and simple. Two reminders were also sent; the first, one week after the first invitation email, and the second after three weeks. Emails were sent on a Wednesday morning, which is considered to be the most effective timing, as suggested by the literature on survey research (Faught, Whitten and Green, 2004). Before the launch, the survey was pilot tested with a small sample of 5 volunteers who shared similar characteristics to the participants. The piloting consisted of completion of the online survey under the supervision of the researcher, who observed the participants' behaviour, registered comments, and, at the end, retrospectively asked for suggestions and any challenges encountered. This procedure combines the *classic cognitive interview* process – where people are typically asked to 'think aloud' which involves verbally reporting comments while completing the survey- with web-survey piloting or *usability testing*, which focuses more on how participants navigate the survey. In this way, it was possible to evaluate issues related to the questions' comprehension as well as the

visual/procedural elements. In the past, these two activities were conducted separately, but in recent years they have started to be combined (Dillman, Smyth and Christian, 2014). Some researchers have reported evidence of a higher efficacy in assessing surveys' weaknesses when the two are implemented concurrently (Romano Bergstrom *et al.*, 2013). The pilots were all conducted individually, in order to prevent participants influencing each other in the process (for further discussion see Dillman, Smyth and Christian, 2014, pp. 226-227). Along with these procedures, comments regarding the survey in terms of content, delivery mode, and instruction provided were also gathered from experts in survey research. The overall testing led to small changes in wording, and adjustments in the presentations of the survey.

As a good research practice, and in order to comply with the ethics regulations, the survey (see appendix[2]) started with some introductory information regarding the study, and a consent form box to sign. To follow, the three main questionnaires were presented. The first is an adapted version of D'Este and Patel's (2007) scale about academia-industry linkages; the other two questionnaires are: the entrepreneurial alertness scale (Tang, Kacmar and Busenitz, 2012) and the BC mind-set scale (Briscoe, Hall and DeMuth, 2006). Additionally, information regarding sex, age, school/college or department of affiliation were gathered in the final part of the survey.

Details about these instruments are reported in Sections 5.3.1.1. and 5.3.1.2. Before proceeding into that, it must be mentioned here that an additional step was required for the survey employed in the Italian setting, as described below.

[2] In the appendix is reported only the survey used in the UK. The surveys used in the other two countries were homologous instruments, in which the only differences were the names of the Schools and Colleges, and the language for the survey used in Italy.

5.1.1.1 The survey in Italy

The survey process in the Italian context required a preliminary step. As the survey was originally in English, translation and back-translation procedures were followed (Brislin, 1980). The researcher, an Italian native speaker, translated the full material from English into Italian; a professional English native speaker translator back translated it into English. The two versions were compared and discussed between the two. Given this adaptation into another language, specific pilots (following the procedures earlier discussed for the general survey) were conducted with a sample of five volunteers (Italian native speakers), to assess content and face validity. In an alternate sequence, both the English and the Italian surveys were administered to the participants, who were asked to complete them and to provide comments. These procedures allowed assessment of the clarity of the Italian survey, and feedback confirmed the decision to adopt an Italian version of the material. Additionally, using a version conformed to the language of the context was thought to enhance the rate of participation (see also discussion on cross-cultural research in Chapter 4).

It must be specified that the BC mind-set scale did not need translation as an Italian validated version already existed (Lo Presti *et al.*, 2011). This was therefore used with permission of the authors. Similarly, regarding the Academia-Industry collaborative activities questionnaire, an Italian version already existed (see Muscio, 2008); however, since two items were modified, the scale used in this study was translated and back-translated anyway and compared with the one already available. No significant differences were found. The survey developed, with the scales used, is reported in appendix.

5.2 Sampling and samples

Different, although linked, sampling procedures and samples were adopted for the quantitative and the qualitative analyses. Overall, the samples were constituted by academics

from the three universities under consideration, covering the following disciplines: medicine, chemistry, biology, maths, physics, geography, computer science, and engineering (with all the different sub-classifications, i.e. mechanical, biomedical, among others). Having said that, schools, faculties, as well as the disciplines themselves in some cases differed from one university to another in the way they were classified and named.

For the survey, the entire population of the academics from STEM disciplines in each of the university under examination was contacted. The adoption of such a sampling procedure is in line with the quantitative strand adopted here, and the aim to form a representative sample of the population, to produce generalisable results, and to make inferences about the population surveyed (Saunders, Lewis and Thornhill, 2016). Recruitment of participants relied on the email addresses available on the universities' websites. All academics from the level of post-doc to professor who had their email addresses available were contacted.[3] The online survey was sent through a link embedded in an invitation email.

Since the researcher did not have any other possible access to university's staff contacts, this was ultimately the only recruiting strategy possible. While a good coverage was achieved, some caveats must be acknowledged. For instance, websites may not always be updated with the latest information regarding the current staff in each department (Saunders, Lewis and Thornhill, 2016), thus they may contain the email addresses of academics no longer working in that specific institution, or they may not have full details regarding the staff, or they may not have the email addresses of all the academics. While it was not possible to operate on the latter issue, to control for the accidental inclusion of, for instance, PhD students or honorary academics, a filter question specifically for these two groups was included at the

[3] PhD students and teaching fellows were excluded as they are generally less exposed to entrepreneurial activities, therefore considered not informative of the topic. Honorary academics were also excluded as they are typically retired academics, or working in different universities, hence not representative of one of the three universities selected.

beginning of the survey. If the participants selected the category 'PhDs/teaching fellow/honorary academic' they were redirected to the end of the survey, where an explanation for their exclusion was reported. The invitation emails also contained detailed explanation regarding who the survey was targeted towards, explaining the criteria for which participants were selected, in an attempt to divert those not fitting with the study from taking part in it.

Table 5.1 reports the total population to which the survey was sent, for each country, and the relative rates of response, which refer to complete surveys, as incomplete questionnaires were discarded (Baruch, 1999). Table 5.2 reports information on the number of participants contacted and the respondents for each university, divided by sex, discipline, and role at university. As it can be noticed, in every university, the percentage of male respondents was higher than the one of for females. However, the male group was also larger in each university, thus the higher number of respondents is the results of male being overrepresented in the samples. In fact, looking at the percentages for relative group, it can be noticed that for every university each category (e.g. male, female, discipline, role) is proportionately represented compared to the total of respondents for the relative category. For instance, the 18.26 per cent of males from the total of male participants from the British group took part at the survey; similarly, the 22.45 per cent of female from the total of females from the same university replied. 'Science and engineering' is also a larger group compared to medicine, in every university; however, is also due to the fact that the group 'science and engineering' is the result of the combination of different disciplines together (e.g. chemistry, maths, physics and all the engineering departments) due to the need to homogenise and make comparable the disciplinary groups across the three universities, which differed in how schools, faculties, and departments were divided and organised.

Table 5.1. Respondents and response rates

University	Contacted	Complete surveys	Partially complete surveys	Response rates
U.K.	1006	196	18	**19.48%**
Australia	779	223	7	**28.62%**
Italy	829	247	39	**29.79%**
Total	**2514**	**666**	**64**	**26.49%**

Table 5.2. Respondents and response rates by sex, discipline, and role

	Male	Female	S.&E.	Med.	Prof.	A.prof.	Dr.
U.K.							
Contacted	712	294	594	412	244	49	713
Respondents	130	66	112	84	45	10	141
Respondents in % referring to the total	**66.33%**	**33.67%**	**57.14%**	**42.86%**	**22.96%**	**5.10%**	**71.94%**
Respondents in % for relative group	**18.26%**	**22.45%**	**18.86%**	**20.39%**	**18.44%**	**20.41%**	**19.77%**
Australia							
Contacted	539	240	728	51	162	107	510
Respondents	148	75	206	17	54	31	138
Respondents in % referring to the total	**66.37%**	**33.63%**	**92.38%**	**7.62%**	**24.21%**	**13.90%**	**61.88%**
Respondents in % for relative group	**27.46%**	**31.25%**	**28.30%**	**33.34%**	**33.34%**	**29%**	**27.1%**
Italy							
Contacted	587	242	638	191	204	333	292
Respondents	178	69	207	40	68	103	76
Respondents in % referring to the total	**72.06%**	**27.94%**	**83.81%**	**16.19%**	**27.53%**	**41.7%**	**30.77%**
Respondents in % for relative group	**30.32%**	**28.51%**	**32.45%**	**20.9%**	**33.34%**	**30.9%**	**26%**

Notes: S. & Eg. = academics in science and engineering departments; Med. = academics in medicine, A. prof. = associate professors.

5.3 Quantitative data analysis

5.3.1 The variables

Descriptive statistics for the dependent and independent variables are displayed in Table 5.3, and the correlation matrix for all the academia-industry collaborations, entrepreneurial alertness, BC mind-set, age, sex, and role variables are presented in Table 5.4.

5.3.1.1 Dependent variables

The study is based on a key dependent variable: academics' level of involvement in entrepreneurial activities. This was measured through an adapted version[4] of D'Este and Patel's (2007) 12-item questionnaire, which captured academics' frequency and type of involvement in academia-industry collaborations. The items were on a Likert scale assessing the amount of times academics had been involved in any of the activities listed *in the last 24 months;* the scale ranged from 0 times (recoded 1) to ≥ 10 (recoded 5). The values in the middle were: 1-2 times (which became 2), 3-5 times (3), and 6-9 times (4). In this way, a classic 1-5 Likert scale was developed, the values of which corresponded to actual frequencies of time. The values at each item were then summed together to create a total score for each participant; with a minimum achievable of 12 and a maximum 60, and alpha coefficient 0.82, which can be considered high (Nunnally, 1978).

For the second analysis, two other dependent variables were developed. Specifically, the activities in the academia-industry questionnaire were divided in two groups according to

[4] With permission of the author, the last two questions and the temporal span to which the respondents were asked to refer to were modified. Specifically, the original version focused on 12 months, however, after having consulted technology transfer and business engagement experts from the UK university, a longer period was chosen in order to have a larger coverage, allowing for certain activities which may require a long time (such as patenting). Regarding the last two questions, these were modified from the original version since the technology transfer and business engagement experts suggested that these specific activities should be included in the questionnaire. Therefore, instead of including question 11, and leaving question 12 open (as the original option was 'other'), 'patenting' and 'other activities related to the protection of Intellectual Property Rights (IPRs)' were included. As the questionnaire was slightly modified from the original version, two classic pen and paper pilot tests were conducted specifically regarding this instrument, before conducting the general survey.

the type- formal or informal- entrepreneurial activity they referred to, in line with the literature (see Chapter 2). One dependent variable was therefore constituted by the hard entrepreneurial activities (AIH) that is items 1, 2, 11 and 12. Alpha coefficient .61. The other dependent variable was formed by grouping together items 3, 4, 5, 6, 7, 8, 9, 10, which referred to the soft entrepreneurial activities (AIS). Alpha coefficient .80.

These two newly derived dependent variables were used in two separate regression analyses, in order to explore the influence of the main independent variables on these different types of activities.

5.3.1.2 Independent variables

The key independent variables were *BC mind-set* and *entrepreneurial alertness.* The former, was measured adopting the 13-items scale of Briscoe, Hall and DeMuth (2006). The former is a 13-item questionnaire aimed at assessing the preference and ability to cross different organisational and roles boundaries. Participants were asked on a 5-point scale (1 = 'to little or no extent') (5 = 'to a great extent') to express the extent to which the items described of themselves. Sample item: '*I enjoy working with people outside of my organization*'. The variable was constituted by the sum of the score at each item; therefore, the maximum score achievable was 65 and minimum 13. Alfa coefficient .82.

Entrepreneurial alertness was measured using Tang, Kacmar and Busenitz's (2012) 13-item scale, which was aimed at assessing the ability to recognise and exploit opportunities with business potential. On a 5-point scale (1 = 'strongly disagree') (5 = 'strongly agree') participants were asked to rate the extent to which the items applied to themselves. Sample

item: '*I can distinguish between profitable opportunities and not-so-profitable opportunities*'. Maximum score achievable 65 and the minimum 13. Alpha coefficient .92.[5]

The models also included other independent variables. Specifically, *sex* was included as a dummy with male as a reference category. The *role at university* was distinguished by a set of dummy variables coded 1 for each role: post-doc, research fellow, lecturer (which also included senior lecturer), associate professor, and with professor as a reference group. Age was included as a continuous variable. Finally, a dummy variable was created for *academic discipline*. Regarding this variable, participants were asked to report first the school or college they were working in, and subsequently the specific department. However, only a limited number of respondents answered the second part, therefore, only macro-information that is regarding the school or college was available. This, in turn, created a difficult comparison between the three universities as schools or colleges varied in terms of departments they were composed of. For instance, the college of Engineering and Physical sciences in the British university comprised departments that in the Australian university referred to the School of Science. To resolve this issue, a two-level dummy variable was created for the academic discipline, where medicine- that was consistently a separate group in the three universities- was 1, and 'science and engineering' (which included life, natural sciences, and engineering disciplines) was 0. Although, this may limit the possibility to look in detail at the effect of the academic discipline, ultimately it was the only feasible solution.

[5] Since the scale was developed and tested on a business-oriented population, in accordance with the author, some items were slightly modified to adapt to a generally non-business sample such as the one in this study. Specifically, in items one, three and four the context was added: the words 'business opportunities' were included in the sentence since the genericity of the items could have been misleading for the population, that generally "*browse the internet*" but not for business opportunities. Information regarding what the questionnaire was specifically referring to was also provided at the beginning of the scale. The adapted version is provided in appendix, where the survey is presented. As the alpha coefficient was high (.92), it could thus be argued that the reliability of the scale was not undermined.

Table 5.3. Descriptive statistics for dependent and independent variables

	U.K.					Australia					Italy				
	%	Mean	SD	Min	Max	%	Mean	SD	Min	Max	%	Mean	SD	Min	Max
Academia-Industry activities		16.7	5.1	12	41		17.4	4.9	12	42		17	4.6	12	42
Entrepreneurial alertness		36.2	12	13	62		37.2	10.7	13	64		36.7	10.4	13	59
BC mind-set		47.9	7.9	26	65		47.8	7.9	26	64		44.9	7.7	25	65
Age		45.12	10	27	68		44.8	10.9	26	76		51.6	9.73	31	72
Role															
Post-doc	7.65			0	1	17			0	1	2.43			0	1
Research fellow	17.4			0	1	24.7			0	1	1.21			0	1
Lecturer	46.9			0	1	20.2			0	1	27.1			0	1
Associate professor	5.1			0	1	14			0	1	41.7			0	1
Professor	23			0	1	24			0	1	27.5			0	1
Sex (male = 1)	66.3			0	1	66.4			0	1	72.1			0	1
Discipline (medicine =1)	42.9			0	1	7.6			0	1	16.2			0	1

5.4 Analytical strategy

Data were analysed with STATA 15. Bivariate correlations, and regression analyses were performed, and regression assumptions tested, the results of which are reported in the following sections. The correlation analysis was performed combining data from the three universities to have a larger sample with which to explore the preliminary associations between variables. The regression analyses were instead performed considering each country separately, in order to notice similarities and differences.

An ordinary least squares (OLS) method was adopted for the analysis. Although this is a widely used method in the social sciences, there is still a debate in the literature regarding 'whether ordinal data, converted to numbers, can be treated as interval data' (Sullivan and Artino, 2013, p. 541). OLS is considered appropriate and legitimate providing that 'the distribution of the dependent variable appears to be roughly normal and the ordered categories accurately represent an underlying continuous distribution' (Lewis-Beck, Bryman and Liao, 2004, p. 941). Regarding the former point, as the samples in this study are >30, the central limit theorem applies (Field, 2013). This means that even in case the distribution of the dependent variable deviates from the normal curve, the assumption of normality still applies. Regarding the second point, it may be assumed the presence of an underlying continuous variable as the dependent variable is not constituted by a single-item but by the sum of the scores at the items that constitute the entire scale, thus it can be considered having a 'quantitative meaning' (Wooldridge, 2016, p. 224). The scale is composed by many categories (12 items) (Lewis-Beck, Bryman and Liao, 2004), which appeared to be strongly inter-correlated as shown by the alpha coefficient (.82). Furthermore, when the 12 items that constitute the academia-industry questionnaire are considered all together, the alpha coefficient is higher than for the two sub-groups 'hard' and 'soft', especially for the former

(see Section 5.3.1.1). Hence, although the items can be considered referring to different activities, the higher alpha for the whole questionnaire suggests uni-dimensionality of the scale. Furthermore, while single Likert items are effectively ordinal, Likert scales which are composed by many items that are summed up can be considered interval in nature (Carifio and Perla, 2008; Norman, 2010; Huszár, Prónay and Buzás, 2016). Given these considerations, OLS was selected for the regression given also the ease of interpretation of the results

5.4.1 Regression models

The regression analyses were divided in two stages. In the first step, a linear regression was performed adopting the total sum of the 12 items of the academia-industry activities questionnaire as dependent variable. In a second stage, the regression was performed on the two dependent variables related to 'hard' (AIH) and 'soft' (AIS) entrepreneurial activities (see Section 5.3.1.1.).

Three models were developed and used for both the first and second analysis. Model *a* aimed to test the effect of entrepreneurial alertness and BC mind-set (the two main independent variables) on academics' involvement in academia-industry activities. The model included the two key independent variables above mentioned, and a series of control variables derived from the literature (sex, age, academic discipline, and role at university,). These variables correspond to hypotheses: entrepreneurial alertness (H1), BC mind-set (H2), discipline (H3), sex (H4), and seniority (H5).

In model *b* while keeping all the variables included in model *a* constant, an interaction term between entrepreneurial alertness and sex (where male was the reference group) was included, to test if the combination of these two hypothesised predictors incremented academics' entrepreneurial behaviour compared to the previous model, as for H6. Similarly,

in model *c* an interaction term between entrepreneurial alertness and discipline was included (replacing the previous interaction term) to test the potential combined effect of these two independent variables suggested by the literature as predictors of entrepreneurial behaviour (H7).

As mentioned, these three models were also used in a second analysis, in which two different dependent variables were included: AIH, referring to hard entrepreneurial activities, and AIS, for soft entrepreneurial activities, to test H8 and H9.

Models 5a, 5b, 5c, used instead as dependent variable AIS, i.e. the sum of the items referring to informal entrepreneurial activities. Models 4 and 5 referred to the British group. The same applies for models 6, 7 that, as can be seen in Table 5.7, correspond to the Australian university, and models 8 and 9, corresponding to the Italian university.

5.5 Findings

5.5.1 Bivariate relationships

5.5.1.1 Scatterplots and correlations

The relationship between involvement in academia-industry activities and the key independent variables was firstly explored with bivariate analysis. Scatterplots between academia-industry activities and entrepreneurial alertness, as well as academia-industry activities and BC mind-set were performed to explore the potential association between these predictors and the dependent variable. The scatterplot reported in Figure 5.1 suggests a linear, moderately strong, positive relationship- with only a few potential outliers- between the level of involvement in entrepreneurial activities and entrepreneurial alertness.

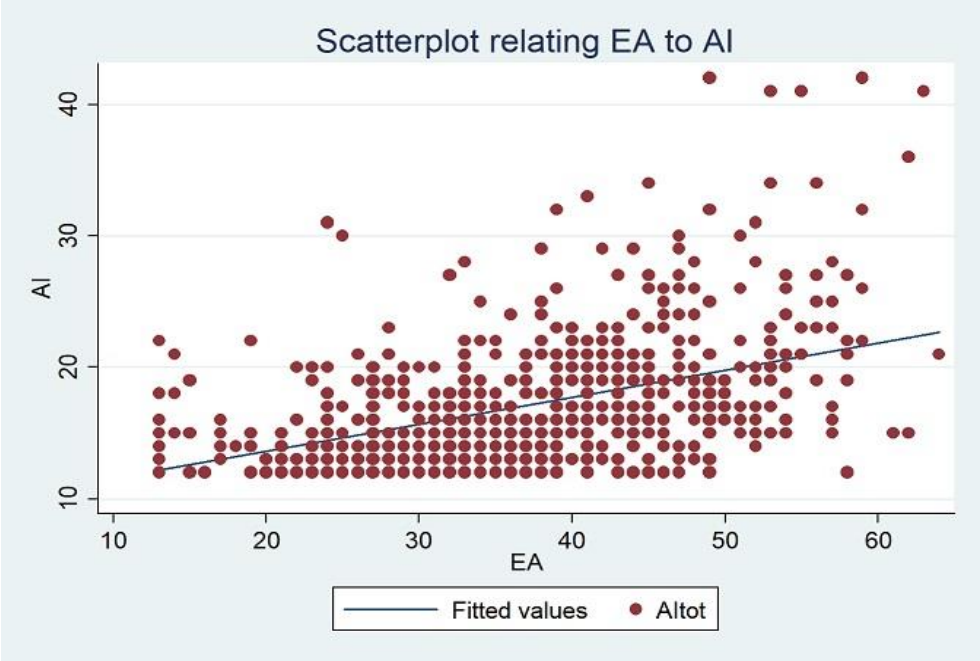

Figure 5.1. Scatter plot relating entrepreneurial alertness and academia-industry involvement

To check the statistical significance of such relationship, correlation analysis was also performed. As displayed in Table 5.4, the results evidenced a significant and positive relationship between entrepreneurial alertness and scientists' involvement in academia-industry collaborations ($r = 0.46$, $p < 0.001$).

Likewise, the association between BC mind-set and entrepreneurial activity was also tested. Figure 5.2 suggests a linear, positive, moderately strong relationship between the two factors, with only a few potential outliers.

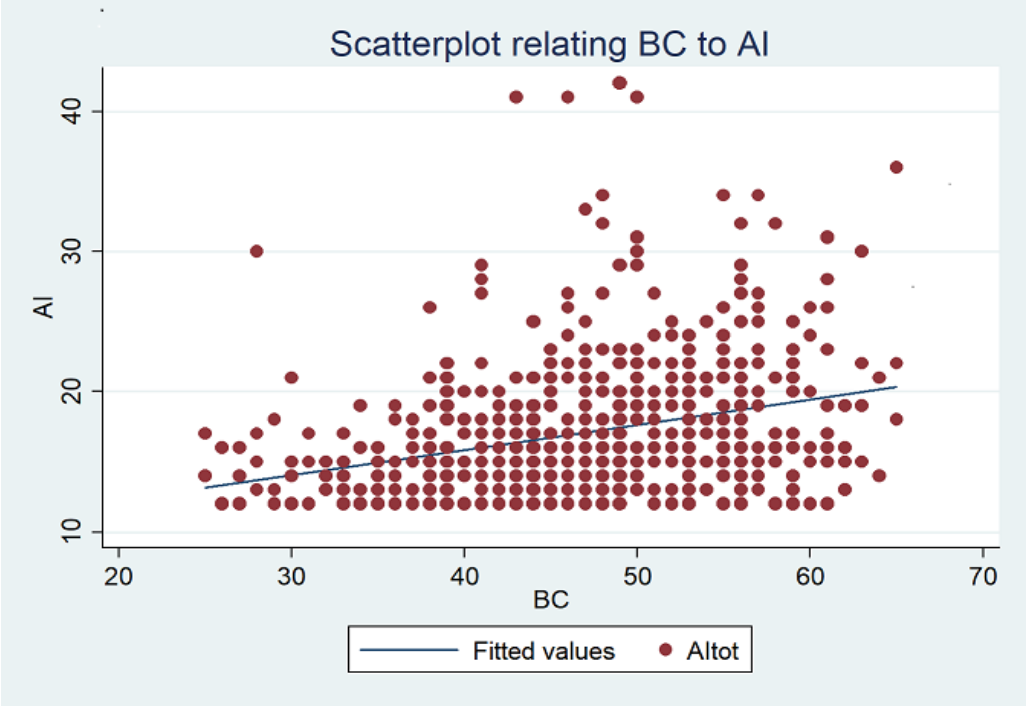

Figure 5.2. Scatter plot relating BC mind-set and academia-industry involvement

This relationship was tested with a correlation analysis. Table 5.4 reports also for these two variables a significant positive relationship (r = 0.29, $p < 0.001$), slightly smaller than the one between entrepreneurial alertness and BC mind-set.

The correlation analysis also showed that the two key independent variables (entrepreneurial alertness and BC mind-set) were positively related (r = 0.41, $p < 0.001$), in line with the literature (Uy *et al.*, 2015).

Table 5.4 reports various other associations between the variables in exam. For instance, being a professor was found to positively correlate with the level of involvement in entrepreneurial activities (r = 0.22, $p < 0.001$), as well as with entrepreneurial alertness (r = 0.16, $p < 0.001$), and BC mind-set (r = 0.08, $p < 0.05$), whereas being a lecturer is negatively associated with entrepreneurial involvement (r = -0.14, $p < 0.001$). In relation to the career stage, it was also found that being a post-doc was negatively associated with alertness for

opportunities (r = -0.09, $p < 0.05$). Looking at this in relation to the positive association between professorship and entrepreneurial alertness, it could be argued that senior academics seem to have a higher tendency to notice potential opportunities.

In turn, it could be speculated that being alert to opportunities with business potential might be an attitude that could be developed over years. Although from a correlation no final considerations can be drawn, this result highlights an interesting point, especially from a practical perspective. As the level of entrepreneurial alertness seems to increase as the career progresses, policy makers may consider how the exposure to such activities as well as training might be useful initiatives to enhance this ability, especially among junior scientists [6]. The relationship, and the potential effect of entrepreneurial alertness on entrepreneurial behaviour will be further later discussed in relation to the regression analyses (see Section 5.5.2.).

In line with the literature, the correlation analysis also signalled a positive association between sex and entrepreneurial activity; particularly, being male was positively associated with entrepreneurial behaviour (r = 0.09, $p < 0.05$). On the other hand, a negative correlation between BC mind-set and males was reported (r = -0.10, $p < 0.01$). Although this suggests a higher female tendency in crossing organisational and/or roles boundaries, females appeared to be less overall involved in entrepreneurial activities. This result combined with the larger coefficient between entrepreneurial alertness and academia-industry activities compared to BC mind-set and entrepreneurial behaviour suggests that more than a tendency to cross-boundaries is having a high alertness for business opportunities that impacts on the involvement in entrepreneurial activities.

[6] Further considerations on how to increase academics' entrepreneurial behaviour are reported in Chapters 9 and 10.

These and other relationships were further explored with regression analyses, where the effects of the main independent variables were tested for each country separately, with the aim to notice whether the impact of individual-level variables on academics' entrepreneurial activity persisted in different contexts, or if there were some cross-country variations in the importance of such variables on the dependent variable in exam.

Table 5.4. Correlation matrix between key variables

	Academia-Industry activities	Entrepreneurial alertness	Boundaryless career mindset	Discipline (medicine = 1)	Sex (male = 1)	Age	Post-doc	Research fellow	Lecturer	Associate professor	Professor
Academia-Industry activities	1.00										
Entrepreneurial alertness	0.46***	1.00									
BC mind-set	0.29***	0.41***	1.00								
Discipline (medicine = 1)	-0.07	-0.01	0.03	1.00							
Sex (male = 1)	0.09*	0.03	-0.10**	-0.12**	1.00						
Age	0.07	0.02	-0.03	0.08*	0.21***	1.00					
Post-doc	-0.02	-0.09*	-0.01	-0.08*	-0.07	-0.37***	1.00				
Research fellow	-0.05	0.04	0.05	-0.05	-0.14***	-0.29***	-0.13**	1.00			
Lecturer	-0.14***	-0.06	-0.02	0.09*	-0.04	-0.16***	-0.21***	-0.27***	1.00		
Associate professor	-0.03	-0.07	-0.10*	-0.08	-0.03	0.17***	-0.16***	-0.21***	-0.35***	1.00	
Professor	0.22***	0.16***	0.08*	0.06	0.23***	0.48***	-0.18***	-0.23***	-0.38***	-0.30***	1.00

Notes: $p < 0.05^{*}$, $p < 0.01^{**}$, $p < 0.001^{***}$

5.5.1.2 T-tests and ANOVA

This section reports the results at the t-tests and ANOVA. This is because while Pearson's correlation analysis is widely used to test the associations between variables, given the presence of categorical variables among the independent variables, t-tests and ANOVA were also performed to show potential differences among levels of categorical variables on a continuous dependent variable (Kremelberg, 2011), in this way, also corroborating the results at the correlations.

As displayed in Table 5.5, similar findings between the two types of analyses- t-tests and correlations- emerged. For instance, no significant difference between the mean of the academics from science and engineering and those from medicine in relation to their involvement in entrepreneurial activities was found. In the same way, the Pearson's correlations showed no significant effect of belonging to a certain disciplinary field on academics' entrepreneurial activities (Table 5.4). Instead, when analysing sex differences (Table 5.5), it can be observed that the mean of involvement in academia-industry activities in males (*mean* = 17.38) was higher than in females (*mean* = 16.41), and this difference was statistically significant ($t = -2.4$, $p < 0.05$). A significant result emerged also at the correlations analysis (Table 5.4), where being male was positively associated with entrepreneurial behaviour.

The findings also showed no significant differences between the means of the group of academics from medicine compared to those from science and engineering regarding the level of entrepreneurial alertness. Similarly, no statistically significant differences in the level of entrepreneurial alertness were found between the mean of males and females. Similar results emerged also at the correlation analysis.

Regarding the BC mind-set variable, the mean of the academics from medicine and of those from science and engineering were not statistically different. Conversely, significant differences were observed regarding BC mind-set and sex. Specifically, the mean of females (*mean* = 47.96) was higher than the mean of males (*mean* = 46.19) and this difference was significant (t = 2.68, $p < 0.01$).

As the variable *role* is constituted by five levels, a one-way ANOVA was initially conducted to determine whether there were differences between the groups of post-docs, research fellows, lecturers, associate professors, and professors on the level of involvement in entrepreneurial activities, as well as entrepreneurial alertness and BC mind-set. The ANOVA revealed a statistically significant difference between groups regarding the involvement in entrepreneurial activities as shown by one-way ANOVA ($F(4,661) = 9.17$, $p = 0.0000$). Similarly, a one-way ANOVA showed a statistically significant difference between groups ($F(4,661) = 5.91$, $p = 0.0001$) regarding the levels of entrepreneurial alertness, as well as BC mind-set ($F(4,661) = 2.47$ $p = 0.043$).

Therefore, t-tests were conducted for the different levels of the variable *role* to see whether the differences in means corresponded to specific groups. As reported in Table 5.5, the mean of professors for the variable academia-industry activity was statically significantly higher than the one of post-docs (18.93 - 16.83, t = -2.31, $p < 0.05$), research fellows (16.51 - 18.93, t = -3.53, $p < 0.001$), lecturers (16.08 - 18.93, t = -5.78, $p < 0.001$), and associate professors (16.80 - 18.93, t = -3.71, $p < 0.001$). These results partially overlap with those at the correlations where being a professor was positively correlated with involvement in academia-industry activities, whereas a negative correlation emerged for lecturers. The t-tests revealed also significant differences regarding the level of entrepreneurial alertness between post-docs and professors (33.56 - 39.71, t = -3.65, $p < 0.001$), lecturers and

professors (35.8 – 39.71, t = -3.58, $p < 0.001$) and associate professors and professors (35.21 - 39.71, t = -3.72, $p < 0.001$). In both the cases, as can be noticed, professors reported higher levels, supporting the results at the correlations.

Senior scholars also reported higher levels of BC mind-set. Professors compared to associate professors showed a statistically significantly higher level of BC mind-set (47.91 - 45.31, t = -2.9, $p < 0.01$), confirming the correlations' results. Regarding this variable, however, a peculiar finding was also noticed: the mean of research fellows compared to associate professors was statistically significantly higher (47.65 - 45.31, t = 2.2, $p < 0.05$). This is somewhat in contrast with the general tendency of senior scholars being more 'boundaryless' than the junior colleagues. However, the significance level is 'borderline', as can be seen in Table 5.5., thus the result might not have a particularly strong relevance.

Table 5.5. T-tests between key variables

	Academia-industry activities	**Entrepreneurial alertness**	**BC mind-set**
Medicine, mean – Science and Engineering, mean *p-value*	16.45 - 17.24 *0.0859*	36.52 - 36.79 *0.7964*	47.18 - 46.63 *0.4704*
Male, mean –Female, mean *p-value*	17.38 - 16.41 ***0.0166***	36.96 - 36.24 *0.4278*	46.19 - 47.96 ***0.0075***
Post-doc, mean – Research fellow, mean *p-value*	16.83 - 16.51 *0.7189*	33.56 - 37.85 ***0.0267***	46.51 - 47.65 *0.3960*
Post-doc, mean – Lecturer, mean *p-value*	16.83 - 16.08 *0.2610*	33.56 - 35.8 *0.1521*	46.51 - 46.48 *0.9772*
Post-doc, mean – Associate prof., mean *p-value*	16.83 - 16.79 *0.9597*	33.56 - 35.21 *0.3234*	46.51 - 45.31 *0.3212*
Post-doc, mean – Professor, mean *p-value*	16.83 - 18.93 ***0.0224***	33.56 - 39.71 ***0.0003***	46.51 - 47.91 *0.2427*
Research fellow, mean – Lecturer, mean *p-value*	16.51 - 16.08 *0.3723*	37.85 - 35.8 *0.1206*	47.65 - 46.48 *0.2383*
Research fellow, mean – Associate prof., mean *p-value*	16.51 - 16.79 *0.6104*	37.85 - 35.21 *0.0662*	47.65 - 45.31 ***0.0286***
Research fellow, mean – Professor, mean *p-value*	16.51 - 18.93 ***0.0005***	37.85 - 39.71 *0.1957*	47.65 - 47.91 *0.8052*
Lecturer, mean – Associate prof., mean *p-value*	16.08 - 16.79 *0.0886*	35.8 - 35.21 *0.5987*	46.47 - 45.31 *0.1710*
Lecturer, mean – Professor, mean *p-value*	16.08 - 18.93 ***0.0000***	35.8 - 39.71 ***0.0004***	46.47 - 47.91 *0.0811*
Associate professor, mean – professor, mean *p-value*	16.80 - 18.93 ***0.0002***	35.21 - 39.71 ***0.0002***	45.31 - 47.91 ***0.0040***

Notes: significant *p-values* in **bold**.

Overall, the results provide initial indications of the presence of associations between the variables in exam. It must be specified that the correlation analysis, the t-tests, and ANOVA, were all performed on a dataset that comprised data from the three countries together, thus they may have not captured cross-country differences. However, these statistical tests were here used as initial tools to explore the relationships among the variables, and to give an overview of them. Finer grained analyses, with also cross-country comparisons, were conducted through regression, which also allowed to gather information on the specific effect of certain variables on the dependent variable(s) in exam while controlling the presence and effects of other variables, which was not possible with the correlations and tests. Regression analyses are presented in the following section.

5.5.2 Regression

5.5.2.1 Academic entrepreneurship: a broad perspective

In the first stage of the analysis, the three models described in the analytical strategy section were performed using as a dependent variable the total score deriving by the sum of all the 12 items that constitute the academia-industry activities questionnaire, as presented in the following sections. Results are reported in Table 5.6.

Model a

The results of the linear regression provided consistent support to H1. Having a high tendency to notice opportunities with business potential appeared to increase the likelihood of academics being involved in entrepreneurial activities, in all the three universities. Specifically, in the British group a unit increase in *entrepreneurial alertness* corresponded with 0.228 ($p < 0.001$) increase in entrepreneurial behaviour. Similarly, in the Australian group a unit increase in entrepreneurial alertness corresponded with 0.116 ($p < 0.001$)

increment in involvement in entrepreneurial activities and 0.176 ($p < 0.001$) for the Italian academics.

The results also demonstrated a positive effect of having a *BC mind-set* on entrepreneurship, supporting H2, albeit partially. For the Australian group, every unit of increase in the level of BC mind-set corresponded with a 0.090 ($p < 0.05$) increase in the level of entrepreneurial activity. In the Italian one, an even slightly higher increment in entrepreneurial behaviour was registered (0.111, $p < 0.01$). These results, thus, provide support for the hypothesised positive effect of being able to cross organisational and role boundaries on AE. However, the British group did not report any significant effect for this variable, thus only partially confirming H2.

The findings also revealed interesting patterns regarding the other variables included in the regression. In model *a1*, ceteris paribus, it was found that academics from medical sciences (the reference category) in the British group were less likely to get involved in entrepreneurial activities than those from science and engineering. At every unit of increase in the variable *medicine* corresponded a -1.719 ($p < 0.01$) decrease in likelihood of being involved in entrepreneurial activities, confirming H3. This hypothesis, however, did not find support from the other two universities in which the academic discipline did not emerge as a significant factor.

Another variable for which a cross-country divergence was noticed is *sex*. For the Italians, being male resulted to positively impact on AE. For every unit increase in the variable *male* a 1.362 ($p < 0.05$) an increase in involvement in entrepreneurial activities was reported. Compared to the effect of other variables, the coefficient of this element is large in this group, signalling a substantive relevance of this factor among the Italian academics surveyed. In

the other two universities, this variable did not appear to have a significant effect; hence H4 found only partial support.

The last result from model *a* refers to the *career stage*. In line with the literature, model *2a* reported a positive effect of *seniority* at university on the level of entrepreneurial activity, confirming H5. In the Australian group, a unit increase in the variable *research fellow* corresponded with -2.959 ($p < 0.01$) decrease in entrepreneurial activity, and a unit increase in the variable *lecturers* with -3.256 ($p < 0.01$) decrease, compared to professors. As the coefficients can be considered quite large, it can be affirmed that this variable is an important predictor of entrepreneurial behaviour among Australian academics.

A significant negative effect of being a junior scholar was also found in the Italian group; here, a unit increase in the variable *lecturers* corresponded with a -1.650 ($p < 0.05$) decrease in entrepreneurial activity, compared to professors. Notably, in the British group this variable was not significant.

Connected to seniority, the literature has sometimes reported an influence of age on AE (Haussler and Colyvas, 2011). Hence, this variable was initially included in the regression; however, no significant effect of age emerged. Since this variable often has a curvilinear effect, an aged-squared term was also tested in the model, but since it did not result in a relevant impact, it was subsequently excluded.

Model b

While keeping all the other variables constant, model *b* also included an interaction term between entrepreneurial alertness and sex- in this case being *male*- in line with H6. The results demonstrated (*3b*) that Italian male scientists with a high entrepreneurial alertness were more likely to be involved in entrepreneurial activities than their female colleagues (r

= 0.137, $p < 0.01$). The slight improvement in the r2 also indicates an improved fit over the previous model. In the other two universities, this interaction term was not significant.

Model c

Model *c* included all the variables in model *a* plus an interaction term between academic discipline and entrepreneurial alertness. The results showed that British academics from the medical sciences despite having a high level of entrepreneurial alertness tended to report a lower entrepreneurial behaviour than those from science and engineering. In other words, entrepreneurial alertness had a decreasing impact of -0.149 ($p < 0.01$) on entrepreneurial involvement for the academics from medicine compared to those from science and engineering. This confirms H7, albeit partially, as in the other two universities this interaction term was not significant.

Overall, the r2 demonstrate that the variables included in the models are significant predictors of entrepreneurial behaviour (1a 34,3%, 1b 19%, 1c 32%). The different coefficients, especially regarding the Australian group, confirm a cross-cases variation.

Table 5.6. Results of the linear regression models

	U.K.			Australia			Italy		
	1a	1b	1c	2a	2b	2c	3a	3b	3c
Entrepreneurial alertness	0.228***	0.242***	0.287***	0.116***	0.062	0.114***	0.176***	0.096*	0.190***
	(0.030)	(0.049)	(0.036)	(0.031)	(0.060)	(0.032)	(0.028)	(0.040)	(0.029)
BC mindset	0.028	0.026	0.026	0.090*	0.091*	0.090*	0.111**	0.090*	0.111**
	(0.043)	(0.043)	(0.042)	(0.042)	(0.042)	(0.042)	(0.038)	(0.038)	(0.037)
Discipline (medicine = 1)	-1.719**	-1.675*	3.747+	-1.275	-1.394	-2.555	0.689	0.667	4.775+
	(0.637)	(0.649)	(2.100)	(1.224)	(1.229)	(5.026)	(0.684)	(0.675)	(2.678)
Sex (male = 1)	-0.360	0.418	0.019	0.374	-2.248	0.357	1.362*	-3.726+	1.388*
	(0.701)	(2.185)	(0.703)	(0.682)	(2.571)	(0.687)	(0.591)	(1.965)	(0.590)
Age	0.039	0.038	0.029	-0.021	-0.026	-0.020	-0.027	-0.027	-0.032
	(0.039)	(0.039)	(0.038)	(0.038)	(0.039)	(0.039)	(0.033)	(0.032)	(0.033)
Role									
Post-doc	0.431	0.353	0.228	-2.272+	-2.312+	-2.257+	-2.883	-3.360+	-2.960
	(1.489)	(1.507)	(1.466)	(1.269)	(1.269)	(1.273)	(1.843)	(1.827)	(1.838)
Research fellow	-1.681	-1.732	-1.784	-2.959**	-2.969**	-2.947**	-1.340	-1.496	-1.364
	(1.182)	(1.192)	(1.163)	(1.092)	(1.092)	(1.095)	(2.311)	(2.281)	(2.304)
Lecturer	-1.478+	-1.535+	-1.366	-3.256**	-3.322**	-3.239**	-1.650*	-1.602*	-1.737*
	(0.864)	(0.880)	(0.851)	(1.045)	(1.046)	(1.049)	(0.805)	(0.795)	(0.805)
Associate prof.	-0.661	-0.699	-0.322	-1.623	-1.552	-1.608	-0.871	-0.852	-0.913
	(1.560)	(1.567)	(1.539)	(1.062)	(1.064)	(1.066)	(0.670)	(0.661)	(0.668)
Entrepreneurial alertness X male		-0.022			0.071			0.137**	
		(0.058)			(0.067)			(0.051)	
Entrepreneurial alertness X discipline			-0.149**			0.035			-0.109
			(0.055)			(0.132)			(0.069)
Constant	7.337*	6.961*	5.395+	11.610***	13.755***	11.616***	6.810*	10.706***	6.580*
	(3.058)	(3.224)	(3.089)	(2.988)	(3.611)	(2.995)	(2.657)	(2.990)	(2.652)
Respondents	196	196	196	223	223	223	247	247	247
Log Likelihood	-555.414	-555.339	-551.553	-645.172	-644.585	-645.135	-681.232	-677.443	-679.936
Df	9	10	10	9	10	10	9	10	10
r-squared	0.343	0.343	0.368	0.190	0.195	0.191	0.318	0.339	0.325

Notes: p< 0.05*; p< 0.01**; p< 0.001***. Standard errors in parentheses.

5.5.2.2 Academic entrepreneurship: hard and soft activities

While so far, the effect of the independent variables on AE has been discussed in relation to the broad definition of AE that is combining soft and hard entrepreneurial activities together, the study also investigated any differential impact of the independent variables on the two groups of entrepreneurial activities separately. Specifically, the effect of the above reported independent variables was tested on two dependent variables: AIH, referring to the hard (or formal) entrepreneurial activities; AIS, related to the soft (or informal) activities (see Section 5.3.1.1). Results are reported in Table 5.7.

5.5.2.3 Hard (or formal) activities

Models 4a, 6a, 8a

Starting with the *formal* types of activities, having a high *entrepreneurial alertness* appeared to have a significant effect in all the three universities. Specifically, a unit increase in entrepreneurial alertness corresponded with 0.058 ($p < 0.001$) increase in entrepreneurial activities in the U.K., 0.030 ($p < 0.001$) in Australia, and 0.034 ($p < 0.001$) in Italy. Being alert to opportunities with business potential appears, therefore, to be a crucial factor not only for entrepreneurial activities in general, but also specifically for the formal types. Conversely, having a BC mind-set did not emerge to be a predictor of academics' involvement in formal entrepreneurial activities, for all the three universities.

Models *4a*, *6a*, and *8a* showed also interesting results regarding the other variables. In the U.K., a unit increase in the variable *medicine* corresponded with -0.663 ($p < 0.001$) decrease in involvement in hard entrepreneurial activities, whereas non-significant coefficients emerged for the other universities (*4a*).

Conversely, *seniority* appeared to be a predictor for both Australia and Italy, but not the U.K. Specifically, model *6a* shows that in the Australian group, at every unit increase in the

variable *research fellows* corresponded with -0.612 ($p < 0.05$) decrease in entrepreneurial activity level, compared to professors, whereas for *lecturers* the decrease was -0.884 ($p < 0.01$), and for *associate professors* -0.899 ($p < 0.01$).

An effect of the role at university emerged also in Italy (*8a*) where at every unit increase in *lecturers* a -0.505 ($p < 0.05$) decrease in entrepreneurial activities was registered. Sex, in this model, did not emerge as a significant predictor, for all the three universities.

Models 4b, 6b, 8b

These models included all the variables as in the baseline model (*a*) plus an interaction term between entrepreneurial alertness and sex (*male*). The latter was found significant in the Australian group in which male academics with high entrepreneurial alertness were more likely to engage in hard entrepreneurial activities than the female colleagues ($r = 0.038$, $p < 0.05$). In the other two universities, this interaction term did not appear to be significant for the hard entrepreneurial activities. This result is rather interesting as in the first analysis, when hard and soft entrepreneurial activities were combined together, this interaction term was significant only for the Italian academics; whereas when looking at the different types of activities a significant coefficient emerged also for the Australian university, but only for the formal activities. This reinforces the usefulness of a finer grained analysis of the different effects of the variables in exam on the various types of entrepreneurial activities.

Models 4c, 6c, 8c

Ceteris paribus, model *c* included an interaction term between entrepreneurial alertness and discipline. In line with the first analysis, this interaction term was found to be negative only in the U.K. (*4c*). In this group, academics from medicine with high entrepreneurial alertness were a -0.057 ($p < 0.001$) less likely to get involved in hard entrepreneurial activities than those from science or engineering.

5.5.2.4 Soft (or informal) activities

Models 5a, 7a, 9a

These models provided further evidence of the positive role of entrepreneurial alertness in predicting entrepreneurial behaviour, in this case in relation to informal types of entrepreneurial activities. As for the previous results, a significant effect was found across the three groups. Specifically, for every unit increase in *entrepreneurial alertness* a 0.170 ($p < 0.001$) increment in likelihood to be involved in soft entrepreneurial activities was found in the U.K.; smaller but significant increases were also reported for Australia ($r = 0.085$, $p < 0.01$) and Italy ($r = 0.141$, $p < 0.001$).

The regression revealed also that having a high BC mind-set positively influences academics' involvement in soft entrepreneurial activities, albeit not in every context. That is, while significant and positive coefficients emerged for Australia (0.082, $p < 0.05$) and Italy ($r = 0.095$, $p < 0.01$), this was not the case for the U.K. Conversely, in this latter group, being from medicine was negatively affecting academics' involvement in soft activities. Each unit increase in the variable *medicine* corresponded to a -1.056 ($p < 0.05$) decrease in entrepreneurial behaviour in relation to informal types of activities.

The analyses also showed a difference between males and females in entrepreneurial behaviour, although only in Italy (*9a*) in which a unit increase in the variable *male* corresponded with 1.230 ($p < 0.05$) increase in involvement in soft entrepreneurial activities. In other words, Italian male academics were more likely to show an entrepreneurial behaviour than their female colleagues, especially regarding the soft type activities, confirming H8.

The regression also provided support to H9. In Australia, professors were more likely to get involved in soft entrepreneurial activities than the junior colleagues (*7a*). A unit increase in

the *research fellow* variable corresponded with -2.347 ($p < 0.05$) decrease in involvement in soft entrepreneurial activity, whereas a - 2.372 ($p < 0.05$) decrease in involvement in soft entrepreneurial activities was registered for every unit increase in the variable *lecturer.*

Models 5b, 7b, 9b

These models investigated the interaction effect between *entrepreneurial alertness* and *sex* on scientists' involvement in soft entrepreneurial activities. The results demonstrated a significant effect only in the Italian group where males with high entrepreneurial alertness were more likely to get involved in soft entrepreneurial activities compared to their female colleagues ($r = 0.126$, $p < 0.01$).

Models 5c, 7c, 9c

Ceteris paribus, these models tested the effect of the interaction term between discipline and entrepreneurial alertness on scientists' involvement in soft activities in the three contexts. A negative coefficient for this interaction term emerged only for the U.K. ($r = -0.091$, $p < 0.05$), where academics from the medical sciences with high entrepreneurial alertness were less likely to get involved in soft entrepreneurial activities compared to those from science and engineering.

Table 5.7. Results of linear regression for 'hard' and 'soft' entrepreneurial activities

	U.K.						Australia						Italy					
	4a(AIH)	4b(AIH)	4c(AIH)	5a(AIS)	5b(AIS)	5c(AIS)	6a(AIH)	6b(AIH)	6c(AIH)	7a(AIS)	7b(AIS)	7c(AIS)	8a(AIH)	8b(AIH)	8c(AIH)	9a(AIS)	9b(AIS)	9c(AIS)
EA	0.058***	0.063***	0.081***	0.170***	0.179***	0.206***	0.030***	0.002	0.028**	0.085**	0.060	0.086**	0.034***	0.028*	0.035***	0.141***	0.068*	0.155***
	(0.009)	(0.015)	(0.011)	(0.023)	(0.039)	(0.029)	(0.008)	(0.016)	(0.009)	(0.027)	(0.052)	(0.028)	(0.008)	(0.011)	(0.008)	(0.024)	(0.034)	(0.025)
BC mind-set	-0.017	-0.017	-0.017	0.044	0.044	0.043	0.009	0.009	0.009	0.082*	0.082*	0.082*	0.016	0.014	0.016	0.095**	0.076*	0.095**
	(0.013)	(0.013)	(0.013)	(0.034)	(0.034)	(0.034)	(0.011)	(0.011)	(0.011)	(0.037)	(0.037)	(0.037)	(0.010)	(0.011)	(0.010)	(0.032)	(0.032)	(0.032)
Discipline (med.=1)	-0.663***	-0.648**	1.449*	-1.056*	-1.027*	2.299	0.216	0.153	-1.447	-1.491	-1.547	-1.108	0.113	0.111	0.400	0.576	0.556	4.375+
	(0.193)	(0.196)	(0.628)	(0.503)	(0.513)	(1.672)	(0.334)	(0.332)	(1.365)	(1.070)	(1.076)	(4.392)	(0.188)	(0.188)	(0.739)	(0.577)	(0.568)	(2.258)
Sex (male =1)	-0.102	0.163	0.044	-0.258	0.255	-0.025	0.194	-1.200+	0.171	0.181	-1.048	0.186	0.132	-0.262	0.134	1.230*	-3.464*	1.254*
	(0.212)	(0.661)	(0.210)	(0.553)	(1.726)	(0.560)	(0.186)	(0.695)	(0.187)	(0.596)	(2.251)	(0.600)	(0.162)	(0.548)	(0.163)	(0.499)	(1.654)	(0.497)
Age	0.010	0.010	0.006	0.029	0.028	0.023	-0.011	-0.014	-0.010	-0.010	-0.012	-0.010	-0.002	-0.002	-0.002	-0.025	-0.025	-0.030
	(0.012)	(0.012)	(0.012)	(0.031)	(0.031)	(0.031)	(0.010)	(0.011)	(0.011)	(0.034)	(0.034)	(0.034)	(0.009)	(0.009)	(0.009)	(0.028)	(0.027)	(0.028)
Post-doc	0.613	0.586	0.534	-0.182	-0.233	-0.306	-0.562	-0.583+	-0.542	-1.710	-1.729	-1.715	-0.613	-0.649	-0.618	-2.271	-2.710+	-2.342
	(0.451)	(0.456)	(0.438)	(1.176)	(1.191)	(1.167)	(0.346)	(0.343)	(0.346)	(1.109)	(1.111)	(1.112)	(0.506)	(0.509)	(0.507)	(1.556)	(1.538)	(1.550)
Research fellow	-0.451	-0.469	-0.491	-1.229	-1.263	-1.293	-0.612*	-0.617*	-0.596*	-2.347*	-2.352*	-2.350*	-0.296	-0.308	-0.297	-1.044	-1.188	-1.067
	(0.358)	(0.361)	(0.347)	(0.934)	(0.942)	(0.926)	(0.298)	(0.295)	(0.297)	(0.954)	(0.956)	(0.957)	(0.635)	(0.636)	(0.636)	(1.951)	(1.920)	(1.943)
Lecturer	-0.368	-0.387	-0.324	-1.110	-1.148	-1.041	-0.884**	-0.919**	-0.862**	-2.372*	-2.403**	-2.377*	-0.505*	-0.501*	-0.511*	-1.145+	-1.100	-1.226+
	(0.262)	(0.266)	(0.254)	(0.683)	(0.695)	(0.678)	(0.285)	(0.283)	(0.285)	(0.913)	(0.916)	(0.917)	(0.221)	(0.222)	(0.222)	(0.680)	(0.669)	(0.678)
Associate prof.	0.089	0.076	0.220	-0.750	-0.775	-0.542	-0.899**	-0.861**	-0.879**	-0.724	-0.691	-0.729	-0.284	-0.283	-0.287	-0.586	-0.569	-0.626
	(0.472)	(0.474)	(0.460)	(1.232)	(1.238)	(1.225)	(0.289)	(0.288)	(0.289)	(0.928)	(0.931)	(0.931)	(0.184)	(0.184)	(0.185)	(0.566)	(0.556)	(0.564)
EA X male		-0.007			-0.014			0.038*			0.033			0.011			0.126**	
		(0.018)			(0.046)			(0.018)			(0.059)			(0.014)			(0.043)	
EA X discipline			-0.057***			-0.091*			0.045			-0.010			-0.008			-0.102+
			(0.016)			(0.043)			(0.036)			(0.115)			(0.019)			(0.058)
Constant	3.469***	3.341***	2.719**	3.868	3.620	2.676	4.065***	5.206***	4.074***	7.544**	8.549**	7.542**	2.957***	3.259***	2.941***	3.853+	7.447**	3.639
	(0.926)	(0.976)	(0.923)	(2.416)	(2.547)	(2.460)	(0.814)	(0.977)	(0.813)	(2.611)	(3.161)	(2.617)	(0.730)	(0.833)	(0.732)	(2.243)	(2.516)	(2.236)
Respondents	196	196	196	196	196	196	223	223	223	223	223	223	247	247	247	247	247	247
Log Likelihood	-321.2	-321.1	-314.8	-509.2	-509.2	-506.9	-355.2	-353.0	-354.4	-615.1	-615.0	-615.1	-362.1	-361.8	-362.0	-639.4	-634.8	-637.8
Df	9	10	10	9	10	10	9	10	10	9	10	10	9	10	10	9	10	10
r-squared	0.272	0.273	0.318	0.328	0.328	0.344	0.152	0.169	0.158	0.164	0.165	0.164	0.187	0.189	0.187	0.302	0.327	0.31

Notes: p< 0.05*; p< 0.01**; p< 0.001***. Standard errors in parentheses. AI = Academia-Industry activities; EA = entrepreneurial alertness; med. = medicine

5.5.3 Regression assumption

5.5.3.1 Heteroschedasticity

The analysis of the residuals, through scatterplots as well as Breusch-Pagan/Cook-Weisber test, showed the presence of heteroscedasticity in model 1 ($p < 0.05$), for all three universities. In order to deal with this, a robust standard errors procedure (Wooldridge, 2016) was performed on this model, the results of which, however, are not substantively different from those earlier discussed (see Table A1 in appendix).

Scatterplots and Breusch-Pagan/Cook-Weisber test reported heteroscedasticity also in the models included in the second analysis, for all the three universities. Robust regression was performed also in this case. The results, reported in Table A2 in the appendix, also in this case did not substantively change.

5.5.3.2 Multicollinearity

From the pairwise correlation analysis it can be seen that although some explanatory variables are correlated, such as entrepreneurial alertness and BC mind-set, sex (male = 1) and discipline, professorship with entrepreneurial alertness, or professorship and age, the correlations coefficients did not go beyond .5. However, as pairwise correlation does not provide sufficient information regarding the degree of the multicollinearity, the variance inflation factor (VIF) (Wooldridge, 2016) was checked for all three countries, and for both the first and the second analysis. The statistics for the VIF were all below 3, for all the models and the three universities. Hence, multicollinearity was not a problem.

5.6 Discussion

5.6.1 Academic entrepreneurship: a broad perspective of its predictors

The results provide strong evidence of the positive effect of various individual factors upon AE in line with previous studies. Interestingly, the findings revealed convergence as well as cross-national variation regarding the effect of the factors included in the models.

Regarding H1 that tested the effect of having entrepreneurial alertness on AE, the results confirmed its role as a positive predictor, in all the three countries. This not only signals the importance of attitudinal aspects in predicting entrepreneurial behavioural outcomes, but also confirms and extends the previous literature regarding the usefulness of this element in the study of AE. As introduced in Chapter 2, while the entrepreneurial alertness has received increasing attention in recent years, studies on AE which have adopted this concept are scarce, with the one of Clarysse, Tartari and Salter (2011) constituting a unique contribution in the literature. Their study showed that having an alterness for entrepreneurial opportunities is a rather positive influential factors on academics' entrepreneurial behaviour. It seemed thus worth expanding further such evidence, considering the claim made by various authors – as discussed in Chapter 2 – about the need to refocus on the individual to have a deeper understanding on AE. With this finding, the present work extends the literature on the topic also by providing information from different contexts and groups of academics which reinforces the evidence on the role of entrepreneurial alertness on AE. The study also furnishes rich information given the adoption of an up-to-date assessment tool of entrepreneurial alertness (the contributions of this study will be discussed further in Chapter 10).

The findings also provide support for H2. Having a *BC mind-set* appeared to positively influence academics' entrepreneurial behaviour. However, this effect was not significant in the U.K., thus only partially confirming H2. Nevertheless, the positive effect found for Australia and Italy reinforces the important role of individual attitudes on AE, also adding an original perspective due to the adoption of BC to empirically test its association with AE, which constitutes a novelty in the literature. The present study, thus, shows that having a tendency, the ability, and the confidence to cross organisational and role boundaries may support academics' entrepreneurial behaviour. As will be discussed further in Chapter 9, BC mind-set may be considered one of the factors that shape the perceptions of permeability of boundaries across sectors and organisations, and in the case of scientists may foster their collaborations for entrepreneurship.

This said, the absence of a significant effect of this variable in the U.K. limits the generalisability of the results, to some extent. Interestingly, this cross-country difference signals that certain predictors of AE can be context-specific, and that in some groups other factors may have a stronger impact. In the British group for example, while BC mind-set was not a significant predictor being from medicine appeared to have a significant and negative effect on AE. The British academics from medical sciences appeared less likely to get involved in entrepreneurial activities than those from science and engineering. This supports H3, and it also confirms the previous literature (e.g. Abreu and Ginevich, 2013). Kenney and Goe (2004) adopting the concept of *nested embeddedness* maintain that cultural and social norms of the department within faculty members are *embedded* influence upon their involvement in entrepreneurial activities. Likewise, Owen-Smith and Powell (2001b) attributed the *disciplinary effect* to values and beliefs associated with entrepreneurial activities shared by academics from the same discipline. In some fields, such as the health

sciences, there are rules linked, for instance, to disclosure issues that may shape the propensity and facility with which academics may interface with other organisations and especially the private sector. Campbell *et al.* (2002) maintain that in genetics 'the sharing and withholding practices of geneticists may have a disproportionate impact on university policy, the behaviour of junior faculty, and the training and socialisation of graduate students and post-doctoral fellows' (p. 474). This evidence holds a significant role in terms of AE promotion. The discourse around the *entrepreneurial university*, the concept of impact, and the activities related to knowledge and technology transfer should perhaps take into considerate account these peculiarities, including those that are context-specific. In the Australian and in the Italian context *discipline* was not a significant factor, thus reinforcing the relevance of a contextualised approach towards AE. Further considerations are reported in Chapters 8 to 10.

Next, this study adds to our understanding of the relationship between sex and AE. As the literature both on general entrepreneurship (e.g. Allen, *et al.*, 2007; Pines, Lerner and Schwartz, 2010) as well as on AE specifically (e.g. Ding, Murray and Stuart, 2006; Clarysse, Tartari and Salter, 2011; Göktepe-Hultén and Ram 2015; Abreu and Grinevich, 2017) has often reported a difference between women and men in their involvement in entrepreneurial activities, this work looked at whether male scientists showed a higher entrepreneurial behaviour than their females colleagues (H4). The results confirmed the hypothesis, however only partially. This sex difference was found exclusively in Italy. A possible explanation lies in the presence of a *gap* in academia between males and females linked to a series of factors such as disparity in opportunities, work-family conflicts, stereotypes about women involved in commercial ventures, more concerns among female academics about the integration of entrepreneurship with their research activity, and a general 'masculine orientation' in the

commercialisation of science practices (see Chapter 2 for further considerations). This could also explain the cross-country difference regarding this factor. Given the later diffusion of AE in Italy in comparison with the U.K. and Australia, it might be that the typical 'male entrepreneur' portrait (Ahl, 2006) may persist in this context, whereas in countries where knowledge transfer activities have a longer tradition time may have flattened the differences. The presence of such a sex gap might also be linked to Italy's traditional patriarchal societal structure, in which associations between entrepreneurship as 'possession' or 'productivity' with a male figure may still be deeply rooted in working practices and career choices (Bruni, Gherardi and Poggio, 2014). Discussions on sex differences in AE continue in section 5.6.2.

Finally, the findings provided support to the hypothesised *career stage effect* (H5); being a senior academic emerged as a positive predictor of AE. Australian research fellows and lecturers were significantly less likely to engage in entrepreneurial activities than professors. A negative effect of being a junior scholar was also found in Italy, but only in relation to lecturers. This *seniority effect* is in line with the previous studies which maintain that senior scientists during their career accumulate a variety of skills and abilities as well as status which confer them an advatange in AE (Stephan and El-Ganainy, 2007; D'Este and Patel, 2007; Haussler and Colyvas, 2011; Abreu and Grinevich, 2017). Other scholars maintain that over a career span the time dedicated to certain activities varies, according to different needs; junior scholars typically tend to focus more on publications, as still the main promotion criteria, spending little extra time in other activities (Clarysse, Tartari and Salter, 2011). This is what some authors have called the 'life cycle theories' (D'Este and Perkmann, 2011, p. 320).

It must be recognised that while the findings confirm a positive effect of seniority, they also signal a cross-country divergence: in the U.K. seniority did not emerge as a significant factor.

This perhaps is due to a combination of elements. In the U.K., policies and initiatives towards AE have a longer tradition compared to the other two countries, therefore even junior scholars may rely on a more supportive environment which may mitigate some of the barriers these academics may encounter in other contexts. It could also be due to the fact that in the U.K. other elements, such as academic discipline, appeared to have a more significant role, therefore mitigating the impact of other elements[7].

In addition to the direct effect of certain factors on academics' entrepreneurial behaviour, the study also explored the interactive effect of some of the variables under examination. This was thought to add insight on the potential influence of some of the hypothesised predictors of entrepreneurship. Specifically, two interaction terms were included in the analysis: entrepreneurial alertness and male (H6), and entrepreneurial alertness and discipline (H7). The results confirmed both the hypotheses, notably again with cross-country variations. H6 found support only from the Italian group, where male academics with high entrepreneurial alertness appeared to be more likely to get involved in entrepreneurial activities than their female colleagues, reinforcing the presence of a gap between the two groups.

H7 received, instead, support from the British group, where a decreased impact of entrepreneurial alertness was found for academics from medicine compared to their colleagues in the other disciplines under examination. This evidence corroborates the presence of a *disciplinary effect* on AE, however in a context-specific fashion; at least in this quantitative analysis[8].

[7] Further considerations will be reported in Chapters 9 combining the elements deriving from the interviews.
[8] Further considerations on the role of disciplinary fields are reported in Chapters 7-10.

5.6.2 Hard and soft activities: differential effects

While so far the study has presented the evidence from the results in relation to the effect of certain variables on AE considered in its broad definition- that is including formal and informal activities together- the study also explored whether the factors under examination had any differential effect on the two different types of activities: hard (or formal) and soft (or informal) activities (see the literature section for details). This is because, whilst the aim of the study was to analyse AE from a general perspective, formal and informal activities may be underpinned by different mechanisms and processes, and the literature has reported evidence- albeit not vast- of different influences of certain elements on the two types of activities. Given these early findings, as well as the scant evidence on the topic, the present study aimed to contribute to literature by providing further evidence, along with new insights.

Beginning with *entrepreneurial alertness*, this factor emerged as a positive predictor of both formal and informal entrepreneurial activities, in all the three universities, reinforcing the role of this element as influential factor in entrepreneurship. Conversely, having a *BC mind-set* appeared to be a significant element only in Australia and Italy and exclusively for the informal types of activities. While the country variation is in line with the first regression analysis (see Section 5.6.1), the exclusive impact of this attitude on soft entrepreneurial activities suggests that different types of entrepreneurial activities are underpinned by different mechanisms. Soft activities as typically require more interpersonal exchanges (e.g. Abreu and Grinevich, 2013) may benefit from a BC mind-set, which fosters the confidence in creating connections outside the current organisation. This evidence provides a unique contribution in the literature regarding the role of having a BC mind-set on entrepreneurship, as this constitutes the first attempt in which the role of BC mind-set on different

entrepreneurial activities was investigated. It also contributes to the AE literature as it highlights how different processes and mechanisms underpin various activities, and it may also explain why informal activities are more diffused (Klofsten and Jones-Evans, 2000; D'Este and Patel, 2007; D'Este and Perkmann, 2011; Philpott *et al.*, 2011; Audretsch, Lehmann and Wright, 2014; Perkmann *et al*., 2013; Bolzani *et al*., 2014; Tartari, Salter and D'Este, 2014; Kalar and Antoncic, 2015; Abreu and Grinevich, 2017; Sá, Sá and Dias, 2017; Balven *et al.*, 2018). These issues will be further discussed in Chapters 9-10.

This second analysis provided further insight on the *disciplinary effect* showing that being from medicine has a negative effect on the involvement in both hard and soft entrepreneurial activities; however, this only applied to the U.K., corroborating the results of the previous analysis, and especially the context-specific effect of certain variables.

The second analysis also revealed that being *male* is a positive factor in AE in relation to the soft activities, in line with H8; the findings however showed a significant effect only in Italy. As discussed in Chapter 2, studies have shown a general lower entrepreneurial activity of female scientists compared to their male colleagues (e.g. Clarysse, Tartari and Salter, 2011), and especially in regard to informal types of activities (Abreu and Grinevich, 2013, 2017). Scholars have attributed this gap to a variety of factors, which often act in combination (Abreu and Grinevich, 2017). In general, the difficulties lie in women facing more challenges than their male colleagues in building an academic career (Le Feuvre, 2009; Duberley and Cohen, 2010; Shaw and Stanton, 2012; Sarsons, 2017), for issues linked to stereotypes, poor work-life balance, work-family conflict, weak career advancement opportunities, lack of flexible working environment, to cite some (see Chapter 2). Given these difficulties, female scientists may be in a disadvantaged position in regard to AE and especially in relation to those activities such as the soft which require larger amount of time

to network with potential external partners, and to sustain such relationships in the long-run. As explained in Chapter 2, the gap between males and females might also be due to female academics' difficulties to access certain social networks, often links to specific disciplinary specialisations, as well as hierarchical positions. This makes female academics less 'visible' for industrial partners, as well as less embedded in strategic and entrepreneurial-oriented networks (Stephan and El-Ganayini, 2007; Abreu and Grinevich, 2017). Female scientists have also been reported to have different networking styles, and different perceptions about the support received and how to ask for it (Abreu and Grinevich, 2017), as well as to receive fewer organisational opportunities (Murray and Graham, 2007). All these elements may contribute to a gap between females and males, which will be further analysed in following chapters. The cross-country difference on this result may be explained as in line with what reported about the previous analysis regading a general male-oriented culture towards entrepreneurship in Italy in general. This could have incremented some of the challenges for Italian female academics given also the shorter tradition in Italian universities of AE and therefore of a lower supportive environment. The qualitative analysis however revealed that some issues are also affecting female academics in other contexts, as will be shown in Chapters 7.

Finally, this study also tested whether senior academics were more involved in soft entrepreneurial activities than their junior colleagues (H9), as theorised by some previous works (e.g. Fini, Lacetera and Shane, 2010). In line with the mixed literature on the *career stage effect*, the results were somewhat ambiguous. Specifically, while in the Australian group, research fellows and lecturers indeed appeared to be less likely to get involved in informal types of entrepreneurial activities compared to their senior colleagues (with professor as reference category), confirming H9, they were also less likely to get involved

in hard entrepreneurial activities than the senior colleagues. Whilst the coefficients for the hard activities were smaller than those of the soft entrepreneurial activities, their significance limits the possibility to attribute an exclusive effect of seniority on soft entrepreneurial activities. Furthermore, a negative effect of being a junior scholar on entrepreneurial involvement but in *hard* activities emerged also in the Italian group, while no significant effect was registered in the U.K. Thus, H9 found partial and ambiguous validation, albeit ultimately in line with the contradictory literature on this issue. Some authors (e.g. Abreu and Grinevich, 2013) maintain that senior academics may have an advantage in getting involved in soft entrepreneurial activities due to the previously mentioned 'accumulation effect' of experience, skills, but also contacts and relationships with industrial partners, which particularly help in soft activities. While also other studies reported similar conclusions (Links, Siegel and Bozeman, 2007; Fini, Lacetera and Shane, 2010), it must be aknowledged that the literature also reports constrasting findings. D'Este and Perkmann (2011) for instance while reporting an overall higher involvement in entrepreneurial activities for senior scientists, they found that this particularly related to hard entrepreneurial activities, as found in this study in the Italian group, whereas soft activities appeared to pertain more to junior scientists. Contrasting and ambiguous findings should however not surprise since, as ultimately emerged in this work, AE is a rather complex and multi-faceted phenomenon, in which various elements combine, sometimes leading to diverging scenarios according to specific contextual or individual factors, as will be further discussed in Chapters 8-10.

5.6.3 Interaction effects

Finally, the potential interaction effects of some of the variables under examination were also tested in relation to soft and hard entrepreneurial activities, through two interaction

terms: entrepreneurial alertness/male; entrepreneurial alertness/discipline (for details, see Section 5.4.1). The results in the first analysis showed that Italian male academics with high entrepreneurial alertness were more likely to get involved in hard entrepreneurial activities than their female colleagues. Very interestingly, the same effect – with a higher coefficient – was found in the Italian group but in relation to the soft types of activities, in the second analysis, where an effect in regards to hard entrepreneurial activities was found in the Australian group.

In contrast, the other interaction term- between entrepreneurial alertness and discipline- was only significant for the British group. A decreased effect of entrepreneurial alertness was found for the academics from medicine compared to those from science and engineering, in the first analysis; the second analysis corroborated the first, showing a significant and negative effect only in the UK group, for hard and soft activities. This evidence provides additional support to H7. Further considerations will be made in the next chapters.

5.7 Summary

Overall, the study provides solid evidence regarding the effect of individual level variables in explaining academics' entrepreneurial behaviour. Entrepreneurial alertness emerged as positive predictor of soft and hard activities. The BC mind-set also emerged as a crucial factor, although only regarding soft activities, and in specific contexts. For instance, in the British group, this element did not have any effect, whereas belonging to a medical field, in this group, emerged as a crucial negative predictor.

Other elements, such as sex and seniority at university, were confirmed as influential predictors of entrepreneurship as suggested by the literature, although showing sometimes cross-country divergence as well as contrasting findings. Male academics, as hypothesised, appeared more likely than the female colleagues to be involved in entrepreneurial activities;

however, this was true only for the Italian context. Likewise, in this group as well as in the Australian, senior scholars were more likely to get involved in entrepreneurial ventures than the junior colleagues, in line with the mainstream literature on AE. However, when looking at soft and hard entrepreneurial activities, while in the Italian group seniority emerged as a predictor of involvement in hard entrepreneurial activities, in the Australian sample a negative effect of being a junior scholar on entrepreneurial activity was found for both the soft and hard types of activities (with the latter, however, reporting larger coefficients). The results, in summary, show consistency with previous studies, and they also provide new insights on the differential effects of certain variables on soft and hard activities. They also, very interestingly, signal both cross-country divergence and convergence, corroborating the relevance of a contextualised analysis of AE, as well as the complex nature of such topic, which will be further explored and discussed in relation to what emerged at the qualitative analysis.

Chapter 6. Qualitative Analysis

As discussed in Chapter 2, the multi-faceted nature of the topics investigated in the present study led to the adoption of a mixed-method approach, which combined quantitative and qualitative data within the same study. Whilst the quantitative analysis discussed earlier provided evidence regarding the effect of individual-level variables on AE, it does not inform about the subjective experiences of the individual academics themselves. In order to reach a deeper understanding of not only the factors but also the processes underpinning AE, the present study also included a qualitative investigation, underpinned by an interpretivist stance. This aimed to shed light on the 'why' and 'how' of scientists' relationship with entrepreneurial activities, and to give voice to the individuals' interpretations and experiences (Johnson *et al.* 2006). In so doing, attention was directed towards exploring AE from a career lens, looking at the interplay between entrepreneurial involvement and career interests, orientations, and work-identity. The following sections reports details about the methods, samples, and sampling procedures followed in this part of the study.

6.1 Methods

6.1.1 Semi-structured interviews

To address RQs 1-3 (see Chapter 1), qualitative data was collected through semi-structured, open-ended interviews. These were considered suitable tools to allow subjective meanings and perceptions to be gathered (Kvale, 2007; Flick, 2009), while covering in a systematic way a series of core themes which the study sought to explore (Choak, 2012). This latter aspect was considered particularly useful given the presence of different groups of interviewees, from different contexts, and the comparative nature of the study. Starting the interviews with a pre-defined set of questions, which were asked to every group, allowed

data to be gathered on the same topics in all the three universities regarding the macro-areas investigated, and to in turn enabling comparisons. On the other hand, the open-ended nature of the questions, allowed new themes to emerge (Choak, 2012).

The interview guide included questions derived from the literature, as well as discussions with experts in the field (Saunders, Lewis and Thornhill, 2016). The original guide was pilot-tested with five volunteers, who either shared similarities with the targeted population or were experts in the subject. Pilot testing is considered an important step which may ensure quality of the interviewing process, by assessing the clarity of the wording as well as the content of the interview (Matthews and Ross, 2010), thus leading to more efficient data collection. Regarding the guide used in the present study, some minor modifications were made after the first pilot, but no further changes followed the remaining pilots (see appendix for the interview guide). Further pilots were conducted for the interview guide used in the Italian university. The guide was translated from English into Italian, by the researcher (who is an Italian native speaker), and successively back-translated by a professional translator (English native speaker with proficiency in Italian). The two versions were then compared and discussed. No discrepancies were found. This process of back-translation is considered the gold standard in cross-country research to ensure quality of the data collection, and comparability of the findings (Brislin, 1980). The newly developed guide in Italian was also piloted with another five volunteers, all Italian native speakers, sharing similar characteristics with the targeted population (academic staff). The guide generally maintained the original structure, with some wording meaningfully adapted to the language of the context.

The interviews lasted on average between 30 and 75 minutes. They were all recorded and transcribed verbatim (Saunders, Lewis and Thornhill, 2016) to ensure ‘credibility and

confirmability' (Duberley, Cohen and Mallon, 2006, p. 1137). For each of the three universities, a sub-group of interviews was transcribed by the researcher to ensure familiarity with the data and to reach a better insight. However, the quantity of the data was deemed to be worthy of the support of a professional transcriber, who continued the transcription process, which was checked for consistency and accuracy (Saunders, Lewis and Thornhill, 2016). It must be specified that a different transcriber, a native Italian speaker, was involved for the interviews from the Italian group. In this case, the transcripts were coded in the original language, and the quotations included in text were translated into English by the researcher and checked for their intelligibility by a native English speaker. The transcripts from all the three cases were subsequently transferred into NVivo11, organised in three groups according to the university to which they referred, and coded thereafter using the software. The latter was used as a tool to categorise the codes assigned to the various parts of the transcripts, however it is not an analytical tool *per se.* As reported in Section 6.3., the data analysis followed a specific method of thematic analyses: template analysis (King, 2004). Quotes in text are reported in their original format without correcting spelling or grammatical errors.[9]

6.2 Sampling and samples

The interviewees in each university were selected following a purposive sampling technique (Saunders, Lewis and Thornhill, 2016). In each of the three universities, a *maximum variation sampling* strategy (Patton, 2015) was followed, to recruit a group of interviewees which was heterogenous for the key criteria considered informative of the topics under investigation (Patton, 2015): sex, role, discipline, and level of involvement in entrepreneurial

[9] This applied also to the quotes in Italian back translated into English, which were not grammatically corrected, but only meaningfully translated trying to adhere to the most equivalent version.

activities. To ensure such diversity, participants were recruited by relying on the results of the survey[10] which provided information on such aspects. The justification for this sampling procedure lies in the aim to explore potential commonalities as well as diversity across groups. This, in turn, was considered important for the present study as a way to shed light on the different factors and processes underpinning the phenomena being studied, as well as appreciating the potential different influence of such elements and mechanisms, and how they combine in different contexts and/or according to groups and sub-groups. According to Patton (2015) any shared patterns emerging from a heterogonous sample hold a particular relevance, because while '*uniqueness and diversity'* in a heterogeneous group can be considered natural (p. 283), 'common patterns that emerge from great variation are of particular interest and value in capturing the core experiences and central, shared dimensions of a setting or phenomenon' (ibid.).

As suggested by the mainstream literature on qualitative studies (see Creswell, 2013), a number between 5-30 interviewees per group was used as a reference for the samples. While there is still an open debate in the literature concerning the importance of the size of the samples as a criterion for quality of research, and if so, which number of interviewees is 'good enough' (see Saunders and Townsend, 2016), some of the criteria listed in the literature were used as indications. In the present study, given the focus on cross-country and inter-groups comparisons, 5-30 interviewees per group was used as general reference. However, given also the heterogeneity of the samples, the number of interviewees recruited tended to be larger than the 5 participants threshold indicated by Creswell (2013), 'to ensure coverage through variation amongst interview participants' (Saunders and Townsend, 2016, p. 838).

[10] The survey included a section in which participants could register their details if available to be contacted for an interview

Tables 6.1, 6.2 and 6.3 and provide information regarding the main characteristics of the interviewees for each university. The level of involvement in entrepreneurial activities (the last column to the right) was determined by relying on the results of the survey in relation to the questionnaire on academia-industry linkages (A-I) as well as the interviews. This allowed cross-checking of the survey's data, and to reach a more comprehensive picture. This is especially because the A-I questionnaire covered only a period of 24 months, thus leaving out potential previous experiences. The interviews indeed revealed that some participants had some involvement in entrepreneurial activities before the 24 months covered by the questionnaire, and they were able to provide information regarding their experiences. Therefore, they were classified as having entrepreneurial involvement.

Table 6.1. Interviewees from the British university

Interviewees	Discipline	Sex	Role	Entrepreneurial experience
B1	Physics	M	Research fellow	No
B2	Physics	M	Research fellow	Yes
B3	Medicine	M	Research fellow	Yes
B4	Medicine	M	Lecturer	Yes
B5	Engineering	M	Professor	Yes
B6	Medicine	M	Professor	Yes
B7	Medicine	M	Professor	Yes
B8	Medicine	F	Research fellow	Yes
B9	Physics	M	Research fellow	Yes
B10	Engineering	M	Lecturer	Yes
B11	Medicine	M	Lecturer	No
B12	Geography	F	Lecturer	Yes
B13	Physics	M	Professor	Yes
B14	Physics	M	Post-doc	No
B15	Medicine	M	Professor	Yes
B16	Pharmacy	F	Lecturer	Yes
B17	Biosciences	M	Lecturer	Yes
B18	Physics	M	Associate prof.	No
B19	Engineering	M	Associate prof.	Yes
B20	Physics	M	Professor	No
B21	Geography	F	Research fellow	Yes
B22	Medicine	M	Professor	Yes
B23	Engineering	M	Associate prof.	Yes

As can be seen in Table 6.1, the sample of the interviewees in the British group was predominantly male. Overall, the sample was composed of a good mix in terms of roles covered by the participants. Regarding discipline, medicine and physics were the most represented, whereas others such as geography were under-represented, or missing e.g. Mathematics. It must be specified that two participants were included in this sample although their results at the survey were not available. This is because while they reported to that they had completed it, they did not sign up their names at the end of the survey, making it

impossible to track their results. However, they sent a separate email to the researcher mentioning that they were available for the interviews. Since their discipline and role made them suitable and relevant cases for the study they were included in the sample.

Table 6.2. Interviewees from the Australian university

Interviewees	Discipline	Sex	Role	Entrepreneurial experience
A1	Medicine	F	Associate prof.	Yes
A2	Medicine	F	Associate prof.	Yes
A3	Engineering	M	Research fellow	Yes
A4	Computer s.	M	Associate prof.	Yes
A5	Engineering	M	Professor	Yes
A6	Bioscience	M	Research fellow	Yes
A7	Computer s.	M	Professor	Yes
A8	Medicine	M	Research fellow	Yes
A9	Computer s.	M	Research fellow	Yes
A10	Engineering	M	Professor	Yes
A11	Engineering	M	Lecturer/senior l	Yes
A12	Engineering	F	Research fellow	Yes
A13	Engineering	M	Professor	Yes
A14	Engineering	M	Post-doc	Yes
A15	Engineering	F	Research Fellow	Yes
A16	Biosciences	F	Post-doc	Yes
A17	Engineering	F	Professor	Yes
A18	Engineering	M	Professor	Yes
A19	Engineering	M	Research fellow	No
A20	Engineering	M	Professor	Yes
A21	Physics	M	Post-doc	Yes
A22	Earth sciences	M	Lecturer/senior l	Yes
A23	Engineering	M	Post-doc	Yes
A24	Earth sciences	M	Associate prof.	Yes
A25	Engineering	M	Research fellow	Yes
A26	Engineering	M	Research fellow	Yes
A27	Earth sciences	M	Research fellow	Yes
A28	Earth sciences	M	Professor	Yes
A29	Earth sciences	M	Research fellow	Yes
A30	Biosciences	M	Associate prof.	Yes
A31	Physics	F	Post-doc	No
A32	Physics	M	Post-doc	No

Table 6.2 reports information about the interviewees from the Australian university. Similar to the British group, the participants in this group were predominantly males. All the main STEM disciplines were represented in the sample, excluding Mathematics. In terms of roles, a great deal of variety was present in the group, ranging from post-docs to full professors. In this group, one participant was included without completing the survey as he expressed his availability for an interview via email. From the information on the university website and his email, he was considered a relevant case for the study thus he was included in the sample.

Table 6.3. Interviewees from the Italian university

Interviewees	Discipline	Sex	Role	Entrepreneurial experience
P1	Medicine	F	Associate prof.	Yes
P2	Medicine	M	Professor	Yes
P3	Earth sciences	F	Lecturer/senior l	Yes
P4	Pharmacy	F	Associate prof.	Yes
P5	Pharmacy	F	Associate prof.	Yes
P6	Engineering	M	Associate prof.	Yes
P7	Engineering	M	Professor	Yes
P8	Engineering	M	Associate prof.	Yes
P9	Physics	M	Professor	No
P10	Physics	M	Professor	Yes
P11	Biology	M	Associate prof.	Yes
P12	Earth sciences	M	Lecturer/senior l	Yes
P13	Engineering	M	Lecturer/senior l	Yes
P14	Mathematic	M	Professor	No
P15	Mathematic	M	Professor	No
P16	Engineering	M	Lecturer/senior l	Yes
P17	Medicine	M	Lecturer/senior l	Yes
P18	Medicine	M	Professor	Yes
P19	Earth sciences	M	Professor	Yes
P20	Computer science	M	Associate prof.	Yes
P21	Earth sciences	M	Post-doc	No
P22	Computer science	F	Associate prof.	Yes
P23	Medicine	M	Professor	Yes
P24	Engineering	M	Professor	Yes
P25	Mathematics	M	Lecturer/senior l	Yes
P26	Medicine	M	Lecturer/senior l	No

Table 6.3 reports details about the interviewees from the Italian university. The majority were males, with all the academic roles and disciplines covered. Also in this university one participant who did not complete the survey was included among the interviewees. This was because his role at university and his discipline made him a good candidate.

As a general overview, it could be argued that in all the three groups the majority had entrepreneurial experience; it must be specified that their involvement varied across the sample, both in frequency and types of entrepreneurial activities participants were involved in.

6.3 Qualitative data analysis: analytical approach

6.3.1 Thematic analysis

The qualitative data analysis was conducted by adopting a thematic analysis approach (Clarke and Braun, 2017). Such an approach consists of the exploration of the text for codes (small pieces of information) and themes (larger units) within the transcripts that support the explanations of the topics under investigation, and ultimately help in addressing the research questions. Codes and themes must be relevant for the topic(s) analysed, as ultimately the use of thematic analysis should help the one of explanation and interpretation of the data rather than mere description (Clarke and Braun, 2017). This, however, may take place at different stages, where an initial descriptive phase of the data is followed by a deeper interpretation of the findings (for further discussion see King and Brooks, 2017). Thematic analysis is considered a general, flexible approach to data analysis, which can be applied in a variety of studies, not prescribing a particular type and size of sample, for instance, and it can be used 'to identify patterns within and *across* data' (Clarke and Braun, 2017, p.297). This appeared useful for the present study given the inter-intra nature of the comparisons among participants, which will be reported in the findings section. Furthermore, it can be applied to studies adopting either a positivistic or an interpretivist stance (Clarke and Braun, 2017). The latter is adopted in the present study, where an interpretivist stance underpinned the aim to explore the subjective meanings (Johnson *et al.*, 2006) academics attributed to the

possibility to be involved in entrepreneurial activities, and how the latter were interpreted and experienced in relation to their career pathways.

6.3.1.1 Template analysis

Within this overall thematic analysis framework, a particular method, template analysis (TA), was followed (King and Brooks, 2017). TA is a type of thematic analysis that can be used to analyse qualitative interviews through the development of a *template*. The latter consists of a list of codes- or nodes- that could be either predefined *a priori*, thus deductively created, or emerge from the analysis, inductively generated, or more commonly, a mix of both. Given the present study's applied orientation and defined research questions to address, the use of *a priori* codes was considered useful to explore specific themes the study aimed to analyse. This procedure ensures, that the research does not overlook crucial concepts that have inspired and guided the study (King and Brooks, 2017). Furthermore, it enables the analysis to begin with a common and general framework to adopt across the cases, which for this study, given the comparative nature as well as the high number of participants, can be considered a rather helpful starting point (King, 2004).

Template analysis is also a flexible approach for what concerns both the data collection and the epistemological position. Regarding the former, compared to other methods, such as grounded theory, TA does not prescribe rigid rules, but an adaptation of general guidelines to the needs, objectives and resources of the study (King, 2012). This appeared, in general, to be a key feature for a study which involved data collection in multiple contexts and a high number of participants. In terms of its epistemological position, TA is flexible and can be adopted within a range of different philosophical positions, to fit the study's needs and assumptions (Brooks *et al.*, 2015). Therefore, it has often been suggested as a good method of qualitative analysis in mixed-methods studies (King and Brooks, 2017) given the often

co-presence of positivist and interpretivist stances. Whilst discussions on the epistemological positions underpinning mixed-methods studies have been reported in Section 4.1.1. (including a debate on the co-presence or not of different epistemological positions in mixed-methods research), it must be specified that the qualitative component of this work was underpinned by what King and Brooks (2017) define as 'limited realism'. This is an approach committed to 'a realist ontology combined with a constructivist epistemology' (p. 17). Similarly to the more known 'critical realism' (Archer *et al.*, 1998, cited in King and Brooks, 2017, p. 18), limited realism assumes the presence of 'a real world' outside, in which physical as well as psychological elements have their own entity. However, this reality cannot be reached in its totality, as the presence of a degree of subjectivity it is always contemplated in the analysis. Thus, while the exploration of the reality is an interpretivist process, this approach seeks also for 'causal explanation of social phenomena' (King and Brooks, 2017, p. 18).

6.3.1.2 Template development

Following the sequence of the data collection, the data analysis began with the transcripts from the U.K. Therefore, the template development was also initiated with this sample of interviews. Following King's (2004) guidelines, the first template was created in a hierarchical way. Given the need to answer some specific research questions, and the presence of certain themes that the study aimed to investigate, the first codes were developed deductively, i.e. a *priori*, inspired by the interview guide's questions. This is typical of studies taking a limited realist stance (explained above) that often build on previous theory (King and Brooks, 2017) therefore including 'theoretically informed' codes (p. 19). Table 6.4 illustrates the first template developed in relation to the U.K. transcripts, which is presented in a *linear style* (King and Brooks, 2017), as for the other templates. As can be

seen, the template was characterised by seven first-order codes, subdivided into second-level order codes (the terms ‘codes’ and ‘nodes’ are here used as synonyms).

Table 6.4. First template for the U.K.

1. Individual career
2. Individual level of involvement in entrepreneurial activities
2.1. Types of sectors
2.2. Types of activities
2.3. Motivations
2.4. Enjoyable aspects
2.5. Frustrating aspects
2.6. Benefits for the career
2.7. Drawbacks for the career
2.8. Activities management
2.9. Support and recognition
3. Departmental level of entrepreneurial activity
3.1. Types of sectors
3.2. Types of activities
3.3. Culture within the department
3.4. Support from the department
3.5. Support from the University in general
3.6. Differences with other universities
4. Barriers
5. Changes and improvements suggested
6. Perceptions of changes at national level in entrepreneurial tendency
6.1. Feelings/opinions related to these changes
7. Individual career perspective (future)
7.1. Position assumed in relation academia-industry interface
7.2. Motivations (for future career perspective)
7.3. Career plan changes
7.4. Trigger events

Following King and Brooks’s (2017) guidelines, this template was applied to a sub-sample of five transcripts (B1, B8, B17, B4, B5) from the U.K. Given the aim of analysing the similarities and differences across groups, the general rule was to select transcripts of participants who differed in the characteristics considered informative of the topics under investigation, that is: sex, discipline, role at university, and involvement in entrepreneurial activities. The heterogeneity of this sub-sample aimed to capture ‘a good cross section of the

issues and experiences covered in the data set as a whole' (Brooks *et al.*, 2015, p. 204), and consequently to lead to the development of richer template versions. To give a flavour of the coding process, a brief overview of how the initial codes developed, and the template changed is reported. The analysis started by applying the *a priori* codes to one of the U.K. transcripts from the sub-sample selected. Since this was of an interviewee with no experience in entrepreneurial activities, second-order nodes were developed regarding the first level node 'individual level of involvement in entrepreneurial activities'. Specifically, second level nodes were added to separate the themes emerging for those participants with 'involvement in entrepreneurial activities' and those with 'no involvement in entrepreneurial activities', as it appeared clear how crucial themes were emerging according to the interviewees' level of entrepreneurial experience. Under each of the new second level nodes, third, fourth, and even fifth level codes were created as the analysis continued. In this way, the template started to include both deductively and inductively generated nodes.

The coding process led to the development of a second template version, which was applied to the transcript of B8, an interviewee with different characteristics of B1, that is: a female, with a high involvement in entrepreneurial activities, from a different disciplinary area to B1. As for the previous participant, the template went through a series of modifications, with the creation of new nodes especially in relation to node two- individual level of involvement in entrepreneurial activities- as the participant's extended experience provided rich insight on this aspect. Furthermore, second-level codes were transformed into third-level nodes, and some nodes were re-named. The process culminated into the development of a third template, subsequently applied to another sub-groups of transcripts selected (B9, B19) following the same rules. For practical limitations, it is not possible here to illustrate and explain in further details how the analysis progressed, and all the versions created. Overall,

from its first version, the template went to a series of modifications, following King and Brooks's (2017) and King's (2004) guidelines, where new nodes were created, others eliminated, and some converted into a different level. From the U.K. transcripts, six versions were developed, with the last one used as a first template for the Australian group.

It must be noted that the decision on whether a template version is the "final" is somewhat controversial and cannot be established in advance, but it must be in line with each study's peculiarities, according to the data as well as practical limitations (such as time for instance) (King and Brooks, 2017). In this work, the template modification continued until the codes developed to the extent that they seemed to capture all the relevant aspects for the research questions, and new nodes did not appear informative – a process defined as saturation (Patton, 2002). Since this last template version appeared to be different and richer from the initial template, after having analysed all the transcripts from the U.K. these were re-coded a second time, starting from the beginning, and using the last template version. In this case, only very minor modifications were applied, and the last template version of the interviews from the U.K. was used as a starting point to code the interviews from the Australian university.

A similar approach regarding the modification of the template in subsequent versions was also followed for the interviews from the Australian group. The template went through transformations, which led to the development of a final version which, in turn, was used to analyse the interviews from the Italian university. In this case, an additional step was needed. As the codes were originally in English, the researcher- an Italian native speaker- translated the codes into Italian. These were cross-checked in their linguistic validity by another Italian native speaker (with an advanced level of English). The template was subsequently applied

to the transcripts[11]. As for the other cases, this version went through modifications, to include the information which emerged from this group of interviewees. The final template derived from the coding of all the interviewees from Italy was back-translated into English. The appendix includes all the main templates developed, for each country. Given the richness, and therefore the length, of these final templates, the versions reported in the appendix only list the first, second, and third-order nodes. In some cases, fourth-order codes were also reported, when considered explicative; similarly, some third-order codes were not listed if considered not particularly informative. What can be noticed from both the initial versions and the last is a process of macro-micro-macro, where initial *a priori codes* – relating to macro areas investigated- were applied to the transcripts, which led to the development of further (micro), more detailed nodes. These were subsequently combined into macro themes. For instance, second-order nodes such as 'motivations', 'enjoyable aspects', and 'benefits' combined into the macro theme 'positive aspects', in a final version of the template; this, while retaining the first-order (and a priori developed) code of 'individual level of involvement in entrepreneurial activities'.

The analysis generally looked for recurring themes for each topic under investigation. However, attention was also given to unique themes, recurrent themes across questions, and differences across participants and the sub-groups later identified (see *entrepreneurial* and *non-entrepreneurial academics*, as will be explained in Chapter 7). A mix of meaningful themes (Braun and Clarke, 2006) as well as frequencies was, thus, present in the template. Themes frequently cited often constituted the starting point for the discussion in the findings

[11] The procedure of using the last template from one group to start analysing the transcripts of another group was also discussed with Prof. King.

sections; at the same time, however, themes which appeared informative- for instance because peculiar of a group- despite their frequency were also discussed.

6.3.2 Quality check

Assessing quality in qualitative research is an area still open to debate (Symon and Cassell, 2012). While some authors (see for instance Tracy, 2010) have created lists of criteria that could be used to check for quality, the authors themselves were critical of the extent to which these criteria should be adopted, and how strictly. Tracy (2010), for instance, maintained that lists of criteria might be helpful, but qualitative research cannot be judged on the basis of fixed criteria as it would lose its core features, such as creativity. Symon and Cassell (2012), agreeing with this position, also contended that quality check criteria could be regarded as guidelines which may or may not be used, depending on the study and the researcher's judgement on their utility (that is subjectivity), despite this undermining the 'goodness' of the work.

Among the procedures King and Brooks (2017) suggest for quality check in qualitative analysis, *using various quotes and thick descriptions*, *independent coding* and *keeping an audit trail* were adopted in the present work, as they appeared useful, appropriate for the type of study, as well as feasible, whereas, for instance, *gathering feedback from respondents* could not be applied due to practical constraints. Quotes from participants provided evidence on the context in which the phenomena studied unfolded, and how and where the considerations in the study were drawn from. The coding, while mainly done by the researcher, was discussed and double-checked by the researcher's supervisor. Comments and feedback received were used to revise the various nodes in the templates. Finally, but no less importantly, an audit trail of all the changes was developed while coding, keeping notes of the various changes, on how and why nodes were created and modified. This helped

the justification of the final templates created, as well as triggering a reflexive process in the coding itself, developing a richer insight into why certain themes were emerging, and from which contexts, in turn informing the analysis.

6.4 Summary

With the aim of exploring academics' sensemaking of the changes that have taken place in the higher education system in the last decades, the second part of the study took a qualitative and interpretivist stance. Semi-structured interviews were conducted across the three universities under examination, selecting the participants by relying on the results from the survey, and forming samples of interviews which were heterogenous for the following characteristics: gender, seniority, discipline, and level of involvement in entrepreneurial activities.

A thematic analysis approach informed the data analysis; within this overall framework, template analysis was used as an approach to systemise, index, and categorise the qualitative dataset. A mix of deductively and inductively generated codes characterised the final template, and different versions were created for the three universities, drawing one on the other. The approach, however, presented some challenges, given the iterative, and therefore time-consuming nature of the template development, and the coding and re-coding processes. While doing so, an audit trail of the changes and feedback from experts were techniques followed to ensure quality of the analysis.

Such a qualitative analysis and methods proved their usefulness in gathering rich information on academics' opinions and positions towards the 'entrepreneurial university', as will be explored in the next chapter.

Chapter 7. Qualitative Analysis: Findings

This chapter presents the findings from the semi-structured interviews conducted in the three universities selected for this study. Following the chronological order of the data collection, the chapter begins with the U.K., followed by Australia, and then Italy. The cases are presented separately to analyse the peculiarities of each country, whereas cross-country comparisons will be reported in Chapters 8 and 9. Within each sub-section of Chapter 7 discussions are organised according to two sub-groups of participants: the *academics with entrepreneurial experience* (either formal or informal or both), and the *non-entrepreneurial* (those with no entrepreneurial experience), as reported in section 6.2. Such a division was thought to provide a framework from which the differences and similarities across groups with a diverging level of experience in entrepreneurial activity could be mapped out. During the interviews, the participants were asked about their motivations for involvement (or not) in entrepreneurial activities, exploring enabling and constraining factors. The interviews also investigated career interests and prospects, and particularly the interplay of these with AE. To support the understanding of these dynamics, as AE implies translating and transferring knowledge from the academic setting into the 'external world' (whether this is industry or the public sector) academia and external organisations were imagined as two extremes of a continuum. The 'distance' and the 'closure' participants expressed regarding one or the other side was used as an indication for the characterisation of the interviewees in typologies. The latter were inductively created on the basis of academics' sense-making of their work and role at university, and how they conceived their entrepreneurial involvement (or not) in relation to it. To develop such categories the study borrows the concept of work-identity to define the personal meanings people use to conceive of themselves at work (Dutton, Roberts, and Bednar, 2010). These typologies will be briefly introduced in this chapter according to

each country, with a more complete discussion in Chapter 8. It must be mentioned that the following sections tend to assume a descriptive nature, where data is reported to illustrate the main findings in each case; critical considerations and elaboration of the findings, in comparison to the previous literature, are instead reported in Chapters 8 and 9. This is because since convergence across the three cases was found for many themes, this approach appeared to reduce the redundancy in explanations, avoiding repetition of the same literature. Finally, it must be noted that for each country the discussions start with a general overview of the main drivers and constraining factors, to give a picture of what were the main themes, which will serve cross-country comparisons in following chapters. Some of these drivers and barriers are then discussed in relation to the typologies identified; as while often themes crossed groups, some appeared more salient in some typologies than in others.

7.1 U.K.

7.1.1. Academics with entrepreneurial experience

This group is constituted by 18 out of the 23 interviewees from the U.K. The majority had experience in entrepreneurial activities that involved the private sector, while a limited number reported experience with the public sector. The group is heterogenous regarding the types of activities participants were involved in (i.e. formal, informal, or both) as well as the frequency of involvement, with some participants being involved in various activities, and at multiple times, whereas others were less frequently involved and only in certain types of activities. Different rationales seemed to underpin the interviewees' entrepreneurial behaviour, as explained below.

7.1.1.1. Academic entrepreneurship: drivers and benefits

The interviews revealed that the main drivers for AE were: (i) the access to resources for research (funding, equipment, personnel); (ii) impact and the possibility to give a more applied flavour to their research; (iii) the interaction with people with a diverse professional background and expertise, and the learning that may derive from it; and (iv) career-related themes.

Starting with the first theme listed above, in line with much of the literature on AE (as will be discussed in following chapters, especially Chapter 9), more than half of the interviewees (across the typologies identified, later presented) reported that being involved in entrepreneurial activities was the most direct way to get *'the cash or the research grant income'* (B10). As explained by B4: *'because money in research is always tight, so building up those relationships with people is actually very, very good because it can help you'*.

It was clear from the interviews that the restrictions in public funding for research have generated the need for universities to open up to alternative providers of such resources, with the private sector being often seen as the most straightforward supplier. Along with funding, another driver that crossed the typologies was the possibility through these collaborations to access resources such as technology and equipment not available at university, different expertise and skills than those possessed by scientists, and a variety of new information that could enrich the research work.

Another frequent theme was *impact.* Around half of the interviewees (across typologies) talked about how they wanted their research to have a societal benefit, to make a difference

in the 'real world', to give something in return to the society, as the excerpts below illustrate[12]:

> *'I want to do something real. I want to use robots, umm, to save the country from nuclear disaster and preserve the environment for future generations. I want to do things that have major societal impact and I cannot do that unless I work with industry'. (B23)*

> *'My research is paid for by the taxpayer and I think I should be doing something useful for the rest of the world'. (B21)*

Notably, these two participants were working with the private sector (B23), and with the public sector (B21). These are just examples to illustrate that while societal scopes were often a constant among those involved with the public sector (an aspect also found in the other two universities), they were also underpinning the collaborations with the private sector. This is not to say that the type of sector was not making any difference. As will be discussed later, for academics in specific disciplines (e.g. health sciences) collaborating with the private sector could be particularly challenging, but this does not always constitute an impossible barrier to overcome.

The interviews further revealed that *impact* may have a dual meaning, i.e. not only entailing making research outcomes *more applied*, but also demonstrating *utility* of research, in line with the assessment frameworks developed in recent years; in turn, gaining career-related benefits, as B22, a senior academic, specified: *'for young people, […], it's no longer seen as something that you shouldn't do, it's seen as something that you should be doing, which is good'.*

[12] Often these narratives were accompanied by comments about how interacting with external organisations was also an intellectually stimulating activity, and a way to learn from people with a diverse background.

Interestingly, senior academics (also in Australia) often reported chronological perspectives about the transformations in the higher education systems regarding the assessment frameworks. As reported by B22, the changes particularly regard junior scholars. B8 and B23, less senior than B22, corroborated these considerations, explaining that their entrepreneurial activity had a significant effect on their career advancement. It must also be noted that these interviewees were among those most involved in entrepreneurial activities, and those who reported very positive opinions about it (as later explained, these were grouped in typology 1). As will be discussed in other parts of this work, recognition for AE may have a positive impact on academics' entrepreneurial involvement.

Interestingly, along with helping a career inside university, AE also appeared to be used for alternative career paths outside academia. B12 explained that:

> *'Academia is very brutal, especially if you want to work in a university like this which is Russell Group … I always feel that this job is… Even though I have a permanent contract, my probation is three years. It's very precarious, so the consultancy gives me some peace of mind'.*

For B12, academia was characterised by employment instability, long hours, and also discrimination (notably, B12 is a woman). Consulting activity gave her a breathing space which meant additional personal income[13] but also a back-up plan in case the academic career did not succeed. Similar themes were reported by B3, a research fellow in a medical area. While enthusiastic about working on research projects with commercial companies, since: *'they are well staffed, well informed, they have sufficient funding available',* he was also looking at such collaborations as a way to bridge with potential future employers in industry, given that academia was no longer in line with his life plans, which included geographical and economic stability. Notably, both these participants were junior-middle

[13] Notably one of the very few interviewees who mentioned this aspect, and anyway linked to personal, basic necessities (such as paying the mortgage, paying for the bills…)

career researchers. Scholars maintain that academics' career choices and how they plan their activities at work are influenced by a variety of domains, including the personal life sphere (Duberley, Cohen, and Mallon, 2006; McAlpine, 2012; Ylijoki and Henriksson, 2017). Being at an intermediate career stage appeared to be a trigger for broad considerations on life choices, and how to prioritise the activities at work, according to certain goals and career prospects. These considerations also included how and if engaging in AE, and for what purpose. The career stage, as discussed in other parts of this work, emerged in this study as a significant element for AE.[14]

7.1.1.2. Constraining factors and downsides

The interviews revealed a variety of constraining factors in AE, related to: (i) differences between academia and industry; (ii) conflict of interest; (iii) academics' lack of time, (iv) career-related issues; and (v) complex bureaucracy and patchy support. Some of these themes crossed the typologies, whereas others were more group-specific.

The first issue listed above refers to divergences between academia and industry and in terms of objectives, mind-sets, and ways of working that seven entrepreneurial academics, particularly in Groups 1 and 2 (later explained), reported as among the main barriers, echoing previous studies (e.g. Tartari, Salter and D'Este, 2014). As here:

> *'academics operate always by necessity or on a much longer time scale than what industry needs and that mismatch in time scale is a source of frustration and it is a barrier in being able to do more'. (B19)*

Notably, while for B19 divergencies between university and industry are barriers *'to do more',* meaning that they may hinder the degree of involvement in AE, but to some extent they can be overcome, for others these were persistent and insurmountable obstacles. These

[14] It must also be noted that while for B12 the idea of leaving academia was mentioned as a *potential* alternative, B3 shared a more concrete plan, therefore the latter was included in 'The leavers', one of the typologies identified (more details regarding this typology are provided in Chapter 8).

differences in perceptions of *boundaries* between sectors and organisations made some academics appear *open* to AE, whereas others more *reluctant*, as later discussed.

Another '*mismatch*' concerned the objectives, where industry and academia were sometimes stereotypically portrayed as one profit-focused and the other as science and discovery oriented.

> *'there are different natures in organises [sic] and industry has its own way to go about, they have different objective to achieve which is largely really more…gain the capital, while university is more knowledge-based centres'. (B2)*

Different aims were often accompanied by efforts from each partner to protect its own needs and aims, thus creating barriers. Seven interviewees (across typologies) talked about conflict of interest between 'science and business' related to diverging scopes, as reported above, which often also entails diverging values and ethos, such as those of, transparency, and knowledge dissemination as traditional in science (Merton, 1968; Dasgupta and David, 1994). Notably, five of these participants were from health sciences. As will be discussed in Chapter 8, scientific communities may act as 'tribes' (Ylijoki and Henriksson, 2017), defining norms and values, and thus *scripts* of legitimate behaviours (Cohen and Mallon, 2001). Violating the norms of science may also be detrimental for the scientific career as it may delay publications, which not only may prevent others from replicating the work (contrasting with the norms of transparency and dissemination) but may also negatively impact on career advancement, as still dominated by publications. As explained by B22:

> *'A big drawback of working with industry is quite often you are working on commercially sensitive issues and so particularly for young researchers, the papers may never get published, or the publications may be delayed for many years until the patents have come through'.*

Notably, B22 underlined how the negative impact may especially affect junior scholars[15]. Such a tension was not only represented by potential conflict of interest, but also lack of time. Half of the interviewees (across typologies) complained about intense workload, where involvement in entrepreneurial activities was sometimes perceived as an '*extra'* (B17) that was intensifying their working life. As here:

> *'Just being, you know, extremely… just being extremely busy and then having the time to put that huge amount of effort that is needed in order to spin an idea and make it work, that's what I would say'. (B3)*

Lack of time meant a trade-off between research and knowledge transfer activities, where being involved in one implied subtracting time from the other. The tension was intensified by two issues. First, the lower quality of research conducted in collaborations with external organisations, as reported by some. Second, a complex bureaucracy, which around half of the interviewees (especially in Groups 1 and 2, but also 4) considered a significant barrier slowing down the process. Third, an ambiguous relation of AE to academics' careers. As previously discussed, while some academics mentioned having benefitted career-wise from their entrepreneurial activity, others lamented a lack of recognition for AE (see for example Groups 3). This seemed to increase the tensions discussed above. It is interesting to note that recognition was a contentious theme; also those who said they had some recognition for it were critical about the reward systems in place as not being homogenous across departments, with publications still evidently dominating the scene, with not very clear indications regarding how AE may contribute career-wise. Further insight on these themes is provided in the following sections.

[15] Career stage as emerged from the quantitative analysis appeared to have a significant role upon AE, as will be discussed in more detail in following chapters.

7.1.1.3. Typologies

The exploration of the entrepreneurial academics' career perspectives revealed two important aspects. First, an academic career was the goal of the large majority of the interviewees, with only one (discussed earlier) planning to opt out[16]. Being an academic was described as an ideal career since it allows fulfilment of intellectual interests while also working in more autonomy compared to industry. As summed up by B19:

> *'To me the most important one was to be able to wake up in the morning and if I have an idea is to have the freedom to pursue it; and you don't get that in industry. In industry you only pursue the idea that company indorses'.*

Intellectual stimulation, academic freedom, and discovery were clearly core interests and values emerging from the narratives, which appeared to be characteristics of an academic work-identity (e.g. Dugas et al., 2018) which seemed to still largely conserve its traditional features. Nevertheless, some interviewees appeared also prone to embrace the change introduced within universities, and to modify the boundaries of their work-identity to introduce new roles, such as an entrepreneurial one.

'Academic and entrepreneur' (Group 1)

The findings revealed the presence of entrepreneurial profiles of academics, which were labelled as 'The academic and entrepreneur' (Group 1). Among these interviewees AE was seen as complementary and well-integrated with their academic activities, often expressing genuine interest and enjoyment for it, and described as *'exciting'* because *'it broadens your mind and gives you different ways of looking at things'* (B22). When asked what they appreciated about it, some said:

[16] However, although also in this case academia was the preferred choice, the practical difficulties for early career researchers in establishing an academic pathway, in combination with personal life conditions (such as starting a family) made this interviewee plan to opt out from academia.

> *'the whole thing. Like looking at different people that come from different experience, …sometimes in academia you can just go after your own ideas and lose the end goal…(…). Also we've got more resources to make certain things happening and you know in research at the moment obtaining fundings [sic] is extremely complicated so obtaining, bagging on these resources is good'. (B8)*

As the excerpt shows, these were academics who, as others, also looked at the benefits AE could bring in terms of resources for research, but this was not the unique motivator; academia-industry interactions were also seen as mutually enriching: '*the strength here is to put together industry-firm…people with clinician [sic] as well as biologist, you need the three-way discussion…'* (B8).

Not that these interviewees did not express concerns about the 'entrepreneurial university'; as discussed in section 7.1.1.2, barriers in AE were also cited in this group. These particularly concerned lack of time and practical issues linked to the process of science commercialisation (such as bureaucracy, legal aspects); however, these appeared to be overcome by facilitating factors such as personal interests, skills, support from the environment, and recognition. Some for instance talked about how they were particularly able at knowledge transfer activities, even better than in research activities (B23), or how over time they developed a personal interest for the 'business side' thus engaging in further studies in this direction to provide interdisciplinarity in their work (B6); others talked about how the environment in which they worked was supportive of their activities (B22 and B8), and how AE had had a positive impact on their academic career (for B8 and B23, as reported in section 7.1.1.1); in some cases, also experience appeared to have helped in AE. For example, one interviewee in medicine while talking about the potential conflict of interest between working with private companies, also offered strategies on how to overcome such

barriers[17], which appeared to be the results of experience in managing entrepreneurial activities accumulated over the years.

It must be noted that none in this group was interested in leaving academia to become entrepreneurs, and the academic career was described as their main goal, in line with their intellectual interests, passion for discovery, and to work with more freedom. However, while retaining such a strong academic identity, they were prone to include an entrepreneurial role in it. As shared by B23: *'I feel I belong in academia, but I am entrepreneurial'.*

'Open academics' (Group 2)

Among the academics who expressed general positive opinions on AE, another sub-group was identified. These were categorised as 'The open academics' (Group 2). Somewhat less interested than those in Group 1 in the 'business side' *per se,* but willing to make their research useful for society, these were academics that in the relationship with external organisations felt as:

> *'I would see myself in the middle of a medium through which to translate information from industry into academia, from academia into industry, and I called the project'Mediate', because mediate means to be in the middle'. (B21)*

Impact, having an applied focus in research, intellectual stimulation, and *'interesting problems to solve'* (B19) were dominant motivations for AE; to some extent, more than funding, although mentioned. In this group it appeared that personal interests but especially their disciplinary field and the type of research performed shaped their positive perceptions towards AE. Being from engineering, as reported by B19, signified: '*that involvement with industry is gonna be a constant…'.* Looking at his future career he said: '*I will always*

[17] For example, he said that in one case, when the conflict of interest with a private company was particularly strong, after a careful evaluation he decided to opt out from the project, and to focus on others.

maintain some teaching and some research involvement, and maintaining research involvement means that some of it will be with industry'.

These profiles were, however, not only found in engineering but across disciplines, including physics, within which AE may be more challenging, as will be explained throughout this work. The key factor for such an *openness* (expression used by one from Italy, later presented) appeared to be the type of research conducted, not always the discipline *per se*. Being involved in applied research seemed to foster a perception of *'complementarity'* (B2) between research and AE.

As for those in Group 1, along with positive aspects, these were also academics who mentioned some barriers and concerns about AE, such as the need for balance between applied and basic research, and the importance of protecting academic freedom, or other difficulties reported in section 7.1.1.2 such as lack of time, and practical difficulties (e.g. industry's diverging time scale). However, these challenges appeared manageable; the divergencies between academia and industry in working styles and objectives could be dealt by for example *'build kind of a mutual agreement and then it's fine…'* (B2), often thanks to good support, which the majority in this group reported to have received, in some cases mentioning specific figures and university services, in others referring to their department. It must be noted that some in this group also had previous work experience outside university which may have also shaped their openness towards AE, as suggested by the literature (e.g. Tartari, Salter and D'Este, 2014; Gulbrandsen and Thune, 2017) (further considerations are reported in Chapter 8). The one who lamented a lack of support from the university explained that some training and initiatives to promote entrepreneurship were present but: '*I could never go to a Breakfast Meeting because I have to take my children to school'.*

The study thus shows the presence of work-family conflicts, and that these are still critical issues for women, which hinder their possibility of participating in specific networking events; ultimately corroborating what reported in Chapters 2 and 5 about the difficulties women may still face in academia and also in relation to AE, as will be further discussed in Chapter 9.

Another element that deserves attention is recognition for AE. The junior scholars in this group mentioned a weak formal recognition system for AE, with publications still the dominant criterion for career advancement; two seniors instead talked about the presence of a system of recognition for these types of collaboration, however, the seniors were also to some extent critical of such a system described as profit-focused, i.e. which tends to reward activities which bring a significant amount of income into the university. Evidence shows that some weaknesses in regard to the entrepreneurial university exist also in the U.K., despite a longer tradition. Further evidence emerged from other groups.

'Mixed' (Group 3)

The findings revealed that for some academics, being involved in AE is a more contentious activity. Compared to the previous groups, those within Group 3 (as well as Group 4, later discussed) generally had lower entrepreneurial experience. Particularly evident in this group were mixed positive and negative opinions about AE. Interested in having *'research funded by industry'* as well as *'have a patent on my CV'* because *'it's good for my CV or for my career'* (all quotes from B17), as well as having societal impact and gaining new ideas, these were academics who also affirmed that *'it's getting a bit too far'* and *'universities are turned in to R&D departments'* and for whom the entrepreneurial university model was seen as *'just changes that are imposed on us'* (all quotes from B17).

Notably, in this group three out of five were from health sciences and one from biosciences. The interviews revealed that certain barriers discussed in section 7.1.1.2 such as conflict of interest in some fields are more salient than in others. As explained by B4, from a medical area:

> *'Well the drawback is the potential / the potential conflicts of interest, so if you're perceived as doing work with these companies and publishing and presenting, you know, people will just say, yes, they're / he's just presenting what the company wants him to present. (...) I think providing everything is declared, and that you declare there's a conflict of interest, and that you remain as an objective scientist (...) I don't see a problem, but you can / there can be a perception in the community...'.*

Scientific communities, as introduced earlier, provide specific norms and values, thus defining working practices. To reinforce the above considerations, B16 from a medical-pharmaceutical area affirmed that: *'I am very pro the...I am very sort of supportive of the process of working with industry, just a little bit worried, I guess, of the motivation behind that...'*

'Ethics' and *'trust'* were the other two words recurring in the narrative, indicating the peculiar issues of specific sub-disciplines in regard to AE, where the concern was often that *'industry manipulates the way that their research goes'* (B16). Notably, Tartari, Salter and D'Este (2014) maintain that trust between scientists and industrial partners is a key aspect to lowering the barriers between science and business. As ultimately confirmed by B15, it is rather important to *'identifying the right person in industry'*.

B16 also affirmed that: '*if the opportunity came up, if I have more space and time to do that, then I wouldn't not do it'.* As discussed in section 7.1.1.2, lack of time was a frequently cited theme, which crossed the various typologies identified. However, while some academics 'managed to manage' various activities, due to the combination of factors discussed, for instance in regard to those in Group 1 (such as personal skills, or support, and/or reward for

AE), lack of time when combined with lack of opportunities and conflict of interest makes AE more challenging in some groups. Regarding personal skills, B17 specified:

> *'I am personally an academic, not a business man, mainly because I enjoy mostly to have new ideas and come up with ideas and I have too many ideas and I can't / I'm not very good and focused at making them work, that's my main problem, and I have too many, so I / I would have to decide which one to focus on and that's really not so much me, I'm too much of a thinker and not enough of a do-er'.*

It could be argued that these self-considerations diverge from those provided by some in Group 1 who talked about how they were particularly able at knowledge transfer, with some even engaging in business studies to foster such abilities.

Recognition for AE was also another critical issue in this group; generally aware of the changes in the higher education system, and the importance of impact, the way this is then formally rewarded appeared as contentious, unclear, or depending on *'who you speak to'* (A12), as while encouraged by university management, ultimately publications still have higher value for promotion, and therefore AE may simply subtract time from activities which have a stronger career impact. One interviewee specified that AE was rewarded only above a certain *'threshold in terms of money or impact or influence or whatever'* otherwise *'is pretty useless'* (B17). Consideration as to the importance of how the 'third mission' has been implemented and the role of the university in supporting this mission is reported in Chapters 8 to 10.

Two interviewees also talked about significant difficulties they had in their entrepreneurial activities, which lead to unsuccessful experiences. The one from medicine especially talked about difficulties in finding an agreement with external companies on data sharing, reinforcing the idea of specific issues affecting certain disciplines; for the one in biosciences difficulties lay in practical issues, such as poor project management, timescales, and working styles of industry. All these challenges were not always mitigated by the university's

support; some specified that the support should be increased since academics are '*busy doing the science'* (B15) therefore they need more and specific help for AE.

'Distant/instrumental' (Group 4)

Among those with involvement in entrepreneurial activities, three from the U.K. appeared to have adopted a particular instrumental view over such activities, *using* them for their research, but *distancing* themselves from it. Gaining resources for their research work, including job opportunities for students were particularly salient motivations. Notably, two of these participants were from physics, which as for health sciences, introduced earlier, emerged from the interviews to be a challenging context for AE due to a general tradition of fundamental science, which is accompanied by specific norms and values shared by the scientific community regarding what 'academics do'.

> *'I think it's actually quite divisive as well, the fact that you might / that your colleague might think that you are going to earn money above and beyond what you ought to be earning, I think is a bit divisive actually and secretive as well, you know'. (B13)*

Thus, some academics, while collaborating with external organisations and interested in specific entrepreneurial activities, sometimes showed a '*cynical'*[18] (B13) position towards them: *'I'm interested in - I think quite honestly now this sounds a little bit cynical - but I'm interested in developing these possible spin-out products'* (B13); but, as he added:

> *'I'm interested in doing that but I think I can only do that if it's part / it helps me in my research, you see, I can't / I am not going to give up my research… I see my job as doing my research and doing the teaching and doing the administration, all the stuff to do with the university professorship, that's how I see my job. If during our research we come across something, as I said, which is / has some potential to earn money, then I will follow that. I mean I will try and make it / I'll try and make it work so I'm always going to be interested and on the look out for that sort of thing'.*

[18] Notably, also B16 in Group 3 described herself as having a 'cynical' view of AE.

These were academics sharing more traditional views of their profession, as mainly dedicated to science, and for whom AE was seen as positive, or better *useful* only in relation to its contribution in terms of resources for research, but towards which they showed a more critical view than others. Among those within this group there was also the perception that the work done with industry tend to be lower in scientific quality, as it is *'project management'* more than scientific production, therefore it may negatively impact on the research work; it could be argued that AE was not seen as providing '*complementarity'* (B2) as perceived by others in Groups 1 and 2. As affirmed by B10 from engineering (but linked to physics):

> *'most of the time, the collaboration with industry umm / is most of the time, not always, it's a one way / you / knowledge transfer to them, so you help them, but that does not help your knowledge much. What you benefit is the cash or the research grant income'.*

AE was also seen as a waste of time considering the amount of time required to connect with external organisations (mentioned by all in this group), especially if coming from another country as in the case of one of the interviewees, and also to sustain the entrepreneurial ventures in the long run for them to be successful. As ultimately said by B9: *'if we had more time, then we could branch more easily'*. Among these participants one talked at length of an unsuccessful experience that in the end diverted time and energy from other activities, leaving him with a bitter feeling about such activities in which now he gets involved 'only if' they contribute to the research, otherwise better not to embark in such lengthy and challenging tasks. The difficulties he encountered were especially practical, related to the industry's poor project management, where the university was also somewhat lacking in its supportive role as lamented by two, with one in particular sharing that support is *'on the paper'* and *'verbal'* (B10). Interestingly, recognition for AE was a vague theme among these

interviewees. Although, aware of the changes and the importance of impact, they were more interested in their research outputs, perhaps reflecting again certain scientific communities' values and the benchmarks to establishing a reputation and a career. While some of the themes were similar among Groups 3 and 4, what appeared to distinguish the former from the latter was to some extent a more positive opinion about AE. Those in Group 3, removed certain barriers (e.g. finding a trustworthy partner), they would engage more in AE. In Group 4, academia and industry were perceived even more as distant worlds, and 'tribes'. Further insight especially on the constraining factors for AE is reported in the following section.

7.1.2. Non-entrepreneurial academics

This section reports evidence gathered from five out of the 23 academics from the U.K. university with no involvement in entrepreneurial activities. The interviews revealed that these participants' lack of entrepreneurial experience was due to: (i) their disciplinary field; (ii) research orientation; (iii) career-related themes; (iv) lack of time; and (v) differences between academia and external organisations.

The interviews confirmed that discussed earlier for other groups, that belonging to a certain discipline such as physics, where fundamental science dominates, does not encourage AE. This in turn appeared to also generate a certain culture within scientific fields, intertwined with personal interests and career choices and orientations. As summed-up in this excerpt:

> *'probably depends on the field; I know that in other fields culture is to go for commercialisation. In particle Physics it's used to be more not … kind of group culture… for me it's kind of very psychologically and personally satisfying that my results can be used by anyone … I am not that much money driven person. Probably there is some kind of interplay that people who are very money driven don't go into this field but go to fields where there is bigger chance to huge kind of amounts of money. It's all kind of bit convoluted'. (B1)*

One participant corroborated the evidence, although providing considerations from another field; medicine:

> *'It's...public health research in general is mainly funded by governments, so…and public health research unlike material research in medicine and unlike pharmaceutical companies, is not affiliated with industry. So, there is a very little opportunity to do public health research with industry. So, that's the main reason we are not involved in industry'. (B11)*

Thus, the study suggests that discipline and/or specific features of research work conducted are significant factors in shaping academics' perceptions towards entrepreneurship. These two factors are sometimes intertwined, as in some fields basic-science and/or not for profit might be more diffused, although not always the case, as ultimately shown by other profiles in this study. Further considerations will be reported in following chapters.

Other significant elements in this group were career-related. For instance, B20 explained that as he wanted to boost his academic profile, he spent the last few years focusing on publications; now, that he had secured *'some high impact papers'*, he shared that *'maybe that's a good time to think about some collaboration with industry at this point, yes'*. As will be further discussed in this study, evidence shows that career stage and promotion criteria are other very influential determinants in AE, as academics appeared to be strategic and careful planners of their work and daily activities, calibrated according to career goals. Task management was deemed necessary also due to the lack of time, also lamented by interviewees in this group, along with difficult connections with industrial partners, and issues related to differences among academia and external organisations in terms of objectives, culture, and mind-sets. These elements appeared to have created a sense of *reluctance* for AE among some of the interviewees.

However, the narratives also revealed potential for entrepreneurship among some in this group, who expressed positive opinions about it, related to the possibility of gaining funding,

but also to have an impact. As here B20 states: *'if the research output can be utilised to / or some knowledge advancement, to improve you know people's lives, then that would be great'.* Also adding:

> *'I think it will cause me a lot of benefits, especially you know for the REF … the ranking depend on different aspects, research output, that depends on what kind of paper you publish and impact is getting more and more important'.*

As for those with entrepreneurial experience, 'impact' appeared to have a dual meaning, related to the 'applied focus' research may take but also (and as a consequence) the return it may have career-wise given the emphasis on this aspect nowadays. To some extent this evidence reinforces that mentioned earlier about the importance of promotion criteria, as also among those with no entrepreneurial experience (particularly some) the changes towards the 'third mission' were clearly perceived. Another interesting insight was furnished by B14, a junior scholar who shared that:

> *'actually it's not like I had much of a choice because mainly in Brazil we don't have many like researchers in terms of industry, it's more done in the countries from the industries came from like Germany, or Europe and they just, they put some part of their research in Brazil but not the main part of it, so and we don't have….'.*

Clearly the features of the national context acted as constraining factors. Interestingly, during the interviews he also mentioned that as he moved to the U.K. for a post-doc he started to notice the presence of academia-industry linkages, and the effective possibility for academics to be involved in these types of activities, as in the case of his supervisor. As will be discussed especially in Chapter 9, the national context, exposure, but also training and role models may act as positive influential factors upon AE, especially for junior scholars, which perhaps could further foster their sense of *curiosity.*

7.2 Australia

This section reports the findings regarding the Australian interviewees. The sample is composed of 32 participants with a variety of entrepreneurial experiences (for further details on the sample see section 6.2.). This section starts with a discussion about the findings in relation to the group of *academics with entrepreneurial experience*, then it continues with the evidence from the *non-entrepreneurial academics*, followed by considerations on the typologies identified.

7.2.1 Academics with entrepreneurial experience

7.2.1.1 Academic entrepreneurship: drivers and benefits

A total of 28 out of the 32 interviewees from this university had experience in entrepreneurial activities, either formal, informal or both; most frequently they were involved with the private sector, but in some cases also with the public sector. As explained below, the main drivers for AE were: (i) making research more applied and having an *impact* on societal issues, (ii) gaining funding for research, and (iii) specific career-related benefits. The interviews also revealed that AE was seen as beneficial to the possibility of accessing a different expertise and perspective, while also learning from people with a different background. It could thus be argued that overall convergence was found on some main themes with the U.K.; however, some peculiar features of Australia also emerged.

For example, *impact* appeared a particularly salient theme among the Australians, cited by almost all the academics with entrepreneurial experience who appeared very interested: *'to see your ideas actually used by somebody outside the university'* (A4). The theme emerged from those with experience with either the private or the public sector. As for instance reported by A5, who was working with the food and pharmaceutical industry: '*I have a view*

that we should all try and make the world a better place. I'm an academic. We have lots of skills and expertise'. This motivation in some cases appeared to be linked to national context issues, as some of the Australians were engaged in research works closely linked with Australia's territory, such as rural aboriginal communities or environmental conservation. These types of activities were on some occasions conducted with public bodies (e.g. governments), other times with the private sector, but anyway generally underpinned by societal aims.

Funding was the other highly cited driver (by more than half of interviewees, across groups). Academics are evidently in need of resources to sustain all the expenses related to research *'be it from government or from ARC, our lead research funding body or from other government sources or industry'* (A26). The resources could also include *'materials and devices that make it possible to do the research'* (A18). While addressing this need, the interactions with external organisations were also sources of intellectual stimulation for eleven of the interviewees (especially in Group 2), and for sixteen (across the groups) were also sources of new experiences and different expertise.

Notably, as for the U.K., the interviews revealed that *impact* was not only conceived in terms of the contribution to society with research, but also how this in turn could benefit academics career-wise. As here:

> *'so being in a position of having interactions with industry, puts me in a very good position as well, also here in the context of a new academic, it's kind of what they want, so yes, it makes life a bit easier'. (A10)*

In relation to the recognition for AE, an exemplar case is A30 who explained that his work with the public sector significantly contributed to his career advancement, since:

> *'the university of [name of university] has a unique / well in my experience a unique and important characteristic and that is actively value knowledge transfer … and my*

> *career in the last ten years has pivoted on the strength of the university commitment into that ... awards and engagement. For instance, I have been on the strength ...of my engagement from senior lecturer to reader and associate professor so this is a very concrete way in which the university supports my undertakings, so there's that, so internally it's been very good for my career to engage I couldn't have gone thus far just on research or teaching'.*

Other interviewees also shared how nowadays being involved in such activities was a *'real advantage … a real bonus'* (A24).

Caution, however, must be taken in concluding that the impact agenda had been effectively implemented in Australia. If some interviwees described beneficial implications of AE on the career side, half mentioned either unclear or non-existent recognition. As here for example: *'that's more of a personal intrinsic sort of driver. In terms of the career I just don't think that there really is the recognition'* (A22).

Some shared that their university recognises such activities but exclusively when they bring direct income into academia, expressing it as a concern, since this is not seen as in line with the societal ethos of socio-economic development as theorised in the Triple Helix (Etzkowitz et al., 2008), ultimately echoing findings from the U.K.

Another similarity concerned the role of AE in helping academics build alternative career pathways outside university. Among the Australians, two academics talked in concrete terms about a career move, with another few mentioning it as a possibility. One for example shared that: *'that experience is good for me because the chances are I am going to be working in industry'* (A12)

The other:

> *'I'm at a bit of a crossroads right now. It's most likely that I will leave the university and become an entrepreneur! (…) it's not working for me. I just / I'm like a consultant here. I just may as well become my own consultant. The university provide the name, you know, provides reputation, provides a certain amount of services, practical services as well, but umm it's most likely that I'll be moving on and I've got some colleagues who are in the same boat and we've already started up a small company, so we'll see how we go'*. (A6)

Notably, these participants were middle-junior scholars. Career stage emerged thus as an influential factor over academics' career choices, in turn with an impact on AE, seen in the light of the benefits it may bring in regard to academics' careers, either inside or outside academia. These participants, along with those from the U.K., formed Group 5, 'The leavers', discussed in Chapter 8.

Along with providing all these benefits, the interviews revealed that AE was a difficult activity. Many themes were similar to those found in the U.K., therefore the following section will report a brief overview, with some themes discussed directly in relation to the typologies identified among the Australians.

7.2.1.2 Constraining factors

The most salient barriers in AE appeared to be: (i) differences between academia and external organisations in terms of objectives and values; (ii) weak support; (iii) lack of time; (iv) a conflictual relationship between academic entrepreneurship and scientific activity; (v) and in turn thus with the academics' careers; and (vi) academics' lack of training in entrepreneurship.

As in the U.K., also Australians talked about how working with external organisations and especially industry was difficult because *'you're in two different worlds, different timescales, different objectives, different skills, different drivers and so on'* (A13), as reported by the vast majority. Furthermore, academics were lacking time, therefore, as clearly expressed by A7: *'from my side if I wanted to I could collaborate more with industry, but I'm so crazy busy most of the time so it's a case of where do I focus my attention'.*

Almost all the entrepreneurial academics talked about a conflict for time, resources and energy to spend in different and numerous activities they were required to be involved with on a daily basis. In such a scenario, AE risked being seen as an 'extra' which could lead to

a trade-off with the research activity, as reported by A29: '*the first immediate drawback is that the more time you spend doing engagement, the less time you spend writing papers'. (A29)*

Notably, this was an academic with extensive entrepreneurial experience, which not only included 'soft' forms of entrepreneurship, but also 'hard' types, and he was particularly enthusiastic about it. Personal interests and skills appeared to have helped in dealing with the numerous activities to accomplish, and other barriers; however, these were clearly perceived by also those partircularly involved in AE. Further considerations are reported in following sections.

7.2.1.3 Typologies

As found in the U.K., a traditional academic career was the goal of the vast majority. The strong academic orientation emerged, and core features were an interest for discovery and academic freedom, which could, however, be combined with an entrepreneurial ethos; at least for some. In this context, however, more than 'entrepreneurial and academic' profiles, the majority of those who expressed a positive opinion about AE, fell into Group 2, which, as discussed in section 7.1.1.3., was labelled 'The open' academics.

'Open academics' (Group 2)

Coming from a variety of disciplines, often engineering, the applied orientation of the research of the interviewees in this group appeared as for some of those in the UK as the key factor for their *open* attitude towards AE, with the latter not necessarily perceived as a radical change, but something that has always been present. As A10 affirmed: *'I do already do a lot of work with industry, so in a way, for me, it's no change. I just keep doing what I've been doing'.* Motivated by conferring to their research an applied focus, and being intellectually

stimulated by real world problems, as well as gaining funding, these were academics who expressed a sense of integration between AE and their academic work:

> *'It's all part of the same job really. […] I think the industry collaboration just for me falls in to the kind of research bit and so I don't think I see it any different than any other project I have, except for, of course, I do have more interaction with somebody external'. (A10)*

AE was also a source of enjoyment: *'I think I've enjoyed it. That's the real reason. I find it very enjoyable working with industry'* (A17).

Hedonistic aspects underpinning academics' entrepreneurial activities are also reported by previous studies (e.g. Gulbrandsen, 2005; Lam, 2011) explained as typical of the most entrepreneurial academics, signalling the presence of intrinsic motivations underpinning AE among some academics. This is not to say that AE was always without challenges for these academics, and some of constraining factors mentioned in section 7.2.1.2, such as lack of time, practical barriers often linked to differences between academia and industry (e.g. working styles, timescale), were also mentioned by these interviewees. Notwithstanding, these were academics who in regard to the entrepreneurial university generally expressed that:

> *'I think it's good. I think it's a very good thing. I think for Australia it's a good thing. We're a bit far behind places like Germany and Sweden and Finland. I think it's a good thing. We've relied on resources for too long in Australia. We had some big mining companies and done so well for so long'.*

AE was seen as a way to foster innovation which was very important for Australia, since as reported by A17, compared to other countries the level of industrialisation and innovation is *'behind'*. It must be noted that the Australian environment emerged as an issue both for entrepreneurial and non-entrepreneurial academics, as later discussed, signalling the role of the macro-context as an influential element; in some cases, as a constraining factor, in others as stimulus, as for instance when triggering specific research foci.

Along with the applied-orientation of research, also the support received for AE appeared to have been a facilitating factor in this group; around half of the interviewees mentioned forms of support in terms of specific offices, or financial support, and also a generic encouragement.

Recognition was, instead, more of a contentious topic; six interviewees in this group mentioned lack of recognition, and others talked about a change that was in progress: *'I think more and more we're introducing the recognition of impact now'* (A17); or as expressed by A24: *'if they are looking for … impact of research, which is more and more becoming the case, then all of a sudden we become much more interesting to them'.* The last interviewee in particular explained that the situation is *'a bit of a dual thing',* where high quality research still maintains relevance, but AE is getting more light, and depending on the audience, academics have to adapt to diverging requests. This condition resembles the 'flexible personas' described by Smith (2012, p. 168) in relation to the strategy adopted by some academics in the current changing environment, in which different and sometimes contrasting messages are sent, therefore the need to adopt a 'changeble' self to deal with these various requestes.While those in this group seemed to have managed such a duality, for others tensions were more evident.

'Mixed' (Group 3)

As in the U.K., some interviewees in Australia appeared *'mixed'* (A4) in their opinion about AE. Because, as mentioned by A4:

> *'I really enjoy the interactions with industry and I enjoy in some ways the freedom that entrepreneurship would imply, but I don't like a one-size-fits-all model. I think there has to be recognition that within a university you're going to get some people who are more traditional and some who are very, very entrepreneurial and everything in between that and my fear is that some people want to say well everybody has to be such and such'.*

This interviewee, as with others classified in this group, reported a mixture of opinions, tensed between what they liked about AE, which generally entailed the possibility to give research an applied side, accomplish societal scopes, and the intellectual stimulation deriving from such activities, and what they were concerned about. AE was considered also *'dangerous'* and '*short-sighted'* (A2), a potential threat to academic freedom and discovery, and *imposed* upon academics. This theme of AE as a top-down 'push' was typical of the narratives in this group, with the idea of the negative consequences of a *'one size fits all'* approach mentioned as detrimental by two. Other elements that appeared also typical of this group were the contentious narratives about recognition for AE, and academics' training. Regarding the former, A4 while mentioning the role of *impact* in the new appraisal, also specified that it had been very recently introduced, so it was a change academics nowadays had to '*deal with';* another two shared similar considerations, as for instance A21:

> *'So there's this very uncomfortable moment where the universities are starting to realise "Oh, this can actually be valuable, but we don't know how to deal with it and we don't know how to count it and our metrics are not set up for this." So I think that'll change a lot in the next few years. In my opinion academic organisations will start to realise how extremely valuable the stuff can be and will start to try to exploit it and encourage it, but at the moment they still don't really know how to deal with it'.*

Three interviewees mentioned that academics are '*not trained to link with industry'* (A2). As A2 also expressed:

> *'Something must happen because people can't do the job we've been trained to do and we're asked to do a job we don't know how to do. It's like a new revolution in our industry. Our job is changing, but we're not ready. Very few of us are ready for the next step'.*

Furthermore, support is sometimes: *'a bit disjointed, so it's a little bit laissez-faire in terms of the interaction of individual academics or groups with external partners'* (A26).

All these factors appeared to be some of the main elements making some academics particularly ambivalent about AE (further considerations in Chapter 8).

'Distant/instrumental' (Group 4)

Some academics appeared to have assumed a particularly 'distant/instrumental' position towards AE. Those from Australia grouped in this typology were two academics who while involved in entrepreneurial activities, appeared uncomfortable with being associated with a specific concept of entrepreneurship, and types of industries, in particular the private sector, since '*they're driven by commercialisation'* (A1). As working extensively with the public sector, these interviewees described AE as *'an opportunity to give'* (A30) to society; particularly to their country. As introduced in section 7.2.1.1 these were among those participants working on specific issues related to Australia's territory, such as natural resources conservation or rural aboriginal communities[19]. The other emphasised that *'the motivation number one is to be very, very, very pragmatic. That's what we're funded to do'* (A1); *'but the second motivation is around…'* and she talked at length about specific needs of aboriginal communities and how *'we think they need some support'*. However, when asked about the academia-industry interplay and their career and role, both clearly described themselves as 'academic'; A30 said: *'I am an academic. That's it. I do/ the university employs me as an academic and I do things that's of particular needs but I am living in this organisation'.*

The findings suggest that being involved in entrepreneurial activities does not always correspond with academics feeling 'academic and entrepreneur', or being interested in the 'business side', or feeling *'in the middle',* as reported by others. Some academics involved

[19] Notably, A30 was among those who explained to have benefitted career-wise from such activities, also describing university as very supportive.

in AE maintain or even reinforce their core academic identity, through for instance processes of organisational identification (Mael and Ashforth, 1992; Whetten, 2006; Ashforth, Harrison and Corley, 2008), which will be further discussed in Chapter 8. The type of research conducted and what this entailed in terms of sectors with which academics interact appeared to shape the opinions about the academia-industry interplay, and ultimately what entails being an academic. It could be argued that societal aims also shape the types of activities academics may tend to engage in, with these two participants in fact more involved in soft forms of entrepreneurship. This, however, appeared not to be the case in general from the study, with a societal focus underpinning collaborations with also the private sector, as shown by other cases from Australia as well as the other two universities. This is to say that specific research work and foci are indeed influential factors in AE, but they are not strict determinants, and similar drivers may underpin different entrepreneurial activities. AE overall appeared a complex rather than a dichotomic and compartmentalised phenomenon, with different factors and drivers dynamically interacting and overlapping.

7.2.2 Non-entrepreneurial academics

This group is constituted by four out of the 32 interviewees from Australia who did not have experience in entrepreneurship. Even before analysing the transcripts, what captured the attention was that the interviewees in this sub-group were all junior researchers, with two from physics. Their position at university and their field of research were confirmed by their narratives as constraining factors, corroborating previously-made considerations on these elements.

A19 explained that as a junior researcher he was mainly focusing on publications to build his career at university. In contrast, his supervisor, a senior academic, was more involved in entrepreneurial activities. As he went on, he added:

> *'After a while, probably in the next two years, I have to have my own group, my own research group and this is when I have to eventually start connecting with industry, government and do all these things'.*

Starting some collaborations with external organisations, private or public, seemed to be conceived as a career stage-related activity. As publications are still the dominant career advancement criterion, those junior scholars interested in an academic career appeared trapped in the 'publish or perish' dilemma. While this theme emerged across various groups, among junior scholars it was particularly evident. Three in this group also mentioned that AE was mainly recognised and rewarded strictly in relation to the monetary benefit it may bring in to university, echoing some of the colleagues with entrepreneurial experience.

The other critical element was the disciplinary field, which emerged from all four interviewees in this group, in more or less direct terms. Three of them (two from physics), explained that their lack of involvement in entrepreneurial activities was due to their field of research, which since focused on fundamental science, does not provide the ground for knowledge transfer activities. The narratives also revealed a lack of support and training for entrepreneurship, as emerged among some of the academics in other groups. As affirmed by A19: *'I want to stay in science. That's what I love to do and that's what I'm trained to do'.* As A16 also said:

> *'It's difficult. For me maybe it's in the training in some ways of the … even in the undergraduate that there's not that accessibility to industry, but maybe that's more the discipline that I did in terms of science'.*

Notably, along with training she also reinforced the role of her discipline (in terms of fundamental science orientation of her research work) as the most likely explanations for her non-entrepreneurial activity. Some considerations of these aspects were introduced in Chapter 2 where it was shown how studies have reported that women, as with A16, tend to distribute in fundamental-science-oriented fields, and to specialise in certain sub-disciplines

which may prevent them from being included in certain *entrepreneurial* networks. Further considerations are reported in Chapter 9.

Another barrier concerned the role of the macro context (notably reported among some of the entrepreneurial academics discussed earlier), with in particular A19 affirming that:

> *'Also Australia isn't really an industrial country. Probably a bit in mineries [sic] or maybe more medicine or these sort of things, like medical devices, but not really industrial. We're really struggling here'.*

Other constraining factors related to differences in objectives, mind-sets and culture, as well as conflict of interest between academia and external organisations, as ultimately mentioned by many of the entrepreneurial academics.

Notwithstanding these challenges, the passion for science and the interest in an academic career, as reported by all four interviewees, their lack of entrepreneurial experience was not in all the cases underpinned by negative opinions about AE. In particular, two out of the four considered AE as potentially beneficial for *'brainstorming, exchanging ideas with others'* (A19) and it could also contribute to the development of instruments or products *'that people can use'* (A19), and this was seen as *'very beneficial and satisfying'* (A16) and *'joyful'* (A19). The findings signal potential for AE among sub-groups of academics who at the moment appeared to be constrained by a promotion criterion which does not incentivise it, or because of their discipline, or lack of experience and training.

The other two interviewees, instead, appeared less *curious* about AE, and more *reluctant.* This seemed to be the result of the factors discussed above, which in some interviewees appeared to act as stronger barriers than in others; particularly, not having been exposed to *'all the possibilities that I might have outside academia'* (A31), and due to the fundamental-science orientation of the research (A32).

7.3 Italy

The present section reports the findings of the 26 academics from Italy. The section starts with a discussion about the drivers, constraining factors and career perspectives regarding the *academics with entrepreneurial experience*, followed by the findings from the *non-entrepreneurial*. The section concludes with a summary of the main evidence.

7.3.1. Academics with entrepreneurial experience

7.3.1.1. Academic entrepreneurship: drivers and benefits

This sample includes 21 out of the 26 interviewees with entrepreneurial experience, including both informal and formal types. Regarding the motivational aspects for AE, the most relevant themes that emerged were: (i) accessing funding and general resources for research; (ii) learning; (iii) giving research an applied focus and having an *impact* on societal issues; and (iv) career-related issues. As can be noticed, these themes ultimately emerged from the other two universities, showing thus a high degree of convergence regarding the main drivers for AE across countries. Given the similarity, only some brief considerations will be reported here, with some issues discussed directly in relation to the typologies identified.

Regarding the first point listed above, more than half of the participants (across Groups 1, 2 and 4) in this group explained that:

> *'the Italian situation, in terms of public fundings [sic], to do research, which is basically nothing at the moment, the opening of the university, of the research centres to private companies, is mainly because they have the money to fund research' (P3).*

Notably, this motivation was described by some as trivial or *'dreary'* (P5), whereas *'learn something new'* (P2), a theme that emerged from 14 interviewees (across Groups 1, 2 and 4) was defined by some as a more *'noble'* (P5) rationale. This is an interesting finding, as it

seems that in the attempt to address practical needs (i.e. gaining funding) academics have tried to extrapolate the 'sunny-side' of AE, i.e. something that may be in line with their typical orientation, such as learning and being intellectually stimulated; as explained here:

> *'it is also the pleasure of rediscovering new things, to confront with different people, to discover new problematics, in the end is the soul of research, or not?' (P20)*

Along the same lines, more than half of the academics with entrepreneurial experience mentioned that collaborating with external organisations and being involved in entrepreneurial activities was a way to '*using what/the knowledge that are within university to have an impact in the real world'* (P22), to step out from their ivory tower, to share recent discoveries with a wider audience, while at the same time being updated about societal needs to ultimately address.

The idea of contributing to societal needs, while very salient for those working with the public sector, was also found among academics working with the private sector, and it crossed the typologies identified, as later discussed. Entrepreneurial activities appeared also to have a potential positive spill-over effect in terms of career, however, such considerations emerged from a minority.

7.3.1.2. Academic entrepreneurship: constraining factors

Dominant barriers for AE appeared to be: (i) administrative issues; (ii) aspects related to the national context; (iii) differences between academia and industry (and external organisations in general) in terms of working styles and culture; (iv) conflict of interest; (v) lack of time; and (vi) lack of formal recognition. Notably, these themes were also found in the other two universities; thus, the following section will only briefly mention some of these elements, with further discussions reported later in relation to the typologies identified, and then in Chapter 8.

Regarding the first point, 13 interviewees (across Groups 1, 2 and 4) mentioned that AE often implied having to deal with a tedious and conspicuous bureaucracy that was slowing down the process. Interestingly, some participants linked it to the broader Italian context, as a typically bureaucratic country, corroborating that reported by Baldini, Grimaldi, and Sobrero (2007, p. 345) in their study of Italian professors involved in spin-off formations, who maintained that 'excessive bureaucracy and rigidity of university administrators' were major factors hampering their entrepreneurial activity. However, it must be noted that similar findings emerged from the other two universities; so, while this issue might be enhanced in the Italian context, evidence suggests that at the meso-level there are practical issues that are similarly affecting academics across countries, as will be further argued in Chapters 8 and 9.

The national context was also considered a barrier by half of the interviewees (spread across Groups 1, 2 and 4) for issues such as the weak industrialisation of Italy, especially regarding certain sectors such as the pharmaceutical sector, the presence of small/family businesses which are typically not innovation-oriented, a *'Mediterranean culture…Christian ethics, catholic'* (P13) for which business is not separate from people (the *human side*), and this to some extent makes entrepreneurship more complex. Another context-related issue mentioned was the lack of flexibility of the Italian labour market, which hinders moves across sectors.

Among the barriers, time and workload deserve special attention. While mentioned by around half of the interviewees, across the typologies identified, these themes were underlined as constraining factors by particularly some in medicine (one in Group 1, one in Group 2, and one in Group 3). It emerged that academics in this field face a situation where being involved in entrepreneurial activities may imply that:

> *'in the end you do one, two, three jobs…I work as orthopaedic therefore I do the clinical activity, I do research activity, I also have to manage the spin-off; it is not pervasive, that is it does not occupy the 100 percent of my time yet there is also that one, therefore we have to do meetings for that, we have to go search for funding, we have do to…so, all this stuff needs time'. (P17)*

This participant specified that diverse activities were managed by allocating a specific portion of time to each, with entrepreneurship not receiving the largest amount of time. This appeared as a strategy to deal with such an intense workload, where AE was overall considered a positive aspect that should be even more incentivised. In opposition, another interviewee from medicine affirmed that academics should not dedicate extensive time to AE since it is not their role; in this case considerations were made regarding what the role of academics does and does not entail, which appeared to be linked to more profound evaluations in terms of work-identity, more than merely workload management. This aspect will be discussed in regard to Group 4, in which the latter interviewee was ultimately situated.

Before moving on to that section it must be mentioned that recognition for AE was another significant barrier in Italy. The vast majority of the interviewees reported lacking a formal system of reward for AE.

7.3.1.3 Typologies

'Academic and entrepreneur' (Group 1)

Findings from Italy suggest the presence of various profiles of academics, among which were 'academic and entrepreneurial' scientists. These were participants with experience in entrepreneurship, including the hard types of activities, motivated by the intellectual stimulation they could derive from such activities, the possibility of applying research into real world issues, as well as gaining resources for the research activities; most importantly they shared positive opinions about AE, seen as a change that could benefit the university.

These were academics from disciplines such as maths or medicine, in which, as discussed in other parts of this work, entrepreneurship can be particularly challenging. Despite this, the study shows that some academics manage to overcome these barriers, to embrace an entrepreneurial role. One for instance wanted to *'confess'* (P18) that he was very sorry for a spin-off activity he was involved in not having been successful in the end (due to practical issues), as he was very interested in it. Enabling factors underpinning such entrepreneurial behaviour appeared again in some cases to be the applied orientation of research and support received; in others, seniority at university appeared to have facilitated the process, along with overall personal interests and skills. As argued by P2 when comparing himself with colleagues:

> *'obviously it really depend [sic] from person to person, because there are colleagues who are much more prone to collaborate and other people who don't like to collaborate'.*

It is worth noting that some of the barriers mentioned in the section 7.3.1.2 were also reported by the academics in this group; support from university was in some cases present, but lacking in others, with others also talking about lack of time or excessive bureaucracy, but also the national context as characterised by a rigid labour market –which create a sense of separation among sectors– and also not particularly innovation focused, and slow in the process of knowledge transfer. However, these barriers appeared to have been compensated by the facilitating factors discussed above, making these academics entrepreneurial.

'Open academics' (Group 2)

Found also in Italy, some interviewees appeared to be 'open' to AE particularly due to their membership to: '*a group which for its own nature is relative applied therefore these types of collaborations have always been present'* (P24). The entrepreneurial university was not

generally seen as a radical change by the majority in this group, but more as something that recently has expanded:

> *'Well, I am an academic but projected to/ I mean I have a larger openness in respect to my colleagues towards the industrial world, because, so, it is the reality, it is the market thus…'. (P4)*

Pragmatism and an applied outlook on research were salient features in this group, with AE seen as a way to diffuse discovery outside the ivory tower, which *'should not remain closed on itself'* (P5), and also as a source of intellectual stimulation:

> *'I will always preserve my role at university because is the thing that I like the most and I have learned to have this passion although I tell you the truth, I mean, I really like it [referring to his entrepreneurial activities] because I am an engineer and I like challenges, I like learning new things and the fact of being in front to also new challenges with a role that is always different, it is always in evolution, I like it to death and therefore until I will be able to I will keep my feet on both the two brackets'. (P13)*

Notably, some made a clear differentiation between hard and soft activities, and how while interested and *open* towards collaborating with industry, ultimately often part of the research work, this sometimes entailed specific activities only:

> *'I wouldn't feel like coming out with a spin-off because in reality I don't/I mean, I don't feel I have this business mind-set, so, whereas I may be closer to the resolutions of problems, in the production perhaps of new ideas, a new product' (P5).*

It could be argued that such considerations differ from those of some in Group 1 about their interest in spin-off activities. Differences in mind-set and abilities and how these were important in order to be 'entrepreneurial', and according to certain activities, were mentioned not only by some in Group 2, but also in Group 4, signalling the importance of individual aspects in AE, and how these were recognised as pivotal by the academics themselves. As P24 reiterated:

> *'Sometimes people inside university do not have the right mentality to interact with businesses, there are many that are/we could call them scientists, let's say, who do*

> *not like to confront with applied problems therefore they have difficulties in getting in accord with also the business world to agree something to do together'.*

While some in this group mentioned that AE was well regarded nowadays, and that being engaged in such activities contributed to raising their profile and reputation among colleagues, the majority reported that AE does not have a significant weight for career progression, and sometimes is even hindered. In this group, given the tradition of academia-industry linkages, these however were not such strong barriers as in other groups.

'Distant/instrumental' (Group 4)

Individual differences, along with other factors later discussed, appeared to be the basis of more nuanced, *distant/instrumental* positions which were also found among the Italians. Three interviewees in particular stressed on funding and resources for research as the main motivations for AE:

> *'the opening of the university, of the research centres, to private companies, is mainly because they have the money to fund research that can be interesting from both parties'. (P3)*

When asked about the main benefit of AE, P3 reiterated: '*Well it's the same answer, money, the possibility of having access to laboratories, no matter the cost'.*

Furthermore, in this group, AE was also considered as potentially dangerous for issues related to conflict of interest between their research activity and the profit interest of the private sectors, mentioned by all three interviewees in this group. In medicine, for example, this could be a particularly serious issue for the industry *'since it pays it could pretend to control some types of situations, some types of messages, concepts'* (P23). This was the interviewee who, as introduced in section 7.3.1.2, underlined that AE should not become the principal activity of academics, and only a limited time should be dedicated to it, since their core role is producing knowledge. By restricting the time to dedicate to such activities, he

seemed to protect his academic role, and, it could be argued, his work-identity, conceived in more traditional terms, from the potential contamination and control over messages industry may exert. Interestingly, he also talked about differences among departments, especially engineering and medicine, about how AE is regarded, as positive or not, and rewarded. Lack of recognition for AE was mentioned by all three interviewees in this sub-group.

Other factors that appeared to have fostered *distant* positions appeared to be lack of preparedness of academics in engaging in such activities, and weak support which meant that sometimes academics have to create these contacts by themselves (P12). These were coupled by socio-cultural aspects mentioned by two in this sub-group. For instance, P3:

> *'it's a typical Italian department in this sense. I think we are starting to understand now the importance of collaborating with private companies, now, and so far, particularly the public fundings [sic], were coming easily and so we didn't have to deal with this problem'.*

All these elements seemed to have fostered more distanced positions towards AE among these academics, who conceived their role in a *'romantic'* (P3) way, such as entailing a devotion to science. To reinforce such a role, one emphasised his membership to the university, through a process of organisational identification (as ultimately found in Australia):

> *'I locate myself completely within university, in the sense that my stipend is paid, let's say, the university of [name of university] and therefore I am an employee, or at least I feel like I am an employee of the university of [name of university], although I am free to do my research activity and when it happens obviously to interface with businesses or private bodies honestly I have the freedom of movement that I consider necessarily'. (P12)*

Interestingly, this participant while *bound* to his organisation, specified that he had the freedom to move across organisational boundaries, somewhat resembling the image of a boundaryless career 'free actor'. This, however, did not mean feeling *entrepreneurial* but

being *'a university employee'*; in so doing, however, he had the possibility to cross boundaries of different organisations. This *bound and boundaryless* condition to some extent resembles similar descriptions reported by Lam (2010, p. 322) in regard to specific groups of interviewees she noticed in her study who appeared to maintain an ambivalent condition to allow a ''free space' for autonomy', which helps dealing with the dissonance perceived in relation to conflicting demands, enabling 'temporary solutions to experiment with new roles' (ibid.). Further discussion on the bound and boundaryless degree of academics in relation to AE will be reported in the next chapters. At this point it must be mentioned that the findings from Italy did not suggest the presence of profiles associated to Groups 3 and 5, as also explained in further chapters.

7.3.2 Non-entrepreneurial academics

This group is constituted by five of the 26 participants with no experience in entrepreneurial activities. Overall the findings confirmed considerations made earlier about the research orientation being a strong constraining factor for AE. While belonging to different disciplines (physics, maths, medicine, or earth sciences), they all talked about the fundamental orientation of their research as the main reason for not having had involvement in entrepreneurial activities. As here P9:

> *'The motivation is that there's no tradition in physics precisely because there is this objective of the research of the fundamental laws of nature that is a thing that/not often finds a direct application, therefore surely there aren't companies that, let's say, are involved in these things'.*

P26, from medicine, explained that since his research is *'no profit'* it is scarcely attractive for industry. Some interviewees combined the discourse about discipline and research with another theme: the national context. Italy was pictured as characterised by small/family businesses which normally are less innovation-oriented and this was a negative factor for

AE, ultimately corroborating previously reported findings from other Italians. However, while some academics managed to overcome this limit, others appeared more trapped within the boundaries of such a context, especially when combined with factors such as the fundamental-orientation of research. For instance, some participants shared that in Italy there is traditionally a more basic-science focus in mathematics, and this does not favour connections with external organisations, and industry in particular, as in other countries. Notably, two of these were both professors. As seen in previous chapters, and further explained in following chapters, seniority at university emerged generally as a positive predictor of AE. However, this seemed not to apply in specific disciplines.

Other factors that emerged as barriers were academics' lack of time, as well as the difficulties in connecting with external organisations due to divergencies in culture and working styles, ultimately echoing the entrepreneurial academics.

While these barriers made some of these academics *reluctant* towards AE, a degree of openness, or better, *curiosity* was also found among some of the Italians with no entrepreneurial experience. Some for instance affirmed that:

> *'I believe that many of us have the interest/to what it is called technology transfer, thus transfer of knowledge. I mean, in the end to prove that what someone does as blue-sky research de facto finds some applied outcomes after'. (P9)*

Or

> *'it has never happened/simply it has never happened to me the occasion, I wouldn't dislike it, but I don't think/not, well, how to say it, I am not sure that what I am able to do might be of interest, but it may also happen'. (P15)*

Although unsure to what extent his field of research (mathematics) and expertise could *'be of interest'* for industry and in general for knowledge transfer, P15 did not dislike the idea. Similar considerations were reported by another interviewee in this group, also from mathematics. The finding highlights the presence of potential for AE in fields that are not

traditionally considered entrepreneurially-oriented, as ultimately emerged from the other two universities. This evidence will be discussed further in the next chapters, as it highlights that AE can be improved and fostered, provided that specific barriers are removed and/or mitigated.

7.4 Summary

The findings suggest a high degree of convergence across countries among the main drivers for AE, which are funding and resources for research, impact, interacting with people with a diverging background, and learning. The study has also revealed convergence regarding the main barriers, these being both symbolic such as those regarding the values and norms of science versus those of industry, as well as practical, such as lack of time, intense administrative issues around knowledge transfer processes and science commercialisation, and patchy support in some cases. The study has also shown that some issues are more salient in specific contexts. In Italy and in Australia academics pointed the light towards the weak industrialisation of the countries as one of the constraining factors, accompanied with a prevalent focus on fundamental science in Italy, and lack of entrepreneurial skills lamented especially in Australia, although emerged as an issue also from the Italians and in the U.K. This latter country appeared to be more advanced in terms of AE; however, a series of barriers such as the disciplinary field, or the type of research conducted, as well as weak support and how AE is formally recognised, also emerged from this country.

Overall it appeared that AE was conceived as a fruitful activity for the academic career, and also for a career outside university by some, but this openness towards it did not always entail embracing an entrepreneurial role. Some academics appeared to have maintained reluctant, distanced, or mixed positions towards it, as the possibility of being ‘academic and entrepreneur’ appeared to be a rather contentious process which only some ‘managed to

manage', by relying on specific influential factors, that for others were either lacking or dominated by others. Further considerations will be reported in the next chapter.

Chapter 8. Typologies of scientists

8.1 Work identity and boundaries of identity

The previous chapters have highlighted that a variety of drivers and constraining factors underpin AE. The findings also pointed out that the way academics conceive the possibility of involvement in entrepreneurial activities differed across participants. Looking at the interviewees' career interests, but especially how they conceived of themselves in relation to the academia-industry interplay, and what were their opinions regarding the changes in academia towards a more entrepreneurial orientation, some categories were identified. These were only briefly mentioned in previous chapters (Sections 7.1 to 7.3) where the focus was an overview of drivers and constraining factors for academics in relation to AE, to look for cross-country convergence and divergence. However, the patterns noticed signalled that among academics, while sharing some of the motivations, there is variety in the way their entrepreneurial involvement (or not) is experienced, which had much to do with their work-identity (Pratt, Rockmann and Kaufmann, 2006; Dutton, Roberts and Bednar, 2010). Such a finding appeared an interesting point for the study of academics' careers, as providing a link between AE and academics' careers that few previous studies have highlighted (e.g. Mallon, Duberley and Cohen, 2005; Duberley, Cohen and Leeson, 2007; Winter, 2009; Lam, 2010, 2011; Gulbrandsen, 2005; Smith, 2012; Ylijoki and Ursin, 2013; Meek and Wood, 2016; Ylijoki and Henriksson, 2017). A further look at the interplay between AE and academics' careers and work-identity may therefore continue a discourse that previous research as illuminated as fertile for the understanding of the 'micro-processes' underpinning AE (Balven *et al.*, 2018, p. 22).

In so doing, the study will adopt the concept of work identity to define the personal meanings people use to conceive of themselves at work (Dutton, Roberts and Bednar, 2010) and which derives from evaluations about their roles at work, personal attributions and group membership (Ashforth, Harrison and Corley, 2008). [20]

The other concept adopted is that of *boundary of identity* to refer to the 'identity-related boundary distinguishing the identity system from its environment' (Lile, 2015, p. 113, 2013). The latter could be constituted by 'external identity options' which might be perceived as threats to a core identity. 'Identity boundaries may be key to the relationship between knowing oneself and adjustment' (Ratner and Berman, 2016, p. 91). Identity is understood as a 'dynamic construct' (Lieff *et al.*, 2012, p. 208), which is influenced by cognitive, relational and contextual domains, and is therefore subject to change and transformation (ibid.; Ibarra, 1999; Pratt, Rockmann and Kaufmann, 2006).

Drawing on these concepts, this study explores academics' sense-making of their involvement in entrepreneurial activities (or non-involvement), if and how boundaries between organisations (academia and external organisations) and roles are perceived, and if being involved in entrepreneurial activities entails an identity, or better, boundary of identity transformation, as suggested by previous scholars.

The chapter reports some considerations on the factors and processes that appeared to have determined the interviewees' different positions and opinions towards AE; some of the discussions will continue in Chapter 9.

[20] Work identity differs from professional identity that refers to the 'type of work individuals do' (Caza and Creary, 2016, p. 5).

8.2 Typologies identified across countries

This chapter presents a typology of academics across the three countries analysed, describing the different types of identity management strategies they adopted when undergoing entrepreneurial activities. It is worth mentioning that participants sometimes fitted into more than one category, as they demonstrated characteristics of more than one group. This might be seen as reflecting tensions embedded in the discourse on the dynamics between science and business, as still 'contentious' (Cohen, Duberley and McAuley, 1999; Lam, 2010) as well as those of careers and people's sense making of them (e.g. Mallon, Duberley and Cohen, 2005; Jain, George and Maltarich, 2009). Acknowledging the potential overlaps, the following categories represent the broad patterns identified across countries.

Drawing on Mallon, Duberley and Cohen (2005), Duberley, Cohen and Leeson (2007), Winter (2009), Lam (2010, 2011), Gulbrandsen (2005), Smith (2012), Ylijoke and Ursin (2013) and Ylijoke and Henriksson (2017), seven categories of academics were inductively developed, based on how participants conceived of their career developing in future (career intentions, and prospects), career interests, and how they saw themselves in relation to the interplay academia–industry and external organisations more generally (including thus the public sector). A focus on both private and public is in line with the broad perspective on AE taken in the study, as explained in previous chapters.

The categories developed were labelled: 'Academic and entrepreneur' (Group 1); 'Open academics' (Group 2); 'Mixed' (Group 3); 'Distant/instrumental' (Group 4); 'Leavers' (Group 5); 'Curious' (Group 6), and 'Reluctant' (Group 6). Categories 1–5 include academics with entrepreneurial experiences, whereas 6 and 7 include those participants who in Chapter 7 were defined as 'non-entrepreneurial', as they did not have any entrepreneurial experience. The names of the categories were often created by adopting descriptions given

by the participants themselves. Tables 8.1 and 8.2 summarise the main barriers, constraining factors and identity strategies for each group.

Table 8.1. Typologies of scientists (Groups 1 to 4)

	Main motivations	**Main constrains**	**Opinions about AE**	**Boundaries of identity management and strategies**
Group 1 **'The academic and entrepreneur'**	Interest in translating research and science commercialisation Societal aims Interaction/intellectual stimulation Funding	Lack of time Practical issues (e.g.admin.) Differences between academia and industry Italy's low level of innovation Conflict of interest	Positive and interested in it Seen as a good change (overall, with some concerns on academic freedom) No role conflict	Adoption of an entrepreneurial role Roles layering
Group 2 **'The open academics'**	Applied focus in research Interaction/intellectual stimulation Societal aims Funding	Practical issues (A-I's different working styles and practices; bureaucracy) Lack of time Need of balance applied-basic res. Conflict of interest National context issues (in Australia and Italy) Skills and mind-sets (Italy) Need for balance applied basic research	AE integrated with research Complementary (Some concerns over balance between applied and basic science, and the need for university to remain place for learning)	Applied persona Openness
Group 3 **'The mixed'**	Societal aims Applied focus Intellectual stimulation Funding	Conflict of interest Threat to academic freedom AE as a 'imposed' Ethics Lack of entrepreneurial skills Differences Academia-Industry Lack of time (and other practical barriers)	Mixed: positive and negative Potential role conflict	Mixed identities, including old and new school in a tension

Table 8.2. Typologies of scientists (Groups 4 to 7)

	Motivations	**Constraining factors**	**Opinions about AE**	**Boundaries of identity management and strategies**
Group 4 **'The distant/instrumental'**	Funding (and resources for research) Societal aims Intellectual stimulation	Conflict with the research activity (and research community) Lack of time Lack of preparedness (Italy) National context' later orientations towards AE (Italy) Practical barriers	Potential role conflict	Distanced self Instrumental and Cynical views Organisational identification
Group 5 **'The leavers'**	Job opportunities outside university To enhance career also inside university (through funding and resources for research) Societal aims (especially Australia)	Lack of time Conflict with the research activity (Australia) Practical issues (Australia)	Mainly positive	Generally open, but also instrumental for career outside
Group 6 **'The curious'**	Benefit for career (impact) (U.K. especially) Societal aims News ideas (Australia)	Discipline Basic science focus Early career stage National context issues Training (especially Australia)	Not particularly knowledgeable about but not against	Generally traditional scientists with sense of openness underpinned by curiosity
Group 7 **'The reluctant'**	Funding Potential general opportunities (also of work outside university)	Discipline Focus on basic science National context (lower industrialisation) Early career stage (U.K., Australia)	Not interested Concerned of the potential conflict with their work and role	Traditional scientists Reluctance about AE and disinterest

8.2.1 The academic and entrepreneur

This category emerged to group those participants who expressed a general constructive attitude towards the possibility of involvement in entrepreneurial activities, and a particular interest in the translation of research into more 'tangible' outcomes.

Table 8.3. The academic and entrepreneur (Group 1)

B22	Medicine	M	Professor
B23	Engineering	M	Associate prof.
B8	Medicine	F	Research fellow
B6	Medicine	M	Professor
P2	Medicine	M	Professor
P17	Medicine	M	Lecturer/senior l
P18	Medicine	M	Professor
P25	Mathematics	M	Lecturer/senior l
A29	Earth sciences	M	Research fellow

These interviewees generally positively welcomed the entrepreneurial university, with some affirming that it should be even more incentivised. While sharing with other groups motivations such as the possibility to translate their research into societal beneficial outcomes, to make research more real-world oriented, as well as to gain funding, within Group 1 also emerged a genuine interest and attitude towards 'being entrepreneurial', a sense of curiosity for the *business side*, and enthusiasm for these activities, which could also provide intellectual stimulation and personal reward. These interviewees shared with all the other categories another theme: funding. They were looking at AE to gain resources for research, but this was not mentioned as the unique and most important driver.

While the research orientation (applied more than basic) had a role in shaping their perceptions towards AE, personal interests and skills also appeared to have helped. As mentioned in Chapter 7 (section 7.1) one interviewee, for instance, specified that he was *more able* in knowledge transfer activities than in doing pure research. Another, from the

U.K., mentioned that he had started in the recent years to develop an interest for 'business', and thus he engaged in further management and business studies, integrating his education in health studies with a business focus. One from Italy (also from medicine) expressed strong interest in the spin-off activity he was involved in, and a deep sense of frustration for the practical difficulties encountered. Another, also from medicine, mentioned being a generally curious person, and that these interactions with industrial partners were rather stimulating from different points of view, along with providing benefits for her research activity.

Other factors that seemed to have fostered an entrepreneurial orientation were support, recognition and seniority, with some divergencies across participants and countries. For example, two interviewees from the U.K. mentioned having been facilitated in their entrepreneurial activities by the collaborative environment they were working in, where everyone is 'moving towards the same objectives' – paraphrasing what was mentioned by one interview – or because of the presence of very supportive colleagues and assistants, as mentioned by another. Clear role division among team members seemed also to make the working environment more efficient. Good support from the environment was reported also by one interviewee from Italy, whereas another three, from the same university, instead reported more negative or nuanced opinions about support.

Regarding recognition for AE, three out of the four from the U.K. explained having benefitted career wise from their entrepreneurial activities[21]. In Italy, recognition did not emerge as a significant element among those in this group; only one interviewee talked about it, but in generic terms. A discussion on why therefore the presence of such entrepreneurial

[21] It must however be noted that two of these while having personally benefitted career wise also talked about a reward system in place as patchy, diverging across departments, and unclear. This is to say that negative narratives were also found among some of the 'academic and entrepreneur' and these profiles were not free from concerns and tensions.

profiles in Italy is proposed later. Seniority also appeared to have played a role on some of these interviewees' entrepreneurial behaviour. Five out of nine in this group were either professor or associate professors. In three cases in particular, two in the U.K. and one in Italy, being senior seemed to have favoured the possibility to establish connections outside academia, since as having established a position in academia they had the time to dedicate to expanding the range of activities in which they were involved, following personal interests in developing a product out of their research, and to engage in collateral business studies. These narratives particularly diverged from those of others, especially junior scholars – as reported in Chapter 7 – who talked about how they were mainly focusing on publications and being involved in entrepreneurial activities often competed for time with the research work, which is ultimately more important for career advancement in academia.

Being senior seemed also to have facilitated being 'entrepreneurial' thanks to the experience accumulated over the years, which helped overcome certain barriers, such as those related to potential conflicts of interests. It must be noted that many of the academics in this group were from medicine, four out of six were professors. This is an interesting finding, as the study, both from the quantitative and the qualitative analysis, signalled that health sciences in general are fields within which being entrepreneurial can be more challenging due to issues such as transparency and data diffusion versus industry's secrecy policies, and other ethical considerations that in human-oriented fields are particularly critical aspects. Interestingly, some of these themes were mentioned by some in this group, but as something that *'sometimes'* (B22) may happen. Compared to other interviewees from medicine, located in other groups (see for instance the 'mixed' or 'distant), those in this group while acknowledging these (and other) barriers, appeared to have developed strategies to overcome

them, also offering practical examples on how to overcome them, as reported in Chapter 7 (section 7.1) which appeared having been acquired through experience.

The propensity of these academics to be 'entrepreneurial' was probably due to the synergic effect of the variety of macro-meso-micro factors, the different combination of which may lead to a variety of, also unexpected, outcomes. An exemplar case is B8, who while from medicine, female, and not particularly senior in the university hierarchy – all of which emerged in this study as constraining factors – she was involved in entrepreneurial activities, and particularly enthusiastic about them. In her case, support and recognition (meso–level), strong personal interest and skills (micro), and a macro context which promoted certain practices (U.K. policies towards AE), promoted the modification of her core academic role–identity (Callero, 1985; Settles, 2004) to accommodate an additional role

It must also be noted that the majority in this group had contacts with both private and public sector, but when talking about specific entrepreneurial activities they often referred to the private, and generally they had experience in both hard and soft activities. Therefore, despite some studies having reported that soft types of entrepreneurial activities are more diffused among academics (e.g. D'Este and Patel, 2007; D'Este and Perkmann, 2011; Abreu and Grinevich, 2013, Balven *et al.*, 2018), which as mentioned by some interviewees later discussed were seen as more in line with their 'mind-sets' and skills, Group 1 shows that some academics may be involved in both, and without necessarily perceive a dissonance with their academic role, and identity. Similar considerations can be made regarding the types of sectors. This is not to say that differences among sectors were not perceived. As reported in Chapter 7, some interviewees talked about divergencies between academia and industry in terms of working styles, time scales, and goals, and they all generally stressed how they rather preferred working in academia than in industry, as the former allows

freedom to pursue intellectual interests and discovery[22]. Notwithstanding, they were prone to cross the boundaries of different organisations. In so doing they appeared to undergo a process of adaptation of *boundaries of identity* (Lile, 2013, 2015; Ratner and Berman, 2016) where the academic identity is modified to adjust to new demands, and roles (Kroger, 2003; Jain, George and Maltarich, 2009; Lam, 2010; Gulbrandsen, 2005; Smith, 2012; Meek and Wood, 2016). In particular, these academics seemed, as described by Jain, George and Maltarich (2009), to conserve their core academic identity, but developed a 'secondary commercial persona' (p. 923). They in fact appeared to wear 'different hats' (Ashforth, Kreiner and Fugate, 2000, p. 472; Mathias and Williams, 2017), with that of the entrepreneur added to that of the academic, but not fused. Both the roles coexisted, in a relatively balanced and integrated way, which is what particularly distinguished this group from others (see for instance the 'distant/instrumental'); yet, both roles maintained their presence. This is why the process of identity transformation appeared to take place in the form of *multiple role-identity layering* (Jain, George and Maltarich, 2009) in which 'pre-existing identities' (Lam, 2010, p. 331), in this case the academic one, did not disappear (see also Ylijoki and Henriksson, 2017). They each maintained their presence; the academic one actually preserved a dominance, or *salience* and *centrality* (Stryker, 1980; Serpe, 1982; Callero, 1985; Stryker and Settles, 2004). The study thus supports the findings of Mathias and Williams (2017) regarding the possibility for a person in a certain occupational role to hold 'several role identities' which 'might be nested within a single occupation that can lead to behaviours characteristic of other professions' (p. 911).

[22] Such a career goal was more nuanced in A29, likely to be due to his junior career stage, as he was contemplating potential career change in future. Considering his entrepreneurial involvement and interest in entrepreneurship this participant was included in Group 1 anyway, acknowledging for the potential overlap across typologies.

From a comparative perspective, it is important to note that this typology of academics was mostly found in the U.K. and in Italy. Along with the factors reported above, such as seniority, personal interests, and skills, the presence in the U.K. of this typology could also be linked to the effect of the macro context, where the policies implemented in the country (see Chapter 3) towards AE, having a longer tradition compared to the other two countries (and in Europe in general) have had more time to diffuse an entrepreneurial culture. It must also be noted that while the majority from the UK in this group mentioned to have benefitted career-wise from their entrepreneurial activities, some interviewees also reported weaknesses in the rewarding system. It seemed that while being more developed than in other countries, also in the U.K. gaps in the implementation of the 'third mission' persist, as ultimately emerged from other groups.

Regarding Italy, the scenario is somewhat peculiar. AE, as reported in Chapter 3, has diffused later in this country compared to others; nevertheless, some participants showed a similar entrepreneurial attitude to some of the British interviewees. Along with elements such as seniority and support, as reported earlier (with however contrasting evidence especially regarding the support received), the Italians classified in this group shared a significant feature: they were all males. This could be due to the fact that the samples in this study were generally dominated by males – ultimately reflecting the distribution of sexes in the STEM disciplines – and thus this might be a numerical-statistical result. However, the findings also seemed to suggest other aspects. As reported in Chapter 5, being male in Italy emerged as a significant predictor of AE. Effects of culture may have played a role in shaping the process of identity transformation among some of the interviewees. This topic will be discussed further in Chapter 9.

Another influential factor appeared to be research orientation. P25 explained that since his research had an applied focus, he and his group were often involved in collaborations with external organisations. This led to the development of a spin-off, regarding which he showed a very positive, genuine and strong interest, describing it as an outcome that could benefit the university in general and therefore should be more incentivised. The applied focus of research fostered an entrepreneurial behaviour among academics from maths, which, as seen in other parts of this work, tend to not be entrepreneurial, especially if coming from more fundamental sciences (see Group 6). Amore applied orientation such as this may have also helped overcome barriers such as the relatively junior career stage position of this academic, another typical barrier for AE, as also further discussed later

Notably, only one Australian was included in this group. As explained later, many appeared more 'open' rather than 'entrepreneurial'; furthermore, the one included in this group while extensively involved in entrepreneurial activities and generally constructive about it, was also somewhat 'mixed' in his opinions, which perhaps reflect that in Australia the change towards AE has been an unstable process, as explained in Chapter 3, also in terms of the formal recognition for it. This interviewee explained, in fact, that AE is a stimulating and interesting activity, but publications are still a dominant promotion criterion in academia therefore extensive engagement in other activities may be detrimental to career advancement.

The importance of the meso level (the university environment) in promoting certain behaviour will be discussed in the following sections, but especially in Chapter 9.

8.2.2 The open academics

This was another sub-group identified among those who expressed a positive opinion towards the possibility of involvement in entrepreneurial activities. Their main drivers for

AE were the possibility to give research an applied focus, to address 'real world' problems, along with gaining resources for research, which also meant new ideas. While coming from different disciplines, the majority in each country (as shown in Table 8.4) was from engineering.

Table 8.4. The open academics (Group 2)

B2	Physics	M	Research fellow
B5	Engineering	M	Professor
B7	Medicine	M	Professor
B19	Engineering	M	Associate prof.
B21	Geography	F	Research fellow
A3	Engineering	M	Research fellow
A5	Engineering	M	Professor
A7	Computer s.	M	Professor
A8	Medicine	M	Research fellow
A9	Computer s.	M	Research fellow
A10	Engineering	M	Professor
A11	Engineering	M	Lecturer/senior l
A13	Engineering	M	Professor
A14	Engineering	M	Post-doc
A15	Engineering	F	Research Fellow
A17	Engineering	F	Professor
A18	Engineering	M	Professor
A20	Engineering	M	Professor
A22	Earth sciences	M	Lecturer/senior l
A23	Engineering	M	Post-doc
A24	Earth sciences	M	Associate prof.
A25	Engineering	M	Research fellow
A27	Earth sciences	M	Research fellow
A28	Earth sciences	M	Professor
P1	Medicine	F	Associate prof.
P4	Pharmacy	F	Associate prof.
P5	Pharmacy	F	Associate prof.
P6	Engineering	M	Associate prof.
P7	Engineering	M	Professor
P8	Engineering	M	Associate prof.
P10	Physics	M	Professor
P11	Biology	M	Associate prof.
P13	Engineering	M	Lecturer/senior l
P16	Engineering	M	Lecturer/senior l
P19	Earth sciences	M	Professor
P20	Computer s.	M	Associate prof.
P22	Computer s.	F	Associate prof.
P24	Engineering	M	Professor

What clearly emerged from the study was that in some fields the applied orientation of the research conducted makes AE a *natural* process. This is also why the majority of the interviewees in this group, which is also the largest, was also evocatively labelled 'the applied scientists' as discussions about 'application of research' permeated their interviews. Many, as reported in Chapter 7, explained that in their field AE 'has always been the case' and this is why more than 'entrepreneurial' they appeared indeed *open* to it, but as a natural result of their discipline, rather than for an interest in the business side, as some in Group 1 for example. Those in Group 2 appeared to already possess an *applied persona* in their 'central, valued, and salient [professional] self' (Ashforth and Humphrey, 1993, p. 99) therefore, they did not need to accommodate the boundaries of their identity to include an entrepreneurial role, or a 'secondary commercial persona' (Jain, George and Maltarich, 2009, p. 923). The 'applied-self' enabled them to perceive a resonance between being involved in knowledge transfer activities and their academic role at university, therefore they did not appear to perceive an identity misalignment (Meek and Wood, 2016, p. 1093) as other scientists, discussed later. This evidence suggests that the entrepreneurial university has not always necessarily implied a change. In some areas, academia-industry linkages and forms of knowledge transfer have always been present (e.g. Etzkowitz, 2003) and these may provide bilateral enrichment (Cohen, Duberley and McAuley, 1999, 2001; Godin and Gingras, 2000; Duberley, Cohen and Leeson, 2007; Van Looy, Callaert and Debackere, 2006; Azoulay, Ding and Stuart, 2007) and complementarity (Bercovitz and Feldman, 2008; Agrawal and Henderson, 2002), as ultimately affirmed by some interviewees. The change perhaps entails more the emphasis that such a trend has received in recent years, accompanied by an increased support received, as suggested by some in this group, and its diffusion in less 'naturally transferable' disciplines.

From a comparative perspective the abundance of Australians within this category along with being the results of a good number of interviewees from engineering, could be linked to the national context's peculiar features. As discussed in Chapter 7, some of the Australians were working on issues linked to environment, such as the fish supply chain, and/or on issues affecting remote geographical areas which were triggering applied-oriented research works. The country, thus, has an effect on AE by shaping the research focus – as it provides certain needs to be addressed– influencing, in turn, the propensity of –at least some– academics to be more 'real world oriented'. As will be discussed for Group 4, it may also influence on the preference for certain types of industries and sectors.

Regarding the Italians, some mentioned how the change towards AE was in progress; albeit, in some disciplines collaborations with external organisations were considered the normal practice, these only recently had started to be highly regarded. One participant in particular specified that his collaborations with industry enabled him to increase his reputation and profile as a researcher. As he also reported, other colleagues had had a similar experience, which was likely to be the effect of a diffusion of behaviours which, since being having praised and rewarded nowadays, were likely to be emulated. The study shows the effect of the macro-meso-level elements such as initiatives and policies towards AE[23], and peer recognition. As reported in other sections of this work, scholars (Bercovitz and Feldman, 2008; Tartari, Salter and D'Este, 2014; Moog *et al.*, 2015) maintain that peers' involvement in entrepreneurial activities has the power to shape academics' involvement in entrepreneurial activities for processes of social comparisons. In Chapter 9 considerations on how these social processes may be leveraged to diffuse an entrepreneurial culture and behaviours especially among junior scholars will be made. It must also be noted how these

[23] Although in Italy reward for AE was still in the early stages, often more informal than formal.

considerations about how AE was perceived in certain fields and departments significantly differ from what was reported by other interviewees in other disciplines, especially physics and medicine, as mentioned in previous chapters, and later discussed according to other typologies. Such diverging narratives led to the idea that scientific communities act as *tribes* which legitimise (or not) certain behaviours.

Another note about the Italians is that one participant made a clear distinction between types of entrepreneurial activities, where being 'open' referred to soft activities, such as joint research collaborations or contract research, seen in line with the academic identity, and also natural in certain disciplines. However, she did not feel she had the skills and attitude required to take part in hard activities. The finding, signals divergences in attitude among some academics, where some feel more 'entrepreneurial' and interested in the 'business side', and others are 'open' but as long as it entails only certain activities. Such a consideration was explicitly mentioned by one participant, but it was not unique to her. It must be noted that while those in Group 1 had experience in both hard and soft activities, those in Group 2 were more heterogeneous in terms of types of activities in which they were involved with some only reporting soft activities. This confirms findings from previous studies about the diffusion and preference among academics of informal activities more than formal (e.g. Abreu and Grinevich, 2013, 2017), which perhaps are linked to different mechanisms behind it, including a certain mind-set, as specified by the interviewee discussed above. Further considerations will be reported in Chapters 9 and 10.

Overall, what can be concluded from the 'open' academics is that AE had indeed spread across countries, and it is more supported nowadays. However, it is neither a completely new phenomenon, nor does it always involve academics transforming their working routines, objectives, and ultimately work-identity. The increased emphasis on academia-industry

linkages has perhaps augmented the awareness of AE, and it has changed some dynamics; however, not all the academics seem to have perceived what Winter (2009) calls an 'identity schism' (p. 121). When the professional identity (e.g. Nixon, 1996; Trede, Macklin and Bridges, 2012; Caza and Creary, 2016) already includes some of the values and norms nowadays promoted, there is no need, at the micro-level, to make profound adjustment. Alignment of interests and norms across 'contexts' shape the perceptions of the boundaries between organisations and roles, in this case, perceived as permeable (e.g. Rodrigues, Guest and Budjanovcanin, 2016).

This is not to say that these interviewees did not perceive boundaries between academia and industry. As reported in Chapter 7 (see also Table 8.1), some talked about the need to maintain a balance between applied and basic research, or they mentioned practical barriers in AE, and they often talked about why they preferred to work at university, indulging in conversations about academic freedom, learning, and discovery, and the differences between academia and industry for working styles, mind-sets, and goals. Yet, these aspects were not seen as hindering their ability to cross organisational boundaries, which in this case did not require to significatively modify the boundaries of their identity. Along with having an applied research focus, facilitating factors appeared to be the ability of *'building a mutual agreement'* (B2), supported by the university; the majority of the interviewees in the U.K. and Australia in this group mentioned specific forms of support, as specialised offices at university, or support received at department level, in the form of dedicated staff. In Italy instead support was more rarely generally perceived; it seemed that in departments where AE is more historically diffused –which tend to be those of specific disciplines such as engineering for example– academics manage to connect with external organisations, without necessarily being greatly supported. Only a minority talked about a significant helping

environment, with others mentioning that it was either lacking, to be incremented; interestingly, few interviewees mentioned that AE in some cases is hindered instead of promoted, since seen as going against a certain traditional, pure science orientation within academia.

Recognition for AE was more of an ambiguous theme also in the U.K. and Australia. In the former, while generally present, it was criticised as weak by some interviewees, or linked to specific outstanding activities, i.e those which bring a significant amount of income to university (as reported in Chapter 7); this form of recognition however may fail to capture the various forms of entrepreneurial activities academics engage in. Recognition and reward for AE was also contentious theme in Australia, where it was described as either lacking or in progress, with unclarity and tensions to be managed regarding the activities that really make an impact upon their career progression. In Italy, it was even clearer that AE was behind in its formalisation, with the majority reporting that career progression mainly relies on publications, and AE indeed helps the research activity, but does not have a significant weight for career advancement. In some departments AE is nowadays 'well regarded', more than before, but a general entrepreneurial culture appeared to be lagging behind.

These differences across countries signal the role of the macro and meso contexts over AE, and how diverging diffusion of initiatives towards AE are shaping how this is taking place. Similarities in themes, on the other hand, signal that despite the divergent diffusion of AE across countries, some improvements have to be made also in those more 'entrepreneurially advanced'. While for academics in the applied-oriented fields, lack of support or recognition may constitute less strong barriers for AE, in other fields, they incremented the difficulties and the weight of other obstacles.

Finally, another aspect worth mentioning regarding some of the interviewees in this group relates to their working experience outside university. Some[24] in all the three countries, mentioned to have worked as a consultant, teacher, or in industry, before, during or after embarking into the academic pathway. Having experienced the industrial environment, for some, but also generally having had boundary-crossing experiences (across sectors, organisations, and employment conditions) may have fostered *boundaryless* perceptions of academia and external organisations. Studies confirm that non–academic work experience is a positive predictor of AE (Tartari, Salter and D'Este, 2014; Gulbrandsen and Thune, 2017). Interestingly, one interviewee in particular affirmed that he somewhat escaped from industry, and that he was rather enjoying the academic career more. This 'university refugee' ultimately corroborated what was mentioned by many others from various typologies, who while working with industry and external organisations in general, affirmed that they strongly preferred working at university. As will be discussed also in other parts of this work, the academic career was a strong goal for the majority of the interviewees, experienced by some as almost a vocation, and which thus appeared to determine their approach towards AE; that is, they were looking at it from their academic lens first, in terms of how it could help their work as researcher, and to what extent AE was in line or not with their academic identity.

8.2.3 The mixed

This category includes academics who, as one participant said, had *'mixed'* (A4) opinions about AE.

[24] Around half of those from the UK and Australia, and less in Italy. The types of jobs they had varied, from working with specific industries, such as British Telecom, to being an English or a skiing teacher abroad, passing from advertising, and with positions in the private and/or the public sector. While it could be argued that specific work in industry may have been more helpful than others in fostering a sense of linkage between academia and industry, having had general, alternative work experiences outside academia may have helped general perceptions of *boundarylessness* across sector. This is why a broad focus was maintained when looking at the different careers and jobs the interviewees had.

Table 8.5. The mixed (Group 3)

B4	Medicine	M	Lecturer
B12	Geography	F	Lecturer
B15	Medicine	M	Professor
B16	Pharmacy	F	Lecturer
B17	Biosciences	M	Lecturer
A2	Medicine	F	Associate professor
A4	Computer science	M	Associate professor
A21	Physics	M	Post-doc
A26	Engineering	M	Research fellow

These were academics with experience with the private and/or the public sector, interested in the applied side of research and translating it into beneficial societal outcomes, and for whom collaborating with external organisations might represent a stimulating learning experience, provide career-related benefits, and also be *'fun'* (A4). However, they also expressed strong concerns especially in relation to the potential conflicts of interest between 'science and business' owing to their divergent scopes and values, and the need to maintain balance between basic and applied science, which appeared to be underpinned by worries about being privately funded which while considered necessary nowadays was also seen as *'dangerous'* (A2).

Some potentially illuminating aspects emerge from this group. First, as shown in Table 8.5, four out of the nine in this group were in health sciences. Their narratives confirm that disciplinary membership is influential as strong concerns often related to ethical issues that might arise when working with the private sector owing to diverging scopes, values and norms. The societal aims often underlying their work, as academics in 'human oriented' disciplines, appear to be challenged by the industry's typical profit focus, with related issues to data sharing. Notably, some interviewees in this group had had experience of the private sector, but expressed strong concerns when talking about it. The evidence supports the idea

that academic discipline influences perceptions of the boundaries of certain organisations in a process that passes through professional norms, ethics and values (Ylijoki and Henriksson, 2017) which in certain areas are still highly relevant (e.g. Dasgupta and David, 1994; Nelson, 2001; Crespo and Dridi, 2007; Ambos *et al.*, 2008; Campbell *et al*., 2002; Henkel, 2010; Musselin, 2010; Lam and Campos, 2015; Ylijoki and Henriksson, 2017). Since this emerged as a recurrent aspect, further discussions will be reported in relation to Group 4, where the role of discipline as a negative predictor was even more evident.

Other factors that appeared to have fostered such mixed perceptions were career stage, promotion criteria, support and training. Notably, these participants were generally at the intermediate or junior stages of their careers. The narratives confirmed that career-related issues affected some of these interviewees' opinions of and involvement in AE. A sense of precariousness and evaluations of career changes were expressed by some of the lecturers in both the U.K. and Australia, as well as by post-docs in the latter. Being at the middle or junior career stages, they were afraid that they might not be able to secure an academic career, and were evaluating what was nowadays considered 'good' to build an academic career. However, such evaluation was not supported by the environment, as mixed messages were sent. In the U.K., some interviewees lamented a weak system for reward in relation to AE and they explained that publications were still more important promotion criteria, therefore AE was competing for time with research, becoming an *'extra'* (B17); or, as earlier introduced, some interviewees explained that recognition was given only in relation to particularly outstanding activities. In Australia recognition for AE was described as a change in progress, as impact had been very recently introduced in academia, and academics now have to deal with this transformation for which they were not prepared (a discourse on training is later reported), with some also lamenting a lack of formalisation of such a change.

Promotion criteria but also clarity about them can be considered important tools in legitimising behaviours (Gulbrandsen, 2005; Dany, Louvel and Vallette, 2011), as vagueness and ambiguity instead create tensions at the micro level, manifested in mixed opinions and positions (see also Hakal, 2009; Laudel, Bielick and Gläser, 2018). This is particularly salient at certain career stages as academics make evaluations on how to prioritise their work and activities towards career goals, therefore in need of clear indications.

Another useful insight that may explain these mixed positions is furnished by the experiences of two participants in this group, both from the U.K. Their interviews were rich in details of the difficulties encountered in their work with external organisations, with particular reference to the private sector. Divergencies in scopes, accompanied by differing working styles and other practical issues such as poor project management, had made some of their entrepreneurial ventures particularly challenging and in some cases unsuccessful. These experiences may have fostered a sense of bitterness toward AE, enhancing perceptions of difficult interactions between academia and industry, and thus reinforcing mixed opinions, with a support which while formally present was considered not sufficient, and to be increased, as mentioned in the U.K., but also Australia.

Support also meant training. Both in the U.K. and especially Australia some academics shared that they felt they did not have the adequate skills and mind-sets to be entrepreneurial, therefore were not prepared for this change, which interestingly was perceived by some, both in the U.K. and Australia, as *imposed* upon them. In the latter context some specified that a *'one size fits all'* (A4) does not take into account individual variation among academics, specifically regarding the presence of both traditional and entrepreneurial attitudes,

ultimately echoing what was said by one participants in the U.K. about not feeling as a *'do-er'* but more of a *'thinker'* (B17).

The study, thus, suggests three points. First, boundaries are still perceived between different types of organisations, and these are not only physical, but also psychological, as experienced by individuals themselves (Sullivan and Arthur, 2006; Dany, Louvel and Vallette, 2011; Rodrigues, Guest and Budjanovcanin, 2016). This depends on individuals' values and motivations (Rodrigues, Guest and Budjanovcanin, 2016), as well as how the individual feels 'equipped' for the cross. At the same time, the study shows that boundaries can be overcome, at least to some extent. These were ultimately academics with entrepreneurial experience, although with heterogenous degrees of involvement among the interviewees in this group, with some with a low experience, and limited to certain activities (soft), and generally lower than others in Group 1 or 2. The study thus suggests that the university may play a key role in shaping academics' entrepreneurial behaviour by enabling more positive entrepreneurial experiences, which in turn may foster perceptions of communicability, fit and alignment between academic work and roles with entrepreneurship; thus, promoting perceptions of permeability of organisational boundaries (Rodrigues, Guest and Budjanovcanin, 2016). According to Lieff *et al.* (2012, p. 213) 'work environments are thus an essential component in identity development as they have the potential to either impede or enable its growth'; support may allow people 'to practice their new identities' (ibid.).

The boundaries of identity management these academics went through differed from the role layering of those in Group 1; the scenario was here rather contentious, owing to 'mixed' opinions, tensions and contradictions that seemed to mirror the difficult dynamics between 'science and business' (e.g. Cohen, Duberley and McAuley, 1999; Lam, 2010), which in this

group emerged in their complex coexistence. It is difficult to determine a specific type of identity transformation for this group because of their heterogeneity. Some appeared to strongly retain their primary academic identity and were not particularly willing to modify it. Others talked about themselves as being *'in the middle'* (A2) between academia and industry, but with strong tensions to manage. In this respect, Gulbrandsen (2005, p. 4) talks about 'liminality' as a condition of certain scientists when involved in entrepreneurial activities. He maintains that in order to deal with tensions arising from divergent tasks, such as academic and entrepreneurial, some scientists adopt an 'in-between' position (Gulbrandsen, 2005, p. 2), which allows them to dissociate from the side with which they feel uncomfortable (industry); yet in so doing, they also distance themselves from academia. However, this categorisation does not seem to explain the positions of the 'mixed', who described themselves as 'academics' when explaining their career choices and orientations. They were not actively distancing themselves from academia, nor was it a consequence of their involvement in entrepreneurial activities. Therefore, they were not 'liminal' (ibid.), but perhaps resembled more what Lam (2010, p. 317) describes as 'hybrids', who 'appear to adopt contradictory positions and express paradoxical views about the nature of the relationship between science and business'.

From a comparative perspective, it must be noted that this group did not include interviewees from Italy. Although some might potentially have been included, such strong mixed profiles were less evident among Italians who, interestingly, tended to be distributed in Group 1, which conversely contained few from Australia, and in the middle categories (for instance, Group 2), as well as in more extreme groups such as Group 7. The absence of Italians in this group may be a result of later diffusion of AE policy in Italy compared to the U.K. and Australia, and thus academics may tend to exhibit entrepreneurial behaviours owing to

personal interest or seniority (like some in Group 1) or their discipline (like some in Groups 1 and 2), or may not be entrepreneurial (as in Groups 6 and 7) but are in less contradictory environments. Furthermore, as explained later for other groups, traditional or *'romantic'* (P3) career pathways may still be scripts circulating among some Italian scientists, who pictured themselves as either 'here' in academia or 'there' outside. This may also explain the less 'mixed' and contentious profiles among Italians, who tend to be dichotomic.

These considerations are corroborated by the presence of Australians in this group, which may be linked to tensions relating to the difficult implementation of the concept of impact in their universities, as reported in Chapter 3 and in other parts of this work. As mentioned by some in this group, while the changes were in progress, ambiguous and unclear messages from the 'top' regarding AE may have created tensions at the micro level, which were clearly reflected in academics' mixed opinions.

This study thus contributes to the literature by showing dynamic movements between macro-meso- and micro-level factors influencing AE, reinforcing the importance to analysing the phenomenon from a multi-dimensional perspective (e.g. Glenna *et al.*, 2011; Grimaldi *et al*., 2011; Lam, 2010; Guerrero and Urbano, 2012; Urbano and Guerrero, 2014; Kalar and Antoncic, 2015; Balven *et al*., 2018). The main point to be drawn from this group is that discipline, career stage, promotion criteria, training and support received are important influential factors for AE, as further discussed in Chapter 9.

8.2.4 The distant/instrumental

Table 8.6. The distant/instrumental (Group 4)

B9	Physics	M	Research fellow
B10	Engineering	M	Lecturer
B13	Physics	M	Professor
A1	Medicine	F	Associate professor
A30	Biosciences	M	Associate professor
P3	Earth sciences	F	Lecturer/senior lecturer
P12	Earth sciences	M	Lecturer/senior lecturer
P23	Medicine	M	Professor

In all three countries, a group of participants appeared to have developed a distant/instrumental view of AE which was described as useful for research purposes, with some particularly stressing on research income and general resources for research as the *main* drivers for their involvement in entrepreneurial activities, but towards which they also appeared concerned and critical. This was especially because of the potential conflicts of interests, particularly if working with the private sector (for those in medicine but also in earth sciences), but also because the collaborations with industry tend to be less 'scientific', and very time consuming and complex, and if not successful in the end they constitute a waste of time. Therefore, AE must be carefully approached, looking at the actual benefit it may bring research-wise, but academics should dedicate it only a limited amount of time, as it is ultimately not their main role, which instead is knowledge production, and diffusion for societal more than commercial scopes, as was the prevailing opinion in this group.

Among the factors that seemed to have shaped such perceptions were issues related to the discipline and research orientation, as well as the macro and meso context. For instance, belonging to physics meant that not only the research work tends to be more basic science-oriented, but there is also a general culture in their scientific community characterised by

negative perceptions regarding AE, seen as profit making activity. Therefore, framing it as 'instrumental' for their research was a way to legitimise it. Similar considerations appeared to apply to the Italian and the Australian from medicine who underlined the potential significant conflicts of interest rising from working in collaborations with the private sector, for values and objectives. The Italian was the one who, as reported earlier, stressed on how the main role of academics is not AE, and they should not spend extensive time on it. Ylijoki and Henriksson (2017, p. 1298) talk about the 'discipline-centred notion of an academic career' where stories of 'what we do here' are shared within the 'core territory' delineated by the discipline. Those who want 'to stay within the core territory' must 'respect the tribal values' (ibid.). In some disciplines, conflicts of interests for diverging values were for some participants salient boundaries, which made some of them distance themselves from the business side to avoid the industry's control over the research, but ultimately their academic activities, and to be in line with the behaviours promoted and requested to be part of a specific 'tribe'. Terry, Hogg and White (1999) affirm that when a person strongly identifies with a particular group the norms of that group become strong elements influencing that individual's behaviour. According to Cohen and Mallon (2001, p. 63), 'occupational communities will have their own scripts, which will provide a kind of scaffolding (both ideological and material) with which individuals negotiate in enacting their careers'. This study shows the power that group membership may exert on academics the norms of which are acquired through the intense training and socialisation process that academics undergo in developing their careers (Van Maanen and Schein, 1979; Meek and Wood, 2016) becoming 'inextricably intertwined with their identity' (Jain, George and Malatarich, 2009, p. 923; for professional identity formation, see also Trede, Macklin and Bridges, 2012).

Along with the discipline, conflicts of interests also related to the specific type of research conducted. This applied to the Italian from earth sciences, whose industrial contacts were sometimes with private oil companies as well as to the two Australians for whom the typical profit-orientation of industry was seen as contrasting with their societal-oriented research, often involving the public sector. The study thus shows that the discipline and the type of research conducted are significant elements in shaping academics' tendencies towards AE. This is not to say that they necessarily hinder it. These were academics ultimately with entrepreneurial experience. What they were concerned about was a particular concept of entrepreneurship, and the types of sectors with which they were to different extent comfortable to engage. [25]

Other factors that seemed to have shaped these interviewees' distant position were socio-cultural issues; in Italy, AE was described as a rather recent change, with academics still not understanding its dynamics and what it may entail, probably also due to a promotion criteria system that mainly reward publications, where instead AE usually does not have a significant weight for career advancement. This may have emphasised perceptions of the conflict of interest and diverging values between academia and industry, by also fostering *'romantic'* views (P3) over career pathways in academia, still conceived in more traditional terms. The study thus shows that the national context may have a significant impact upon AE by promoting (or otherwise) certain initiatives towards AE, and academics' behaviours and ultimately concepts of their career and role. The national context appeared to have also had an effect in Australia, in this case mediated by the research, whereby providing certain research foci (linked to Australia's specific issues such as environmental conservation or

[25] A discourse on how to promote entrepreneurship in certain areas – for instance looking at forms of social entrepreneurship – is proposed Chapters 9 and 10.

aboriginal communities, as reported in Chapter 7) was impacting on academics' perceptions of the values in their research work, their role as academics, and thus how and if to approach entrepreneurship, according to what this may entail.

Evidence also show the role of the meso-context. The perceived lack of recognition for AE in Italy, despite changes in this direction being actually promoted by governments (as reported in Chapter 3), signals that at meso level universities are not diffusing the message in the correct and most efficient manner. This entails also the support provided. As reported in Chapter 7, in Italy but also in the U.K. participants shared difficulties in connecting with external organisations, poor project management (examples reported from the U.K. in this group), along with general lack of time, and lack of entrepreneurial skills. On all these aspects universities may have a significant role. As will be further discussed in the next chapters, revising promotion criteria, as well as academics' workload, while also providing adequate support and training may significantly contribute to reduce the *distance* toward AE taken by some interviewees.

Studies show that distancing oneself is a mechanism of self-protection from perceived threats and stressors (e.g. Berzonsky, 1992; Jaremka *et al.*, 2011; Verduyn *et al.*, 2012; Weiss and Freund, 2012). The *distance* adopted appeared in fact as a strategy to protect their core, salient (Callero, 1985; Settles, 2004) academic identity from the intrusion of other, dissonant, roles; that is, a mechanism enacted to reduce the identity misalignment perceived (Meek and Wood, 2016) and to mitigate the experienced dissonance (Festinger, 1957; Settles, 2004). Such a strategy differs from the 'secondary commercial persona', as for those in Group 1, neither is 'an applied self' as for those in Group 2, nor a 'hybrid identity' (Lam, 2010), which includes 'a bit of both' as in Group 3, or a *liminal* position (Gulbrandsen, 2005), as ultimately those in this group reinforced their membership to their profession,

scientific community, and/or organisation. The instead developed a *'distanced self'* sustained by mechanisms such as cynicism, physical distance (by only dedicating a small amount of time to AE) or by the reinforcement of group membership (such as the scientific community) but also the profession and/or the organisation. One Australian and one Italian, as reported in Chapter 7, particularly stressed on their status as 'university employee'. Such process of organisational identification (Mael and Ashforth, 1992; Whetten, 2006; Ashforth, Harrison and Corley, 2008) appeared as a strategy to define the boundaries of territories which provide scripts of legitimate behaviours. The mechanism was enacted to protect their academic identity from a world –the *business side* – which appeared as threatening. Studies confirm these as self-protecting strategies. For instance, organisational studies have reported that employees use cynicism to distance themselves from normative pressures with which they do not agree (Fleming and Sturdy, 2009). Realistic conflict theory suggests that in-group identification is enacted when an out-group threat is perceived (LeVine and Campbell, 1972, cited in Howard, 2000).

Interestingly, one interviewee in this group (P12), in exploring his position at the academia–industry interface and his willingness to be open to the 'external world', questioned why the situation should be looked at as 'academics collaborating with industry', and not vice versa. In so doing, he was questioning which partner should open the doors, underlining the importance of making industry more willing to move toward academia. Leaving the Ivory Tower appeared to be seen by some as an intense boundary-crossing experience that might significantly challenge the boundaries of identity and was thus suggesting that the boundary crossing might be undertaken by industrial partners, who might perhaps align more with the university ethos. Considerations on how to better promote AE are reported in Chapter 10.

From a comparative perspective, the multinational nature of this group provides evidence regarding the presence in AE of overarching barriers that are discipline/profession-specific entailing norms, values and working practices of specific disciplines which act as tribes which define roles. The latter are also influenced by the organisation itself towards which some academics appeared to turn, to find a legitimisation of certain behaviours.

Similarities in themes regarding weak support in the U.K. and Italy also reinforce the idea of the role of the meso-context in shaping academics' perceptions of AE, which although diffused at a different chronological order, appear to also present gaps in environments such as the U.K. where there is a longer tradition.

The findings from this group also signal the role of the national context in shaping academics' perceptions of entrepreneurship, by providing specific societal scopes to be addressed, but also by promoting (or not) specific initiatives. In turn, these will be enacted at the micro-level if they found a fertile ground promoted by the meso-context, which may entail providing adequate support, but also clarity on promotion criteria.

8.2.5 The leavers

This category comprises the very few interviewees who mentioned a potential move out of academia. They were found only in the U.K. and Australia, as shown in Table 8.7. In the latter context, two further interviewees (A27 and A29) might have been included in this category, but since they also showed other key features, they are included in other groups.

Table 8.7. The leavers (Group 5)

B3	Medicine	M	Research fellow
A6	Bioscience	M	Research fellow
A12	Engineering	F	Research fellow

Those in this category were early career researchers who mentioned that they were thinking of leaving academia and working in industry (one from the U.K. and one from Australia) or becoming an independent consultant (another Australian). For the first two, academia was their preferred career choice, but was seen as either incommensurate with their life choices, or unlikely to succeed in the long term, given scarce job opportunities nowadays. Industry was thus seen as an alternative employer. As this study does not focus on scientists' careers *per se*, this discussion is not further expanded. Rather, this study focuses on how such career prospects are linked with AE. In this respect, the findings show that these academics used AE strategically to foster potential careers outside. In this sense, they were using AE instrumentally, like those in Group 4, but for those in Group 5 not for an academic career but for a career change outside university. One interviewee stated that in relation to an academic career, AE might actually interfere with research activities.

Interestingly, this study shows that AE may have a dual and sometimes contrasting relationship with academics' work, depending on their career prospects, in turn linked with elements such as career stage (micro level) and promotion criteria. As reported by the interviewee from Australia just mentioned, since publications are still the dominant factor in career advancement, engaging extensively in other activities may be detrimental to one's academic career, especially if at an early career stages. This participant also mentioned that the criteria had recently begun to change, and spoke of ambiguity, lack of clarity, academics' unpreparedness to report on their 'impact', and policies changing and re-changing over time. Thus, corroborating previously made considerations about the importance of meso-level organisational practices in shaping academics' entrepreneurial behaviour (e.g. Siegel, Veugelers and Wright, 2007; Balven *et al.*, 2018).

Another interesting point is that these two interviewees, while sharing a similar rationale for involvement in AE, and especially an instrumental view on a career change, they had differing opinions on AE. The U.K. interviewee expressed a more positive view, whereas the Australian was more critical. Thus, academics may have divergent opinions of AE, yet share similar drivers, or in this case 'uses'. The intricate dynamics between motivations, constraining factors and academics' opinions of AE are further discussed in Chapters 9–10.

Also of interest in this group was the case of the interviewee from Australia who mentioned a potential career change in order to be an external consultant. Although he liked the academic environment, he was planning to continue his consulting activities outside university. The latter was making AE difficult, especially in terms of administrative and practical issues more generally. However, he also mentioned that coming from an academic context provided him with an advantage for his consulting work in terms of *'reputation'* (A9).

Three main points thus arise from this group. First, the presence of entrepreneurial tendencies among academics, including the juniors, and those working on very socially-oriented research, such as environmental issues, as for A6. This may provide further support to the idea of expanding the association of 'entrepreneurship' from the private and business sector to 'social entrepreneurship' (Dees, 1998; Dees and Anderson, 2006; Petrella and Richez-Battesti, 2014), which may align better with some academics' interests, as further argued in Chapter 10.

Second, evidence highlights that the university, at the meso level, may be both a facilitating and a constraining factor. This suggests the need for improvements regarding the support provided by the university for AE.

Third, what can be drawn from the 'Leavers' is that AE may also serve career-related aims outside academia. The study shows that AE is indeed linked with academics' career prospects, but not necessarily nor exclusively in terms of careers in academia. This confirms other authors' call to look at many different domains including private life, to understand how careers unfold (Mallon, Duberley and Cohen, 2005; Duberley, Mallon and Cohen, 2006; Duberley, Cohen and Leeson, 2007; Clarke, Knights and Jarvis, 2012; McAlpine, 2012; Ylijoki and Henriksson; 2017).

From a comparative perspective, the absence of interviewees from Italy in this group may be explained as the result of Italy's rigid labour market, where mobility across sectors was described as something *'for other countries'* (P24). This may have contributed to the traditional career views shared by some from Italy. Evidence thus, shows that the national context is an influential factor in career choices and in turn in AE.

In this regard, this study corroborates the idea that careers, even among knowledge workers, are not necessarily becoming boundaryless, as factors such as the national context still influence career trajectories (Harley, Muller-Camen and Collin, 2004; Kaulisch and Enders, 2005; Duberley, Cohen and Mallon, 2006; Inkson *et al.*, 2012 Gunz, Mayrhofer and Tolbert, 2011a; Clarke, Knights and Jarvis, 2012). These issues of national context may also be in line with the finding for Group 1 that only males, in Italy, were 'academic and entrepreneur', thus reinforcing the idea of macro–micro dynamics underpinning AE. Further discussions are provided in the next chapters.

8.2.6 The curious

Before moving on to explain Groups 6 and 7, it must be mentioned that the groups illustrated in this and the next section were found across academics without entrepreneurial experience. While sharing some themes in regard to the constraining factors in AE not all interviewees

without entrepreneurial experience were against it. This finding is considered worth further analysis, as it may provide both theoretical and practical insights.

As the name of Group 6 evokes, some non-entrepreneurial participants appeared to be *curious* about AE. These were found in almost the same proportion across the three countries, as shown in Table 8.8.

Table 8.8. The curious (Group 6)

B14	Physics	M	Post-doc
B20	Physics	M	Professor
A16	Biosciences	F	Post-doc
A19	Engineering	M	Research fellow
P9	Physics	M	Professor
P14	Mathematics	M	Professor
P15	Mathematics	M	Professor

Two interesting features of these participants are their typical membership of fundamentally science-oriented disciplines, and their heterogeneity in terms of career stage. As shown in Table 8.8, this sub-sample includes both very senior (professorial) and very junior scholars, i.e. the extremes of the career spectrum. Discipline and career stage, and their related factors emerged as the most significant elements for their non entrepreneurial experience. Regarding the discipline, it emerged that belonging to certain fields such as physics or maths, in which typically science has a more fundamental-orientation was a strong negative element. The findings thus confirm what was reported earlier regarding other typologies about the role of discipline and/or the research conducted upon AE, which applied to both senior and junior scholars. For the latter, however, it was also about their career stage and how to advance it. Especially in the U.K. and Australia, AE was framed as a career-related issue, and since publications still hold a dominant role in the promotion criteria, academics in their early career stages tend to focus more on them, ultimately confirming considerations

reported in Chapters 2 and 5 about the potential explanations of the different involvement in AE of junior versus senior academics. The topic will be also discussed in the next chapters. The Italians in Group 6 were all senior scholars, and for them career-related issues in terms of advancement were not salient themes. Instead what they suggested was an effect of the national context, with the Italian industrial sector described as characterised by small/family businesses therefore usefully not innovation-oriented, but also because of a typical traditional emphasis on fundamental more than applied research (a theme shared especially with one participant in Group 7). The national context as a constraining factor also emerged among some of the Australians who talked about the weak industrialisation of their country. Other barriers in this group were also lack of entrepreneurial skills, a theme that appeared particularly salient among Australians in general.

As will be discussed further in Chapters 9–10 the study shows that the discourse on 'science and business' is a rather complex and multi-faceted phenomenon where individual and contextual factors act in dynamic ways, assuming diverging roles and importance. Some elements often appeared as barriers, as for instance being involved in basic science, or the weak industrialisation of the country, but these did not always have the same negative effect in all the groups. For example, Italy's weak industrialisation or academics' lack of time were also mentioned by interviewees in Group 1 or 2 for example, who, however, thanks to other factors such as a more applied research orientation, or a supportive environment, or experience accumulated over the years, managed to establish collaborations with industry, and/or to spin-out their research outcomes. For others instead, lack of opportunities from the context, combined with a more basic orientation in research and/or issues related to career advancement, made AE more challenging, reinforcing one another. In the final chapters the study will explore potential solutions to act on these macro-meso-micro dynamics, especially

considering the main point that can be drawn from Group 6: the presence of curiosity among 'entrepreneurially disadvantaged' categories. These were not academics who went through any identity transformation, with their academic one reinforced through the narratives of their career as mainly driven by an interest in science; yet, they displayed curiosity, indicating openness to a world of which they had little knowledge, but which they did not discard *a priori*. They rather appeared challenged by the factors discussed, but the evidence signals that there is potential for AE among a variety of academics. AE may be diffused across a variety of disciplines if, for instance, certain training opportunities are provided, or perhaps ad hoc activities suited to certain fields. The presence of this typology across countries signal in fact the presence of some over-arching barriers in AE which are linked to the profession, and its norms and practices according to disciplinary communities, but also linked to how the profession is managed by universities regarding career advancement. Similarities across countries on such a theme suggest that the entrepreneurial university is still a contentious issue in terms of what it may practically entail in different contexts, in turn suggesting the need for a revision. The meso level may clearly play a role in shaping perceptions of boundaries between science and business and what is considered *legitimate* (e.g. Dany, Louvel and Vallette, 2011). Rodrigues, Guest and Budjanovcanin (2016) suggest that people evaluate what consequences crossing the boundaries of certain domain(s) may have on others. The outcomes of these evaluations depend on the salience of each domain. Therefore, for those whose core identity is academic, during a phase of uncertainty due to precarious career stage and/or unclear promotion criteria, and where AE does not clearly contribute to their academic careers, the boundaries between the two roles are seen as particularly persistent.

The emerging issues specific to national-context underline the presence of macro-determined boundaries in AE, in turn suggesting the importance of taking into account what the national context may or may not offer in terms of entrepreneurship.

Having said this, caution must be exercised regarding the extent to which such curiosity is a predictor of action. Conclusions cannot be drawn from this study in the absence of longitudinal data. Future studies might consider a longitudinal outlook on AE to analyse how changes in academics' perceptions evolve over time, and whether they spread across less traditionally entrepreneurially-oriented groups.

8.2.7 The reluctant

This category comprises academics with no entrepreneurial experience who, unlike 'the curious', were *reluctant* to engage in AE.

Table 8.9. The reluctant (Group 7)

B1	Physics	M	Research fellow
B18	Physics	M	Associate professor
B11	Medicine	M	Lecturer
A31	Physics	F	Post-doc
A32	Physics	M	Post-doc
P21	Earth sciences	M	Post-doc
P26	Medicine	M	Lecturer/senior lecturer

These were found across the three countries confirming the over-arching nature of certain barriers. The majority held junior or intermediate roles in their universities, and were mainly in health sciences or physics, with one from natural sciences. The interviews confirmed that discipline was a significant factor hindering their propensity to redefine the boundaries of their identity and welcome additional roles, such as a 'commercial persona' (Jain, George and Maltarich, 2009, p. 923). Their narratives moved around issues such as conflicts of

interest between researching in certain areas, such as public health, and the aims of the private sector. In such cases, the academics' identity, strongly embedded in norms and values (Merton, 1968), was not permeable to the 'intrusion' of other identities, which were perceived as threats and as out of line with their core identity, as well as how in certain disciplines such as physics there is no culture of entrepreneurship, and more traditional ideas about the work and role of academics. Evidence thus confirms that discipline is a strong influential factor in shaping perceptions of boundaries of organisations, institutions, and roles, (e.g. Duberley, Mallon and Cohen, 2006; Ylijoki and Henriksson, 2017), through the provision of norms, values, and behavioural scripts, as discussed for previous typologies.

The other feature characteristic of this group is a general skewness towards junior career stages. This not only meant that some academics at early career stages were more oriented towards publications, but junior scholars lacked also experience, exposure and entrepreneurial skills. These elements also appeared as influential on perceptions of organisational and roles' boundaries, and whether or not they are seen as crossable.

In this respect, the university may have a positive influence at the micro level, in terms of providing support for acquiring the experience and skills needed to allow boundaries to be crossed, and perhaps multiple roles to be adopted; thus, to experiment with 'alternative selves'. Further considerations are reported in the following chapter.

8.3 Summary

This analysis of academics' sense-making of the entrepreneurial university and AE has provided useful insights into AE and its relationship with academics' careers. First, the findings challenge the BC theory as conceived in its original definition, characterised by blurred boundaries across organisations (Arthur and Rousseau, 1996). While using this theory highlights that organisational boundaries can be crossed, the study provides evidence

of their persistence (Duberley, Mallon and Cohen, 2006; Inkson, 2006; Inkson *et al.*, 2012; Rodrigues, Guest and Budjanovcanin, 2016). Academics engaging in entrepreneurial activities perceive boundaries of different roles and organisations, the extent of which varies across academics. This is because these boundaries are not only physical but also symbolic, linked to professional norms, organisational requirements and values, and also peer norms. All these elements shape perceptions of the boundaries themselves (Dany, Louvel and Vallette, 2011; Rodrigues, Guest and Budjanovcanin, 2016). For instance, as discussed earlier, even within the STEM disciplines, belonging to one discipline rather than another may have differing effects on academics' perceptions of the boundaries of 'science and business'. This study supports Sullivan and Arthur's (2006) later theorisation of the BC, which stresses the presence of both physical and psychological components, with the latter referring to how boundaries are perceived by individuals themselves.

Another point suggested by this study is that perceived boundaries in roles and organisations can actually be crossed. In so doing, academics undergo a process of boundaries of identity management (Lile, 2013, 2015; Jain, George and Maltarich, 2009; Lam, 2010; Gulbrandsen, 2005; Smith, 2012; Meek and Wood, 2016; Ylijoki and Hernriksson, 2017). This sometimes entails assuming multiple identities in a process of role layering, through which additional identities are added to the dominant one. Sometimes they assume hybrid identities, reflecting their management of contentious multiple roles. At other times they engage in organisational or professional identification processes to preserve their central identity, when potential 'others' are conceived as threatening and illegitimate. All these strategies help scientists to manage their careers and what it means (or may mean) to be an academic in the entrepreneurial university era, in which, as argued by some scholars (e.g. Etzkowitz *et al.*,

1983; Etzkowitz and Leydesdorff, 1995), the boundaries of science and business are blurred, or even eroded.

Use of the concept of boundaries of identity (Lile, 2013, 2015) is proposed in this study to explain the micro processes underpinning AE (Balven *et al*., 2018). In so doing, while corroborating previous studies of the potential for academics' identity to be transformed as they become involved in the 'third mission' (Jain, George and Maltarich, 2009; Winter, 2009; Lam, 2010; Gulbrandsen, 2005; Smith, 2012; Meek and Wood, 2016; Ylijoki and Henriksson, 2017), this study provides a key contribution in showing additional mechanisms for managing boundaries of identity, while also challenging previous considerations in this regard. In particular, in contrast to Jain, George and Malatrich (2009, p. 923), this study shows that assuming multiple identities and a 'commercial secondary persona' is only one of several mechanisms enacted by academics, and does not apply to all academics involved in entrepreneurial activities. Thus, the study shows the limitations of such a conceptualisation in defining the identity transformation process of academics involved in entrepreneurial activities.

Similarly, the concept of 'hybrids' (Lam, 2010) is one possible 'self' for academics involved in AE, which may indeed evocatively illustrate the often contentious and contradictory positions of some academics; however, other strategies are also enacted. When in 'dangerous' territories, academics distance themselves, either psychologically through cynicism, or by maintaining or even reinforcing the boundaries of their professional and/or organisational territory, or physically by 'not spending too much time on it'. Reluctance is another strategy that might be considered similar to psychological distance, which occurs in reaction to something that is perceived as not in line with neither their interests nor with their work ethics and profession. These aspects may all be *'convoluted'* (B1).

At the opposite end of the spectrum from reluctance is ‘curiosity’. The willingness for discovery intrinsic to or typical of the academic profession may perhaps be used as a point of leverage to foster AE in a variety of academics. This study has found this to be key to AE, along with various drivers and the constraining and other facilitating factors discussed earlier and explored further in the next chapter.

Chapter 9. Quantitative and qualitative findings

9.1 A multi-dimensional perspective

As suggested by various scholars (e.g. Phan and Siegel, 2006; Ambos *et al.*, 2008; Glenna *et al.*, 2011; Grimaldi *et al.*, 2011; Urbano and Guerrero, 2014; Kalar and Antoncic, 2015; Fini and Grimaldi, 2017; Filippetti and Savona, 2017), this study has adopted a multi-dimensional outlook to explore the role of individual and contextual factors underpinning AE. The aim was to disentangle the role of each dimension, while at the same providing a holistic picture, about which the literature is still scant (Fini and Grimaldi, 2017). A conceptual model (Figure 9.1) has been developed to illustrate the macro-meso-micro factors emerged as underpinning AE, and how they interplay. This chapter provides a general overview of the findings and their implications, combining evidence from the quantitative and the qualitative analyses, and from the three countries analysed.

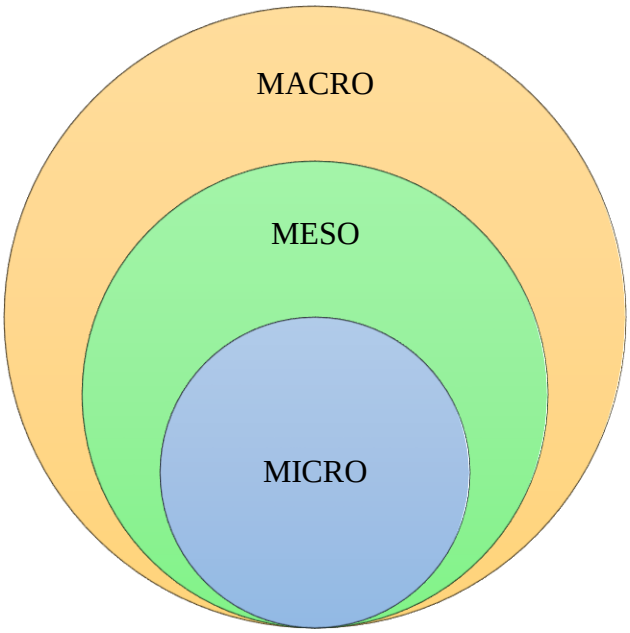

Figure 9.1. A multi-dimensional model of AE

The various components of the model are explained in the following sections. The discussion starts with the external layer of the model, the macro dimension, and it proceeds towards the internal. This reflects a stylistic choice, and it should not be inferred that one dimension has a higher importance. Instead, the aim is to provide an illustration of how the individual, core focus of this study, is embedded within 'contexts'. Such a model appeared, thus, a meaningful framework and illustration around which to discuss the findings. Figure 9.2 shows the main topics that will be discussed in the following sections, which relate to the three dimensions.

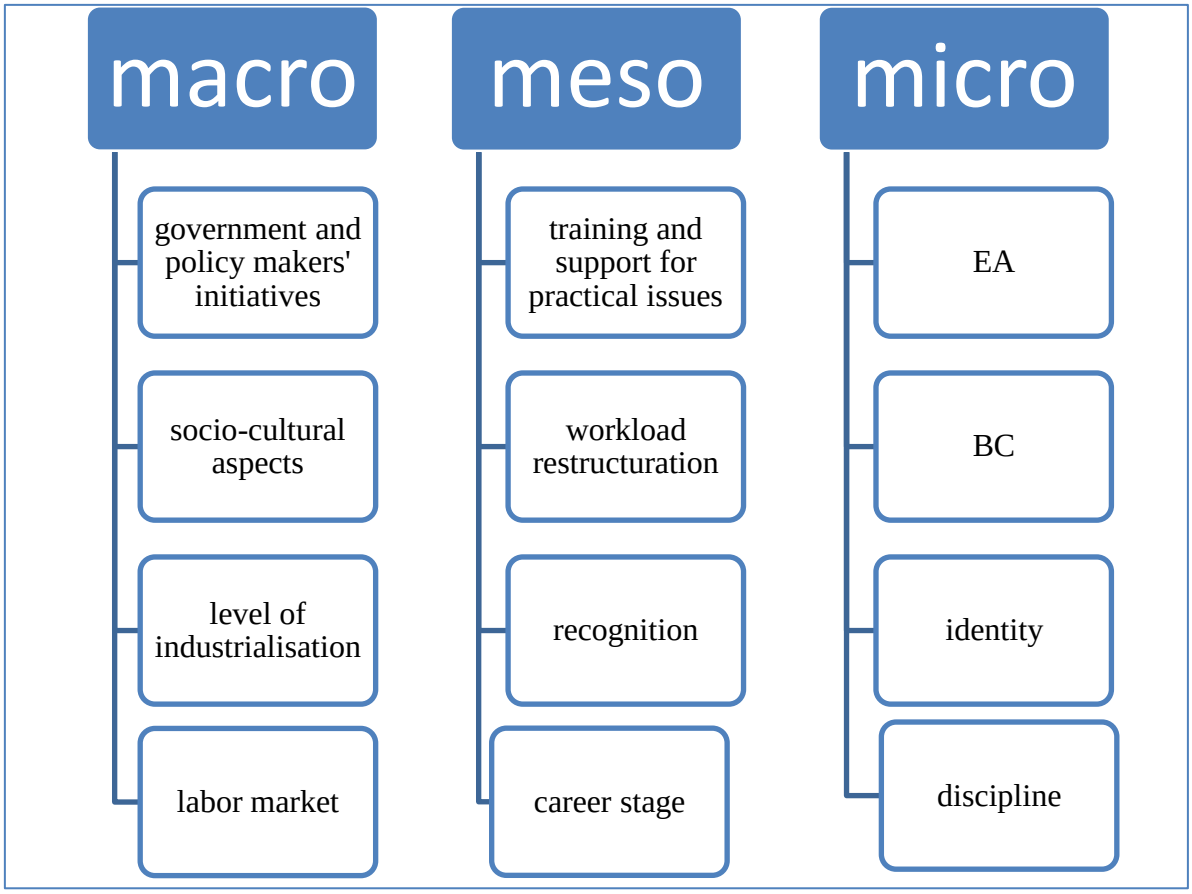

Figure 9.2. Macro, meso and micro dimensions in detail

9.1.1 Macro dimension

Analysing the individual *within* the context has provided useful insight for a more complete understanding of AE. As discussed, the context has been understood in this work in terms of both the university environment (meso-level) and the national context (macro-level). Regarding the latter, the study extends the previous literature by providing evidence from three different countries, which as explained in Chapter 3, share similarities and differences which made them interesting cases to compare. The study has tried to analyse the implications of the divergence in terms of national and institutional contexts upon AE, with the aim to shed light on the potential role of environmental elements, or vice versa how certain outcomes could be attributed to individual aspects. Regarding the macro context, the findings suggest that this may act as a facilitating and/or a constraining factor. The following sub-sections will illustrate some of the main aspects emerged from the study.

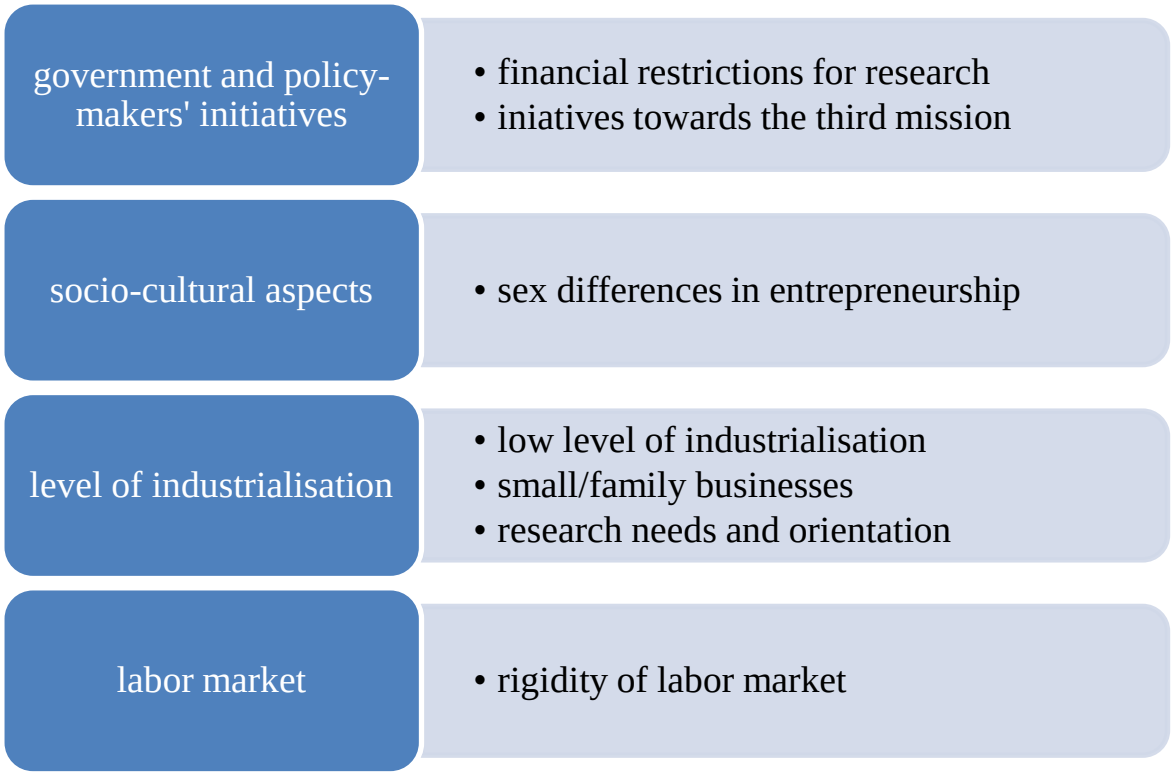

Figure 9.3. Macro dimension – main aspects

9.1.1.1 Government and policy-makers' initiatives

The first aspect that appeared to play a role in AE entails the role of policy makers and governments, through a variety of initiatives that have led to an expansion of AE. Above all, government funding cuts have created a need among academics to search for alternative sources of support, and academia-industry linkages but also collaborations with public bodies (such as governments themselves) have become the first and most important options. These considerations are supported by findings reported in Chapter 7 showing the pervasiveness across the whole sample regarding the theme of 'funding'. With this evidence, the study corroborates previous research (Meyer-Krahmer and Schmoch, 1998; D'Este and Patel, 2007; Jain, George and Maltarich, 2009; Lam, 2010, 2011; D'Este and Perkmann, 2011; Cherney *et al.*, 2012), that AE is, at least to some extent, experienced as a 'push'. By changing the higher education's funding system, governments and policy makers have had a significant impact upon academics' working life (e.g. Duberley, Cohen and Leeson, 2007; Winter, 2009; Grimaldi *et al*., 2011; Philpott *et al*., 2011; Ylijoki and Ursin, 2013; Fini and Grimaldi, 2017).

This consideration is corroborated by another frequently cited theme: impact. The latter has a dual meaning, as it may be considered as the possibility to assist research applicability and to address societal aims, as well as in terms of the impact agenda conceived as the newly introduced assessment criterion. This section will focus on the latter, with the former discussed in relation to the micro dimension.

As discussed in Chapter 7, it clearly emerged that among academics there is a growing awareness of the recent changes in the higher education system, with the majority of the interviewees in each of the three countries reporting changes towards a more entrepreneurial university. The study has also shown that the divergencies in the development of initiatives

towards AE in the three countries analysed seemed to have differentially shaped such perceptions. The different distribution of the interviewees in the various categories discussed in Chapter 8 could be considered a sign of such divergence. For example, the presence of 'mixed' profiles among the Australians is likely to be the result, as some of the interviewees themselves reported, of the on-going change and instability of the initiatives regarding the 'third mission' which have perhaps created a sense of vagueness and unclarity. Conversely, in the U.K., illustrative examples of the shift that has taken place were noticed, with some academics claiming to have developed an interest for the 'business side' or feeling that they are academic but also 'entrepreneurial'. It is important here to note that whilst the U.K. has a longer tradition of AE, gaps in its implementation seemed to be present also in this country, especially in regard to issues at the meso-level, as will be further discussed in section 9.1.2.4. The national context also appeared important in Italy, where examples of 'academic and entrepreneur' scientists were also found. However, as discussed in Chapter 8, it is likely that other factors as the career stage or socio-cultural aspects, later discussed, were playing an important role in Italy, perhaps more than the initiatives towards AE, which in this context appeared less developed than in the others, especially compared to the U.K.

The evidence regarding the 'impact agenda' but also generally the initiatives towards the 'third mission' while providing insight on the role of the macro on the micro level, also offers points of reflection regarding the need for a revision. The study has shown great variety among academics regarding their opinions about the entrepreneurial university, registering both positive and negative opinions. Concerns, as discussed in previous chapters, referred to a variety of issues, such as conflict of interest as well as role and identity conflicts, to cite some examples. While corroborating previous studies, (e.g. Winter, 2009; Lam, 2010; Gulbrandsen, 2005; Meek and Wood, 2016; Balven *et al.*, 2018), the present work, as it will

be further discussed in the following sections, suggests amendments and improvements in regard to the 'third mission' which could increase AE, but also academics' working lives.

9.1.1.2 Socio-cultural aspects

The role of the macro-context upon AE also concerns socio-cultural aspects. Both the qualitative and the quantitative analysis suggested a divergent involvement in AE between females and males, with the latter more 'entrepreneurial' than the former. In the quantitative analysis this appeared to apply particularly to Italian female academics; during the interviews one participant underlined differences between soft and hard entrepreneurial activities, and how she did not see herself inclined to the latter; the study, instead, has found profiles of males 'academic and entrepreneur' with experience also in spin-off activities. Such a difference between hard and soft activities however could be linked to the discourse around academic identity *per se*, more than sex, and how certain activities may suit the academic profession more than others (further discussed in section 9.1.3.1). It must be noted, in fact, that differences between males and females regarding entrepreneurship in Italy emerged for the soft activities, at the quantitative analysis, rather than the hard types. These controversial findings could be explained by looking at a series of elements of the context.

Some considerations on this have been already reported in Chapters 5, and 8. It has been argued that this sex gap might be due to the persistence in Italy of the old, traditional 'masculine' figure of the entrepreneur (Ahl, 2006; Gupta, Turban and Bhawe, 2008). Since in Italy AE has developed later than other countries (e.g. Bolzani *et al.*, 2014), older dynamics may be still diffused (Molino *et al*., 2018).

Interestingly the OECD (2016) reports that in Italy entrepreneurship is in general not seen as a 'virtuous' employment condition. However, the study shows very little differences in this perception based on sex, and furthermore, women are those sharing the, slightly, more

positive opinions about entrepreneurship. While it is not practical in this study to examine the complex interplay between entrepreneurship and sex diffferences, these controversial findings highlight the variety of factors that may intervene, where cultural influences have a role, but also socio-economic issues. Studies showed that barriers for women in entrepreneurship may entail lack of financial resources to invest in new ventures as well as specific training (Bianchi, Parisi and Salvatore, 2016; Rinaldi and Tagliazuchi, 2018) and experience (Goel, Göktepe-Hultén and Ram, 2015; Abreu and Grinevich, 2017). Molino *et al.* (2018) reported that in Italy women tend to receive less support from friends and family in relation to their entrepreneurial intentions; furthermore, such type of support has been reported as more important for women than men. Therefore, it is not only a matter of beliefs and stereotypes, but also practical constraints; the two sometimes intertwined. This may also apply to academia.

As also mentioned in Chapters 2, 5 and 7, since AE requires time, female academics may face more challenges due to the fact that they are more likely to suffer time poverty than men as a result of caring/domestic responsibilities. It must be also noted that this sample was made up of academics from the STEM disciplines within which Rinaldi and Tagliazuchi (2018) have reported that Italian women still face gender stereotypes. However, this does not exclusively pertain Italy nor academia (e.g. Rodrigues, Guest and Budjanovcanin, 2016), but for the scope of this study the focus will be on the latter. Previous studies also confirm that difficulties for women in building an academic career are global (e.g. Le Feuvre, 2009; Duberley and Cohen, 2010; Shaw and Stanton, 2012; Kalaitzi *et al.*, 2017; Naz, Fazal and Khan, 2017; Sarsons, 2017). As also reported in Chapters 2 and 5, women in academia still face challenges related to stereotypes and work-family conflicts, poor work-life balance, weak career advancement opportunities, lack of flexible working environments, and these

may impact negatively on AE (e.g. Abreu and Grinevich, 2017). These findings are corroborated by evidence from the interviews in this study, in which some female academics from the U.K. group revealed in their narratives challenges related to sex discrimination and work-life conflict (often referring to family duties).

These barriers however did not negatively impact on female academics in the U.K. on their entrepreneurial involvement, as ultimately the quantitative analysis did not report any negative effect in this context. This could be due to the long-standing policies in place in the U.K. regarding AE, a more supportive environment for entrepreneurship- as ultimately mentioned by one of the females in Group 1- compared to Italy for example, and a more developed culture in this direction, which may enable overcome some of these women difficulties. Conversely, in countries such as Italy where policies towards entrepreneurship within academia developed later, combined with a notoriously difficult career path in academia in general (see for example Abramo *et al.*, 2015), and the socio-economic issues earlier reported, difficulties for this group still persist, despite interest, as shown by studies on general entrepreneurship (OECD, 2016). This may also explain why at the quantitative analysis the sex difference was found for the soft forms of entrepreneurship rather than the hard. Some of the Italian female academics might have some ideas about not being 'suitable' for the formal types of entrepreneurial activities, but this is likely to be linked to the broader discourse on AE and the academic profession and identity in general. The study suggests that the critical issues lie more on the support received from the context. When provided, female academics can engage in both soft and hard entrepreneurial activities. When lacking, they appear trapped in socio-cultural but especially socio-economic dynamics which do not favour female academics both in terms of their career and their possibility to be involved in AE. While this was particularly evidenced in the quantitative analysis for Italy, the

interviews revealed that these issues seem to affect women in other contexts also, as ultimately shared by one interviewee in the U.K., who mentioned that she could not attend the 'business breakfasts' organised by her university as she had to accompany her children at school. Abreu and Grinevich (2017) suggest that female entrepreneurial involvement could be fostered with specific initiatives aimed for instance at increasing this sub-population' networks, often weaker than in men. Interestingly, the interviewee in this study seems to suggest that networking initiatives exist, but if they do not take in considerations the 'domestic capital' (Duberley and Cohen, 2010, p. 193) they will fail eventually.

This evidence contributes to the literature on both general entrepreneurship, AE, but also careers in academia by confirming the presence of a sex gap. The cross-country divergence at the quantitative analysis but the similarities of some themes emerged at the interviews shed light on the presence of socio-economic and socio-cultural issues as affecting AE, but also how these could be mitigated by the context, in terms of specific initiatives towards AE. It must be noted that a sex gap did not particularly emerge in Australia. While is difficult to explain why this was not evident in this context, considering the international evidence about females and males differences in AE (see Chapters 2, and 5 in particular), it could be argued that this is likely to be due to a combination of various elements that mitigated one each other. The quantitative analysis has shown that in Australia career stage was a particularly significant factor for AE, ultimately confirmed in the interviews, linked to the the discourse on recognition and reward for AE. This aspect as affecting academics more generally might have mitigated the effect of sex, by dominating the scene. The interviews also showed that Australians were particularly concerned about not 'being trained', as later discussed, and this could also have acted as negative element, moderating other potential difficulties.

From a methodological perspective, the evidence underlines the importance of investigating social phenomena adopting a multiple lens, which may provide insight on issues that some methods may fail to capture. From a practical perspective, this evidence suggests the need to take into consideration sex differences within academia and how these are affecting both female academics' work experiences in general, and their possibility to involve in AE more specifically. It must in fact be noted that while the present study has shown a significant negative effect of being female on entrepreneurship especially in Italy, studies have documented it in various contexts (for example Abreu and Grinevich, 2013, 2017 in the U.K., or Goel, Goktepe-Hulten, and Ram, 2015 in Germany, Moog *et al.*, 2015 in Germany and Swiss).

9.1.1.3 Level of industrialisation

Another important element for AE appeared to be the level of industrialisation at national level. As discussed in previous chapters, Italian interviewees especially, but also some among the Australians, explained that the national context did not favour academia-industry linkages due to the lower level of industrialisation, and/or presence of small/business families (in Italy) which are generally not innovation-oriented, ultimately confirmed by previous studies (Minniti, 1999; Fini, Grimaldi and Sobrero, 2009; Iacobucci and Micozzi, 2012). A similar observation was also made by one interviewee from the U.K. who mentioned how in the country he trained (Brasil), academia-industry connections were not widespread, with this having had an impact on his lacking entrepreneurial involvement. As he moved to the U.K. for a post-doc, he became aware of such possibilities, promoted at university, and in which his supervisor was particularly involved in. While signalling also the role of the meso-context and role models (later discussed), the study here confirms the role of the country in shaping academics' perceptions towards AE. It also reinforces the idea

of macro-micro dynamics, and thus the multidimensionality of AE, which should be taken into account from both a theoretical and practical perspective. The level of industrialisation in particular appears to act as a constraining factor when it does not offer opportunities for academia-industry linkages. However, it may be also considered a specific intervening factor, which by providing certain societal needs to be addressed, it influences the research activity and in turn academics' willingness to engage in AE. As this point appeared an interesting one for the topic studied, the following section reports some further considerations.

9.1.1.4 Research orientation

As mentioned in Chapter 7, some among the non-entrepreneurial academics in Italy talked about the strong fundamental orientation of their discipline, as a special feature of Italy, compared to other European countries where the same discipline (in this case mathematics) has developed in a stronger applied direction. Previous studies (Iacobucci and Micozzi, 2012) confirm these views, maintaining that in Italy there is a strong division between the theoretical and the applied side of knowledge, with the former more emphasised at university. In Italy scientific disciplines are also rigidly separated and defined with less interdisciplinarity. This may be seen as linked to the discourse of the rigidity across professional sectors in Italy later discussed, but also the discourse around the level of industrialisation of the country mentioned earlier, which may (or may not) foster academics' entrepreneurial propensity. In this regard, Iacobucci and Micozzi (2012) discussed how these socio-economic and cultural aspects have resulted in a lack of entrepreneurial programmes taught at university in Italy (see also Bianchi, Parisi and Salvatore, 2016).

Australia offered insight on the notion of the national context as 'provider' of research questions, and therefore an intervening factor in AE, not necessarily with a negative

connotation. As reported in Chapters 7 - 8, some interviewees narrated that they were working on specific issues affecting the Australian context, such as bio-diversity, fish supply chain conservation, rural and aboriginal communities. As mentioned in Chapters 7 (Section 7.2) and 8, among the Australians impact and societal aims were frequently cited drivers, probably as a result of these specific context-related needs, that in turn made some of these interviewees interface regularly with the public sector (e.g. federal government). While confirming the role of the national context, mediated by the research activity upon AE, this evidence also suggests that AE may be expanded in its definition by including the concept of social entrepreneurship (Dees, 1998; Dees and Anderson, 2006; Petrella and Richez-Battesti, 2014). Such forms of entrepreneurship may better align with academics in certain national contexts, but also with academics' ethos in general which seem to still incorporate societal values, as it will be discussed in relation to the micro dimension.

9.1.1.5 Labour market

An aspect of the national context that also appeared to shape academics' perceptions regarding AE is the labour market. As discussed, some Italian academics referred to Italy as a country where boundaries across sectors are particularly impermeable. On the one hand, this appeared to negatively influence upon academia-industry linkages, as explained by some of the interviewees in this country. By increasing the perceptions of persistence and strength of boundaries across sectors, academics feel lower feasibility of a boundary-crossing, and thus possibility to embrace an entrepreneurial role. Such rigidity sustains beliefs about divergencies across sectors, and in this case about academia and industry, as 'different', therefore of difficult communication and connection, as reported in Chapter 7. On the other hand, such impermeability appeared to also have an effect on careers which tend to be rigid, and defined, as explained by some of the interviewees themselves. Thus, not *boundaryless*.

This aspect, as discussed, appeared to have fostered ‘romantic’ views of career trajectories also at university, where becoming an academic, especially for junior scholars, is seen in more traditional ways. The study here provides further support on the idea of persistence of boundaries in the discourse of ‘science and business’ in which the context, in this case the national one, shapes academics’ perceptions of such boundaries (Harley, Muller-Camen and Collin, 2004; Rodrigues, Guest and Budjanovcanin, 2016).

It must be mentioned that this was not exclusive of the Italian group, and also previous studies have shown the persistence of such traditional views regarding career trajectories in academia especially among junior scholars in other countries such as the U.K. (Dowd and Kaplan, 2005; Duberley, Cohen and Lesson, 2007) or Finland (Ylijoki and Ursin, 2013; Ylijoki and Henriksson, 2017). This is also linked to a broader discourse on career stage and promotion criteria that will be later discussed. The study here wanted to stress on the role of the context in shaping perceptions about roles and careers. Regarding the boundaries across sectors, for instance, this emerged as unique concern among Italians. In the U.K. and Australia academics did not mention such a rigidity, and some talked about boundary-crossing in terms of potential career moves, particularly among the Australians, some of whom were ultimately included in ‘The leavers’, a typology that instead was not found among Italians. This from the point of view of AE raises useful insight on some differences in the barriers across countries. In Australia and in the U.K. moving from different employment conditions appeared to be more ‘accepted’ than in Italy; thus, in those two countries the labor market was not negatively impacting on AE. The Australians however appeared to have to deal with barriers related to the mixed messages sent from the ‘top’ regarding AE, which made some of them ambiguous about whether or not engaging in it, and how this could jeopardise their career. Similar considerations can be made regarding the

U.K., where while the national context overall may be considered pro-entrepreneurship, considering also the longer presence of policies towards AE, issues at the meso-level in terms of reward and workload appeared also as significant barriers.

It is also interesting to note that two of the junior scholars in the Australian group who shared such traditional views regarding scientific careers were of Italian nationality and started their educational pathway in Italy. It might be that the national context in terms of socio-cultural issues has an influence that persists despite further experiences abroad. This could be due to a variety of issues discussed in this section, including the one about the research orientation typical in certain countries. Training imprint norms and values (Bercovitz and Feldman, 2008), and it could be argued that developing a professional path in a certain context gives an imprinting that is difficult to change. It would be interesting to see longitudinally if there will be a change in perceptions, as for instance the one reported by the interviewee in the U.K. who mentioned to have noticed a difference between Brasil and the U.K. in regard to AE, and how moving to the latter country had an influence on his perceptions about AE. The fact that the two interviewees above mentioned moved to Australia where AE is less developed than the U.K. may also have contributed to the lack of change in perceptions.

All these findings provide a unique contribution regarding the complex role of the macro-context on AE, by having analysed and compared the differences at macro level of three countries which have seldom been looked at together within the same study. Such a synoptic view of countries which share similar trends, but also differences in how such trends have developed over time, provides a useful insight into how AE is influenced by context-specific features. The study has also furnished insight into how the macro context interplays with the meso and micro dimensions, triggering points of reflections from a theoretical but also practical perspective, discussed further later.

9.1.2 Meso dimension

Various meso-level elements also emerged as influential upon AE. This is not surprising, as previous studies have highlighted the important role of university as an institutional context in fostering AE (e.g. Ambos *et al.*, 2008; for a review, see Balven *et al*., 2018). However, while much of the literature has focused on TTOs, as discussed in Chapter 2, the present study expands the evidence by also considering organisational factors such as training, workload management, and reward. In so doing, the present study tries to address the claim made by scholars regarding the importance of looking at a various meso-level factors (e.g. Phan and Siegel, 2006; Bercovitz and Feldman, 2008; Ambos *et al.*, 2008; Tartari, Salter and D'Este, 2014; Filippetti and Savona, 2017; Balven *et al.*, 2018). The main elements the present study focuses on are illustrated in Figure 9.4. Before moving on with the discussion, it must be noted that while the career stage can be considered an individual element, is discussed in this section as it is closely linked to considerations made regarding meso-level factors, such as training and promotion criteria.

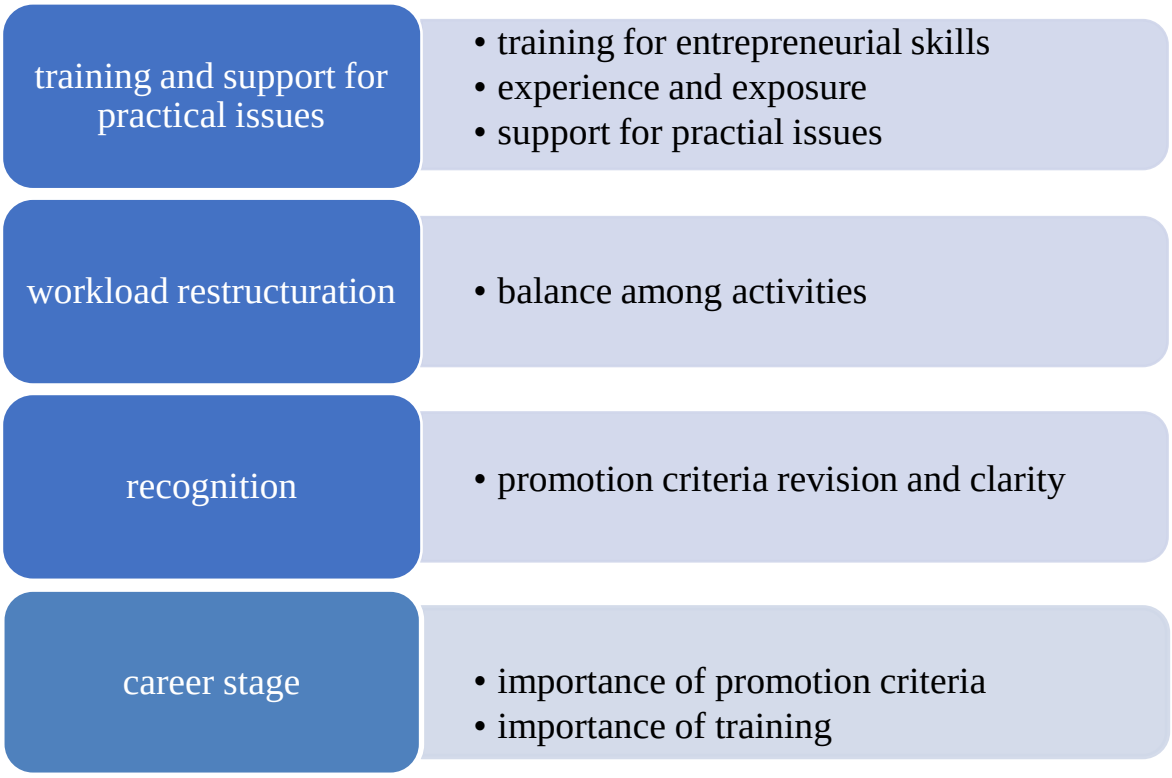

Figure 9.4. Meso dimension – main aspects

9.1.2.1 Training, support on practical aspects, and exposure

Similarly to what reported by other studies (Clarysse and Moray, 2004; Lockett, Wright, and Franklin, 2003; Moog *et al*., 2015) some interviewees in this study felt that they did not have adequate skills to engage in knowledge transfer and science commercialisation. While this might be considered an individual-level factor, is here discussed as strictly linked to the role of universities in fostering AE. As discussed in the previous two chapters, across countries and groups (entrepreneurial and not entrepreneurial), but particularly emphasised by Italians and Australians, some interviewees explained that they had been trained to be 'scientists', i.e. able at doing research, but lacked knowledge, information and practical skills about how to be 'entrepreneurial'. Some academics mentioned difficulties on very practical issues such as how to frame an email to send to industrial partners, which signals the presence of very micro mechanisms hindering the process of AE. While more often coming from junior

scholars, the lack of training also emerged from the interviews with senior staff and those experienced in entrepreneurship. This is an important finding from a practical perspective; on the one hand, as it suggests the importance of personal skills and abilities as well as academics' perceived self-efficacy in enacting an entrepreneurial behaviour. On the other, it points out the key role of the institution in promoting certain behaviours. This is because, as discussed in previous chapters, many interviewees across the various groups also talked about difficulties in knowledge and technology transfer as sometimes related to practical issues such as the extensive bureaucracy, the contracting process, industry regulations, and the divergencies in working styles between them and industrial partners. While coming from various groups, these themes were particularly important among 'The mixed' but also the 'The distant/instrumental' academics, among which some discussed at length the practical difficulties they encountered in their entrepreneurial activities and the unsuccessful results in some occasions, which seemed to have had an influence on their perceptions about the feasibility of involvement in knowledge transfer and collaborative works with industry. These challenges may have had an impact in shaping these academics' opinions about AE, increasing a perceived 'distance' and presence of boundaries between the two sectors; and thus, roles. The study, thus, argues that the meso context may have a significant role in promoting AE, by providing specific support, preparing academics for such activities, and revising the practices and procedures of AE itself, in order to make it more 'manageable' for academics. In so doing, it may lower the experienced distance and difference between sectors and activities. As mentioned in Chapter 8, the environment has a key role in allowing people experimenting 'new selves' as it may facilitate or hinder certain behaviours (Lieff *et al.*, 2012), which therefore may or may not become part of the repertoire of roles.

The evidence from the three countries regarding this theme signals gaps at the meso level, linked to practical issues related to AE, which are affecting universities in different countries in similar ways. Such convergence suggests that there are over-arching barriers in AE, intrinsic to the process of knowledge transfer, and which appeared to be linked to the differences between academia and industry, in terms of diverging working styles, languages, which arguably reflect at a surface level more profound differences in values and objectives. While the change around the discourse on 'science and business' is a rather complex one, and it may always present tensions, the study shows that the university has an important role in shaping such discourse, and increasing *communicability* across sectors. This may entail providing support on practical issues, as well as academics with specific training.

Studies have reported that training is an important component in AE (e.g. Philpott *et al.*, 2011; Abreu and Grinevich, 2013; Miranda, Chamorro-Mera and Rubio, 2017), as it may increase entrepreneurial behaviour by providing resources and experiences (Rauch and Hulsink, 2015), and it imprints specific behaviours (Bercovitz and Feldman, 2008). Moog *et al*., (2015) found that scientists with a diverse range of skills have higher entrepreneurial intentions. The authors, as ultimately reported by others in Chapter 2, strongly sustained the idea that while TTOs may support knowledge transfer, it is important to more closely look at the individual academics, and how to foster entrepreneurial behaviour among them (see also Ambos *et al*., 2008; Balven *et al*., 2018). Very interestingly, Moog and colleagues also noted that the effect of having a variety of skills on entrepreneurship was moderated by the effect of peers and more generally a supportive environment and particularly in terms of time. This will be discussed further in section 9.1.2.2. Training may not only focus on providing specific skills, but also improving attitudes (Miranda, Chamorro-Mera and Rubio, 2017), as will be discussed in relation to the micro dimension.

A further note on academics' 'entrepreneurial preparedness' regards the career stage, since for junior scholars it emerged as a particularly relevant aspect. While lacking specific entrepreneurial skills, this group of academics in all three countries also generally lacked experience and knowledge about the 'industrial world' as well as what AE is and may entail, i.e. information and awareness. As discussed in previous chapters, this may explain why in the quantitative analysis junior scholars appeared less likely to be involved in entrepreneurial activities than the senior colleagues, and especially in the Australian group, as can be seen in Table 5.6. This could be connected to the earlier discussion about the salience of the theme 'training' in this group. This evidence, also explained in Chapters 2 and 5, corroborates previous findings regarding what has been called the *accumulation effect*. Scholars (e.g. D'Este and Patel, 2007; D'Este and Perkmann, 2011; Haussler and Colyvas, 2011, Abreu and Grinevich, 2013; Tartari, Salter, 2014) who also have found senior academics more involved in entrepreneurial activities compared to the junior colleagues explained this as the result of skills and experience, and contacts, academics accumulate in the course of their career, which give to senior academics an advantage in AE. This was confirmed by senior interviewees in this study who mentioned how they were 'well known' in certain industries, with long standing relationships with external partners which were built over the years. Studies have also linked the gap to the divergent focus senior and junior academics have on the various activities they have to accomplish, with junior academics typically dedicating most of their time at work to publications as required for career advancement (Clarysse, Tartari and Salter, 2011).

The findings regarding academics' training and experience corroborate the importance of the meso level in supporting academics to be 'entrepreneurial'. In this regard, along with in-class training focused on specific skills and abilities, policy makers may consider in-the-

field experiences, to increase knowledge and awareness about the 'industrial world' as well as AE. As previously mentioned, awareness and experience emerged as critical issues for junior scientists. Experience has been documented as a key element in AE (e.g. D'Este and Patel, 2007; Mosey and Wright, 2007; D'Este, Mahadi and Neely, 2010; Clarysse, Tartari and Salter, 2011; Tartari, Salter and D'Este, 2014), ultimately confirmed by evidence deriving from the 'Open academics' among whom some had previous, non-academic work experience, in some cases in industry, but also in other sectors. Experience seems also to increase entrepreneurial alertness and BC mind-set, as ultimately shown by the correlation analysis (Section 5.5, Table 5.4) which reported positive associations between being *professor* with both entrepreneurial alertness and BC-mind set.

Role models have also been shown to have a positive influence on entrepreneurship (e.g. Guerrero and Urbano, 2012; Clarysse, Tartari and Salter, 2011; Philpott *et al*., 2011; Hannon, 2013; Tartari, Salter and D'Este, 2014; Fellnhofer and Puumalainen, 2017). Tartari, Perkmann and Salter (2014) show that, due to a process of social comparison, what is done by other colleagues tends to be emulated within departments, creating norms or 'archetypes' (Bercovitz and Feldman, 2008) of what an academic 'does or does not do', i.e. how certain behaviours are considered legitimate and feasible. Social comparison is thus a powerful tool for shaping perceptions and behaviours (Mussweiler, 2003; Mussweiler and Strack, 2000, Weiss and Freund, 2012). The latter for junior scholars may appear a particularly useful approach, as indicated by some of the interviewees themselves; exemplar is the case of one interviewee in the U.K. who compared himself with his supervisor in terms of entrepreneurial involvement and skills, and how the latter was encouraging the former in increasing such aspect. This evidence is confirmed by previous studies which have underlined the importance of role models particularly for early scholars (Owen-Smith and

Powell, 2001b) who tend to use social comparison more than their senior colleagues (Tartari, Perkmann and Salter, 2014). Tartari, Perkmann and Salter (2014) note that junior scholars often compare themselves with peers more than superiors, and if colleagues at a similar career stage are involved in AE, these tend to be emulated. It could be argued that role models may be constituted by peers and not exclusively more senior academics. Diffusing information among departments about successful entrepreneurial experiences of colleagues might be a strategic solution, for example. As ultimately suggested by (Lieff *et al*., 2012, p. 213) 'comparing oneself to others may have the potential to reinforce or inhibit emerging identities'.

The usefulness and importance of providing these types of support and training is confirmed by the 'curiosity' found among both junior and senior academics across countries, as discussed in Chapter 8. These interviewees suggested the presence of potential for AE, which sometimes is hindered by barriers in the translation and implementation phase of such interest, due to inexperience, lack of skills, and also other factors related to the meso dimension, later discussed.

9.1.2.2 Workload

The study has reported evidence on how AE difficultly dovetails with academics' busy daily routines. As mentioned in Chapter 7, 'lack of time' was a pervading theme across countries and groups of interviewees, who often talked about their work-life imbalance, long-hours worked, and as a consequence the need to carefully plan and prioritise activities at work. This is also because AE is a time-consuming task, for issues and difficulties related to intense and complex bureaucracy and administrative issues reported by many academics, across countries, and discussed in various parts of this work. In such a scenario, the 'third mission' often becomes a 'third burden', competing for time and resources with other activities.

Similar observations are reported by other studies which have documented that among academics is diffused the 'notion that there is no room to be fully engaged in both academic and entrepreneurial activities' (Balven *et al*., 2018, p. 36). While the discourse is also linked with the one about career promotion criteria, later discussed, workload appeared to be a theme that deserved a distinct mention given its pervasiveness in the narratives.

As with previous studies (e.g. Phan and Siegel, 2006; Philpott *et al*., 2011; Meek and Wood, 2016; Balven *et al*., 2018) the present work stresses the role the institution may play in fostering an entrepreneurial university with the support provided, which may entail improving the practices around AE, including revising academics' workload. This is also because such a new *imperative* may not only negatively impact on academics' wellbeing at work – topic behind the scope of this study – but it may also imply for some a career decision. Some of the participants, across the three countries, affirmed that in order to succeed in entrepreneurial activities they had to adopt some strategies such as increasing the workload and hours worked using time previously dedicated to other activities, such as research, for their entrepreneurial activities, with in turn the potential risk of jeopardising their research work; or not dedicating time to AE; or, they may leave academia, to continue their entrepreneurial activities (see the case of one of 'The leavers' from Australia discussed in Chapter 8). While some of these scenarios might not even be feasible for some, they can all be considered critical situations for the individual scientists as well as universities to handle, in terms of leave-time management or staff retention, just to cite some.

In line with previous studies, the present work, by showing the pervasiveness of this theme across different national contexts, adds to the literature evidence on the presence of gaps at the meso level that have the potential to hinder the 'third mission', and which are linked to the academic profession and to how this is managed by the institution university. AE should

be considered as a career decision in the way it entails academics having to plan and prioritise activities at work. A better alignment and balance between the various tasks academics have to accomplish would perhaps not only increase work-life balance, by also promote more AE. Here the study agrees with what sustained by scholars (Philpott *et al*., 2011; Kalar and Antoncic, 2015; Fini and Grimaldi, 2017; Balven *et al*., 2018) about the importance for policy makers to consider aligning AE with academics' careers, giving a balance between the various activities, ultimately underlined by recent studies. As introduced in the previous section, Moog *et al*. (2015) found that scientists' entrepreneurial intentions were positively influenced by their variety of skills, but the effect was moderated by the time available, and particularly a 'working time balance' (p. 500) between the variety of tasks academics engage in (e.g. teaching, research, administrative duties, commercial activities and other non-commercial activities). The authors also underline how this is a rather important aspect, yet underresearched, as confirmed by Balven *et al*. (2018). This topic links with to the discourse about recognition for the various activities that will be later discussed.

Before moving on to the next section, a special mention has to be dedicated to the academics from medical sciences, who from a role and time-management perspective appeared to face more challenges than others. Academics in these fields, across countries, seemed to face a situation where being 'entrepreneurial' meant adding a third if not a fourth role to their working routine, characterised by research, teaching, administrative, but also often clinical duties, such as working in a university hospital. This evidence signals three interesting points. First, universities have an important role in promoting AE for what entails allowing the time for it; ultimately reported by some interviewees as a form of support. Second, the discipline appears to be an important factor in AE, by shaping the academic profession and what this entails in each discipline in practice. These evidences suggest a third aspect: the

importance of tailored approaches toward AE that take into account disciplinary differences for example, or academics' career stage, as later discussed. As it will be discussed in Chapter 10, a 'one size fits all' approach is unlikely to be effective in the promotion of an entrepreneurial university given the variety of factors underpinning it (e.g. Lam, 2011; Filippetti and Savona, 2017; Fini and Grimaldi, 2017).

9.1.2.3 Recognition

As discussed in various parts of this work, the findings from this study sustain the idea that AE is strongly intertwined with academics' careers pathways and prospects. As reported in Chapters 7 and 8, interviewees across countries talked about the link between being involved in entrepreneurial activities and their career advancement. Such a theme created, in all three countries, a division among participants, with some mentioning the presence of policies in place to ensure an alignment between AE involvement and career promotion, whereas others instead lamenting the opposite. Notably, such a dichotomy emerged in all the three countries, signalling again a convergence at the meso level which highlights how some of the barriers in AE are neither national context nor individual-specific, but pertains the link between AE with the academic profession but also how this link has been managed or mis-managed by the institution university. The frequency of the theme *recognition* across the interviews also underlines how this is a very critical aspect for academics, and therefore policy makers should perhaps dedicate special attention on this aspect. It must also be noted, however, that in Australia and especially in Italy formal recognition for AE was a particularly contentious aspect, as either unclear, or particularly weak.

As introduced in Chapter 8, the importance of clear career promotion criteria lies in the power of these in legitimising behaviours (Ambos *et al*., 2008; Dany, Louvel and Vallette, 2011). As maintained by scholars (Dany, Louvel and Vallette, 2011; Owen-Smith and

Powell, 2001a; Philpott *et al*., 2011; Tartari and Breschi, 2012; Tartari, Salter and D'Este, 2014; Meek and Wood, 2016) academics, as other professionals, make a careful evaluation of costs and benefits of their actions at work, and they 'need to understand the price of certain choices' (Dany, Louvel, and Vallette, 2011, p.992). The study shows that when promotion criteria are unclear or absent , academics tend not to involve themselves in such activities, and also to have more negative opinions of them. Conversely, when academics perceive recognition they are more likely to be involved in entrepreneurial activities and they show a more positive attitude towards them. Examples have been reported in Chapter 7, and some also discussed in Chapter 8.

The presence and *legibility* of career promotion criteria (Dany, Louvel and Vallette, 2013) may help in re-assessing some of the issues which emerged in this study as barriers for AE, such as the lack of time for instance. By having a clearer indication upon which evaluating how to prioritise activities, academics may make better-informed choices on how to prioritise their activities, and more broadly their career. This may serve to reduce the problem of workload management and conflict for time. Regarding the latter, one of the issues which emerged was that in the absence of clear indication of the actual importance of AE for career promotion, as well as because of the still dominance of publications for career advancement, academics tend to prioritise research over other activities. This issue was mentioned by academics in all the three countries and at varying of career stages, but for junior and middle-scholars these issues were particularly important.

Better and clearer formal recognition for AE may also provide support to the identity mis-alignment discussed in Chapter 8. While the difficulties in accommodating an entrepreneurial role can be associated to a variety of issues discussed in various parts of this work, arguably the institution also has a role in making certain behaviours more legitimate

and increasing their enactment by rewarding them (e.g. Owen-Smith and Powell, 2001a; Ambos *et al*., 2008; Dany, Louvel, and Vallette, 2011; Philpott *et al*., 2011; Huyghe and Knockaert, 2015; Meek and Wood, 2016). As ultimately maintained by Etzkowitz *et al*. (2008, p. 683):

> *'The reworking of boundaries around institutions undergoing changes in their mission occurs through a 'game of legitimization' with integrating themes invented to align heretofore contradictory practices'.*

While this aspect has emerged as significant theme across countries and for a large number of interviewees, the career stage appeared to be an intervening element in these dynamics, making promotion criteria an even more sensitive topic for some groups of academics.

9.1.2.4 Career stage

As some issues have been already approached in previous sub-sections, this section reports a brief sum-up of the main aspects rotating around the career stage.

For AE, being at an early career stage appeared to signify: (i) inexperience and 'unprepardness'; (ii) being in a difficult position in terms of entrepreneurial involvement given the lower weight and/or unclarity of such activity for career advancement. These two issues can be considered the most likely explanations for the negative coefficients emerged from the quantitative analysis regarding career stage and entrepreneurial activities, discussed in Chapter 5. Potential strategies to overcome these difficulties have been discussed previously, regarding the university's role in providing training and experience, as well as clarity about promotion criteria and balance among activities. This section aims to points out that AE is a career decision because it entails different groups of academics, at different career stages, evaluating costs and benefits of such activity. The narratives of junior and senior scholars, in all the three countries, while converging on certain themes, as reported in Chapter 7, diverged on the importance of having a clear direction for career advancement.

Some of the seniors in all the three countries recognised how there has been a change at university over the course of their career, and while in the past AE was not particularly important for career advancement at university, it was important for junior academics to be involved in such activities nowadays. However, the dominance of other imperatives, particularly publications, the lower importance in terms of career advancement of AE, despite the emphasis placed by policy-makers, appeared to create a sense of ambiguity among junior academics. As sustained by Hilijoki and Henriksson (2017) junior academics in the current changing scenario at university face a situation where they experience 'conflicting pressures and ambivalence as to what makes a successful academic career' (p. 1293).

This could also be linked to the discourse on the 'romantic view' of careers in academia, discussed in Chapter 8, which was found in this study among especially some early career researchers, who still conceive their pathway as linear and characterised by an almost exclusive dedication to science, ultimately reported by other studies (e.g. Dowd and Kaplan, 2005; Duberley, Cohen, and Leeson, 2007; Ylijoki and Ursin, 2013; Ylijoki and Henriksson, 2017). The findings in this study seemed to suggest that some junior scholars entered a world regarding which they had certain beliefs and ideas, but as such world is in the process of change (e.g. Winter, 2009; Meek and Wood, 2016), their personal scenarios had to be reframed. In the absence of clear indication on how to picture, or re-picture, what it entails being an academic nowadays, junior scholars face a situation which could be *'weird'* as expressed by one early-career researcher from Australia. Not only does this create confusion, but it may discourage some academics from involvement in AE, as discussed in Chapters 7 and 8 showing a different distribution of junior and senior scholars in the various typologies.

The study argues that the institution may have an important role in shaping the discourse on 'science and business', creating alternative 'scripts' (Duberley, Cohen and Mallon, 2006; Dany, Louvel and Vallette, 2013; Vallette and Culie', 2015; Laudel, Bielick and Gläser, 2018) and career narratives (Ylijoki and Ursin, 2013; Ylijoki and Henriksson, 2017). By rewarding, supporting, creating role models, the institution legitimises behaviours, shapes perceptions, and therefore encourage roles to be enacted: perhaps also without perceiving a strong dissonance among roles. These interventions while key for academics in general, may be particularly important for specific sub-populations of academics.

The role of the institution in changing perceptions and behaviours may be corroborated by the absence of a career stage effect in the U.K. at the quantitative analysis. This might be due to a more advanced level of an entrepreneurial university model within this context which may have shaped perceptions, also among the more junior scholars.[26] The study at the quantitative analysis has also showed that in this context, academic discipline (medicine) has a significant role in hindering AE, and this may have mitigated the effect of career stage. The two appeared particularly relevant factors in influencing lack of entrepreneurial experience, as well as fostering a sense of 'reluctance', as shown by the non-entrepreneurial group across countries. However, the study also shows that the various factors underpinning AE may combine in diverging ways in different contexts, with some assuming more importance. In so doing, the findings highlight the need for tailored approaches for AE, which take into account context-specific issues (e.g. Harley, Muller-Camen and Collin, 2004; Fini and Grimaldi, 2017), as it will be discussed in other parts of this work.

[26]As ultimately reported by one of the 'curious' also cited in section 9.1.1.3 who reported how after having moved from Brasil to the UK for a post-doc he started noticing the possibility for academics of involvement in entrepreneurial activities, as his supervisor was doing.

Before moving on to the next section it must be noted that while in the U.K. AE has a longer tradition which may have fostered an entrepreneurial culture, gaps especially at the meso-level were also reported in this context. The quantitative analysis did not shown a career-stage effect in this country, but the qualitative interviews revealed that also in the U.K. since publications still hold a higher relevance, junior/intermediate academics make careful evaluations on the extent of involvement in entrepreneurial activities. Some interviewees also commented on the recognition system itself as often focused on only specific, and outsanding activities, which, as discussed, may overlook the vast range of entrepreneurial activities in which academics may engage in. Evidence thus signals that also in more 'entrepreneurially advanced' environments there are gaps at the meso-level that persist and which may compromise AE.

9.1.3 Micro dimension

As discussed in previous chapters, the analysis of the individual dimension has focused on two main issues. First, the assessment of the effect of specific individual-level variables, i.e. entrepreneurial alertness and BC mind-set upon academics' entrepreneurial behaviour. Second, the exploration of individual scientists' perceptions and experience of AE, and particularly the sense-making attributed in relation to their career. Such an analysis highlighted the importance of the individual as core actor in the process of AE. However, the findings also suggested that the individual is embedded in a context with which he/she interacts. From these dynamics emerged diverging scenarios, where for example the role of certain individual-level variables may not be particularly significant in certain contexts, or where conversely certain individual characteristics, such as the career stage, may be particularly sensitive to contextual issues. These aspects, illustrated in Figure 9.5, will be further discussed in the next sections.

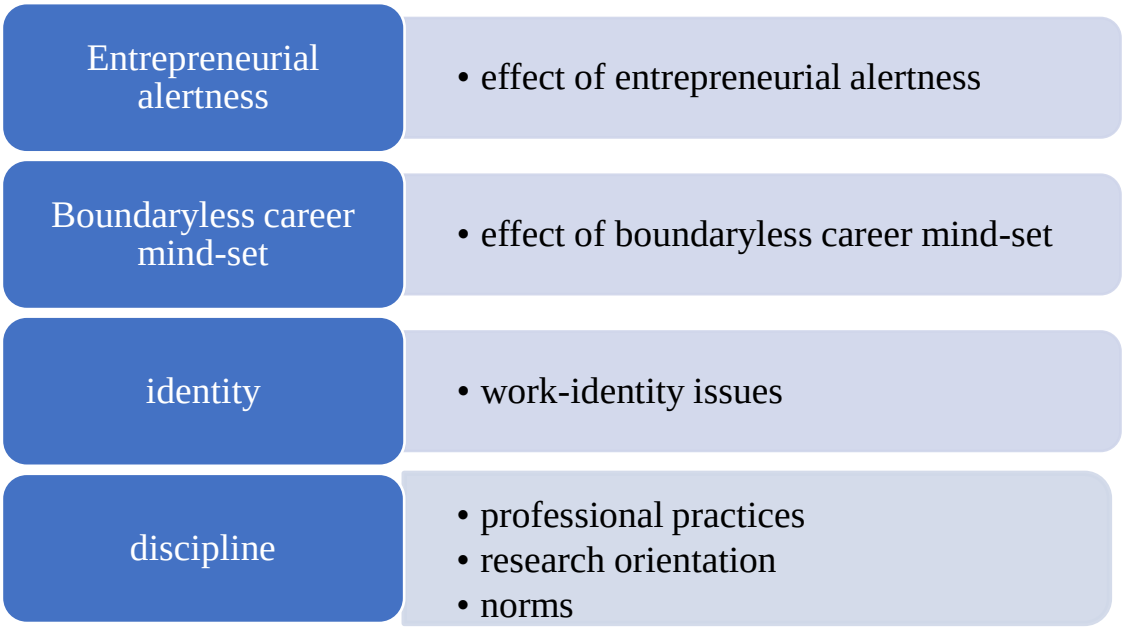

Figure 9.5. Micro dimension – main aspects

9.1.3.1 Individual factors

Entrepreneurial alertness

The study provides strong evidence regarding the role of specific individual attitudes upon academics' entrepreneurial behaviour. Having a high level of entrepreneurial alertness is a key determinant for involvement in both formal and informal entrepreneurial activities. This effect was found across the three countries, and it was controlled for variables such as sex, discipline, role at university (for details see Chapter 5). With this evidence the study contributes to the literature on AE showing that there are factors in AE which do not depend on specific national or meso-level conditions but are internal the individual. In so doing, the study expands the literature on the topic, and particularly regarding the role of entrepreneurial alertness which only one previous study has adopted in the context of AE (see Clarysse *et al*., 2011). The present work adds to the literature stronger evidence thanks to the analysis of such attitude in different national and institutional contexts which strengthens the notion of 'internationality' or over-arching role of this individual variable.

The relevance of this finding also lies in having used an up-to-date and more comprehensive scale for entrepreneurial alertness, compared to the previous study mentioned; this strategy not only furnishes more solid and reliable results, but also provides a methodological contribution, which will be discussed in Chapter 10.

From a practical point of view, this finding offers points of reflections on how to foster an entrepreneurial university, and on which specific aspects re-focus the attention. As discussed in Chapter 2, the expansion of the 'third mission' has often implied universities spending on structures and services such as TTOs in order to advance the process of science commercialisation. Only later, studies have demonstrated that the role of these services is indeed important but only partially explains AE, and a key role is played by the individual (e.g. Clarysse *et al*., 2011; Balven *et al*., 2018). At this regard, the study while confirming previous works, provides additional evidence on how entrepreneurial alertness has an impact upon AE in different national contexts and settings. In turn, furnishing support to the idea of a possible effectiveness of such an attitude in also other contexts.

Translated into very practical steps, the study suggests that in order to promote AE universities may for example consider evaluating personal characteristics of individuals and adopting strategies to enhance them. As discussed in relation to training, some academics felt they did not possess adequate skills to engage in entrepreneurial activities. However, it has also been mentioned that some interviewees, instead, considered themselves particularly able at knowledge transfer activities and collaborating with external organisations. The latter were among those in Group 1, whereas the former tended to distribute in other groups, such as the 'The mixed' (Group 3). The findings thus show that when academics perceive to have the necessary skills and mind-sets to engage in entrepreneurial activities they show a stronger entrepreneurial behaviour.

Regarding entrepreneurial alertness, studies have shown that it can be fostered with training (Valliere, 2013; Ho *et al*., 2018). Although not abundant – reflecting perhaps the relatively recent development of such a concept as well as the availability of scales to assess it – these studies provide an initial direction that universities may consider if they wish to increase AE. This patchy evidence on the role of training on entrepreneurial alertness may also constitute a starting point for further investigation. These considerations could also be applied to the BC mind-set, with however some different considerations to make.

Boundaryless career mind-set

The study provides a contribution to the notion of a *micro component* in AE by showing the positive effect of having a BC mind-set on academics' entrepreneurial behaviour. However, in contrast to entrepreneurial alertness, this individual variable appeared to have a significant role only regarding the soft entrepreneurial activities, and it also showed cross-country divergence, with the U.K. group not reporting any significant effect for this element. The relevance of these findings is here explained.

Regarding the exclusive effect of this variable upon informal entrepreneurial activities the study adds to the literature evidence regarding the multifaceted nature of AE, which not only refers to formal and informal channels of knowledge transfer (D'Este and Patel, 2007; Audreustch, Lehmann and Wright, 2014; Abreu and Grinevich, 2013; Grimpe and Hussinger, 2013; Tartari, Salter and D'Este, 2014; Kalar and Antoncic, 2015; Balven *et al*., 2018) but also that these are underpinned by different mechanisms. The latter, not only refer to motivational processes, as shown by some studies (e.g. Göktepe-Hulten and Mahagaonkar, 2010; D'Este and Perkmann, 2011; Lam, 2011; Huszár, Prónay and Buzás, 2016), but also skills, i.e. what the individual scientists are able or 'feel' able to do. Support to these considerations is provided by evidence from the interviews also earlier discussed

about academics' perceptions on their skills for AE. While some offered generic explanations, some made some specific comments on the differences between hard and soft activities, considering themselves more inclined to the latter. This may, at least partly, explain why previous scholar have reported a higher frequency of soft form of entrepreneurship among academics (Agrawal and Henderson, 2002; D'Este and Patel, 2007; Audretsch, Lehmann and Wright, 2012; Abreu and Grinevich, 2013; Grimpe and Hussinger, 2013; Tartari, Salter and D'Este, 2014; Kalar and Antoncic, 2015; Balven *et al.*, 2018). Why may some academics have less difficulty with soft activities?

Soft entrepreneurial activities, as discussed in Chapters 2 and 5, typically rely on interpersonal interactions, networks among people, and other informal channels. Academics arguably already possess the ability to interact and establish contacts with people across different organisations, as they often need to establish collaborations with colleagues in other universities and research institutes; thus, they might be naturally, or better *professionally*, facilitated in getting involved in soft entrepreneurial activities. In other words, the academic profession by already including a degree of *boundarylessness* as argued by some scholars (Arthur and Rousseau, 1996; Baruch and Hall, 2004), may better suit informal types of entrepreneurial activities.

However, as argued in other parts of this work, crossing the boundaries of academia and industry might be considered as a different process, as the two sectors traditionally diverge in values, norms, but also, as discussed, working styles. For academics therefore collaborating with partners in industry or other not research-type external organisations (such as governments) may require different and/or additional skills. While having an entrepreneurial alertness appeared to help such process, the study also supports the idea that a BC mind-set have a key role. While we do not know if those with a high BC mind-set are

more able at making connections with research-type organisations, we do have evidence that a BC mind-set promotes involvement in soft forms of entrepreneurial activities, which involve connecting with industry but also public types of organisations (not universities). The significant coefficient for the BC mind-set on entrepreneurial behaviour signals that there is a difference among those who have a high BC mind-set and those who have a low. This is to say that not every academic is *boundaryless;* the degree of *boundarylessness* in this case is shaped by individual-level factors. As discussed in other parts of this work, the perceptions of persistence of boundaries across sectors and organisations is a process influenced by a variety of factors; the study here shows that individual variables are among those with a role in this dynamic.

Regarding the BC mind-set, this evidence while adding to the literature about AE, also contributes to general entrepreneurship as well as the BC mind-set theory. The study shows that BC mind-set is a predictor of entrepreneurial behaviour, adding to the literature empirical evidence regarding this association. This evidence, furthermore, derives from a non-business sector therefore extending the inquiry and providing ground for future utilisations of such a concept in other non-business sectors. However, the exclusive effect of this variable upon the soft forms of entrepreneurial activities while on the one hand signals the complexity of the mechanisms underpinning AE, on the other, limits the strength of this variable, which only partially and selectively supports AE, therefore suggesting that other variables intervene.

The limit of this variable is also indicated by its non-significant coefficient which emerged in the British group. Regarding the latter, it appeared that, instead, the discipline was a very significant factor; academics from medicine in the U.K. were less likely than those from other disciplines to be involved in entrepreneurial activities. It could be argued that in such

a context despite having certain individual predispositions that may favour AE, academics might be limited in their entrepreneurial intentions and behaviour by elements of their discipline, which as discussed in various parts of this work, may entail norms and values, but also how work is structured. The findings thus reinforce the multifaceted nature of AE, suggesting an inter-play between the individual and the context that mono-dimensional approaches would not have highlighted. The discourse on the discipline has been approached in various parts of this work, therefore this chapter will not illustrate it in much detail; however, given the emerged importance and the recurrence of this element across the others analysed, some considerations will be reported in the next section, as a summary of the main points.

Discipline

This aspect can be considered a meso-level factor, if consider it in terms of norms and values, i.e. the 'rules' provided by the scientific community. However, as it can be also considered an individual-level factor, a discussion about the discipline is here reported, as a stylistic choice, also because it appeared flowing with what discussed above.

The study has shown in various parts that discipline is a significant factor in AE. Not only the quantitative analysis but also the interviews suggested that some important aspects related to it. Discipline is an influential element as: i) it provides norms and values. As explained, in fields such as medicine the norms of open science (Merton, 1968; Dasgupta and David, 1994) are still particularly important. Therefore, AE, especially in relation with the private sector, may become particularly difficult for academics in certain areas for issues such as conflict of interest, and secrecy of information (e.g. Campbell *et al.*, 2002; Gulbrandsen and Smeby, 2005; Geuna and Nesta, 2006; Buenstorf, 2009; Langley and Parkinson, 2009; Tartari, Salter and D'Este, 2012). These barriers are likely to explain the

negative coefficient found at the quantitative analysis for *medicine*. However, it must also be noted that, first the negative coefficient was found only in the British group, signalling that in other contexts other factors (such as sex in Italy or career stage on Australia, as discussed) may have a more important role. Second, entrepreneurial profiles from medicine were found also in the U.K. group. How they overcame the barriers above mentioned appeared to be linked to the senior career stage, which helped leveraging on contacts and experience; the support from the contexts, as well as individual interests also acted as facilitating factors. Nevertheless, the persistence of perceived differences in values, and the risk of conflict of interest between academia and industry in certain disciplines, which also entrepreneurial profiles reported, corroborates the idea of the need of tailored approaches towards AE, which takes into account the specific situation of sub-populations of academics in specific fields.

To reinforce such considerations, the study has shown that conversely belonging to disciplines such as engineering makes AE an integrated aspect of the academic profession. The discipline here lowers the boundaries of science and business and it allows to combine AE in the academic profession in a *natural* process.

ii) The discipline shapes what the academic profession may entail in practice. As reported regarding the workload, academics in medicine when involved in entrepreneurial activities often face a situation where they have to handle numerous roles; the one of the researcher, teacher, but also often the clinical one. Adding an entrepreneurial role might be particularly difficult for this group of scientists, despite having certain individual predispositions or interest (see the case of P17 mentioned in Chapter 7).

iii) Discipline influences the type of research conducted. In areas such as physics or mathematics it is more typical for academics to be involved in fundamental rather than

applied science and this appeared to have a significant impact on their propensity to engage in entrepreneurial activities. This has been discussed in Chapters 7 and 8, in which was explained how a different focus on research has influenced academics' diverging perceptions about their possibility to engage in AE. Some cases among the interviewees, however, particularly reinforced the notion that is not the disciplinary field itself, or exclusively, to act as an influential factor upon academics' entrepreneurial behaviour, but the research orientation. Scientists involved in entrepreneurial activities were also found in mathematics for example, when this however had a more applied focus.

Discussion on these aspects has been reported in Chapters 5 to 8, and particularly about the role of the discipline in imprinting norms and rules as well as in providing 'scripts' of legitimate behaviours in certain scientific communities (e.g. Ylijoki and Henriksson, 2017). The study here, while confirming such aspects, also highlights how in certain disciplines AE might be more difficult for practical issues linked to the work practice (as for the academics in medical sciences). The convergence of these issues found across the three countries sustain the strong role of this element upon AE, signalling the need for policy-makers to take into considerations the differences across disciplinary fields, otherwise risking 'reluctance' and 'distance' from the academic community. In so doing, the study provides further evidence regarding how 'the structure and culture of the disciplinary communities and specialities can be traced to the career experiences and practices of academics (Kaulisch and Enders, 2005, p. 139).

Work identity

The analysis of the individual dimension, as introduced in Chapter 2, not only involved exploring the role of certain individual-level variables on AE from a quantitative perspective, but also how academics interpreted and experienced the 'third mission'. In this regard, the

study, as discussed in Chapters 7 and 8, has shown that academics' decision to become involved in entrepreneurial activities has a close relationship with their career interests, prospects, as well as work-identity. Regarding the latter, Chapter 8 has illustrated that a variety of strategies are enacted by academics in relation to the possibility to embrace an entrepreneurial role, which entailed managing the boundaries of their academic identity in a time of change, when new, and sometimes contrasting roles, were asked to be performed. As these strategies have been discussed in Chapter 8, they will not be here further analysed. This section instead focuses on an element shared by all these strategies, which appeared relevant for the discourse on AE. What emerged from the findings was that despite different boundaries of identity mechanisms, the vast majority of the interviewees in the study shared a common aspect: academic identity salience. In other words, as explained in Chapter 8, the academic identity was their main work-identity, and even those in Group 1 ('The academic and entrepreneur') who introduced a 'commercial persona' in their work-identity, retained their primary academic identity, which appeared to have strong centrality. This was evident when asking about their future career prospects and interests, in which academia clearly dominated the scene, with the vast majority of the interviewees sharing themes such as autonomy at work, academic freedom and intellectual interests as the main motivations for such a career choice. It was also evident from the pervasiveness of certain themes as motivations for AE.

As reported by previous studies, the present work has shown that aspects such as gaining funding for research (Lee, 1998; Gulbrandsen and Smeby, 2005; Van Looy, Callaert and Debackere, 2006; D'Este and Patel, 2007; Etzkowitz *et al*., 2008; Geuna and Muscio, 2009; Nilsson, Rickne and Bengtsson, 2010; Lam, 2011; Wu, Welch and Huang, 2015; Huszár, Pronay and Buzás, 2016; Tseng, Huang and Cheng, 2018), and general resources for research

(Buenstorf, 2009; D'Este and Perkmann, 2011), apply research outcomes into 'real world' issues and creating societal benefits (Nilsson, Rickne and Bengtsson, 2010; D'Este and Perkmann, 2011; Lam, 2011; Huszár, Prónay and Buzás, 2016), possibility to open the doors to job opportunities in industry for students (Lam, 2007, 2011; Huszár, Prónay and Buzás, 2016), intellectual stimulation and learning opportunities (D'Este and Perkmann, 2011; Lam, 2011), were the main important drivers for AE. Personal financial gains were, on the contrary, rarely mentioned, also confirmed by previous studies (Göktepe-Hulten and Mahagaonkar, 2010; D'Este and Perkmann, 2011; Lam, 2011; Huszár, Prónay and Buzás, 2016). In other words, all drivers strictly linked to their academic work-identity and profession.

Thus, the study confirms what maintained by McInnis (2012) regarding the persistence among academics in different 'contexts' (institutional or disciplinary for example) of certain common *motifs* which are elements of their professional identity. Other scholars also have highlighted that despite the changes in the higher education systems, there is continuity of certain traditional values and norms of the academic profession (Henkel, 2000, 2010; Dowd and Kaplan, 2005; Ylijoki, 2008; Hakala, 2009; Musselin, 2010; Lam and Campos, 2015; Ylijoki and Ursin, 2013; Ylijoki and Henriksson, 2017). This is probably due to the fact, as introduced in Chapter 8, that an academic identity develops through a long process of training regarding specific skills, but also socialisation processes through which norms and values of the profession are acquired (Van Maanen and Schein, 1979; Jain, George and Maltarich, 2009; Lieff *et al*., 2012; Ylijoki and Henriksson, 2017). The result of such a lengthy formation is a strong work-identity, which perhaps explains why it is difficult to adjust and accommodate for new roles, as discussed in Chapter 8, or other careers. Regarding the latter, only some exceptions were found; as discussed, very few interviewees explained

that they were thinking of a career change. However, these minority groups were found exclusively in the U.K. and Australia (details of which reported in Chapter 8), and their motivations were not linked to a disinterest in the academic pathway *per se*, but to difficulties in pursuing it as a result of a lack of job opportunities or the need to accommodate personal life conditions which could not been meet with an academic life. The findings thus suggest that for scientists, in different institutional and national contexts, their academic identity maintains salience (Callero, 1985; Stryker, 1980; Stryker and Serpe, 1982; Settles, 2004).

The present study, thus, in agreement with previous research (Jain, George and Maltarich, 2009; Göktepe-Hulten and Mahagaonkar, 2010; Lam, 2010; Gulbrandsen, 2005; Meek and Wood, 2016) argues that AE should be looked at from a career and identity lens. This may entail focusing on aspects of the profession such as for example pro-social tendencies (Andersen and Pallensen, 2008), reflected in academics' interest in making research outcomes at the service of the society. In very practical terms this may include expanding the range of entrepreneurial activities and supporting especially those which have a stronger resonance with academic identity, as for example social entrepreneurship, as introduced in Chapter 8, which could be more aligned with academics' societal ethos. In this regard Balven *et al.* (2018, p.32) adopted the concept of 'deontic justice' in the context of AE to explain the willingness of academics to address societal problems with their research activities. The present study has illustrated how such a theme was rather pervasive across the interviews, especially in the Australian group, as explained in Chapters 7 and 8, and also previous sections of this chapter. While such tendencies were particularly relevant among those working with the public sector, they were frequently found among the interviewees, also those working with the private.

The discourse on AE could also consider leveraging academics' tendency towards discovery and intellectual stimulation, as reported by the vast majority of the interviewees in this study, and/or ensuring interest alignment, and a mutual enrichment between being involved in entrepreneurial activities with the research activity itself (e.g. D'Este and Perkmann, 2011). It could also focus more extensively on the informal types of activities. As discussed, previous studies have shown that such activities are wider spread across academics (Klofsten and Jones-Evans, 2000; D'Este and Patel, 2007; D'Este and Perkmann, 2011; Audretsch, Lehmann and Wright, 2012; Abreu and Grinevich, 2013; Bolzani *et al*., 2014; Tartari, Perkmann and Salter, 2014; Tartari, Salter and D'Este, 2014; Kalar and Antoncic, 2015; Balven *et al*., 2018). The present study has provided evidence on a potential mechanism behind it, linked to academics' ability to be *'boundaryless'*. This ability could be reinforced and adopted in the context of AE. Policy makers may take into considerations individual differences, and perhaps proposing *'alternative career pathways'* (A4), which may allow different sub-populations of academics to follow and express their abilities, without forcing, and 'pushing' AE as a top-down and 'for all' imperative. Tailored approaches to AE may also serve to accommodate the variety which emerged regarding the disciplinary fields and how this heterogeneity impacts upon AE.

These are only some examples of initiatives that policy makers could implement, and they are far from being exhaustive. This is also because of the numerous factors underpinning AE as this study highlighted, which suggest that a 'one size fits all' strategy for AE would be misplaced, as it would fail to capture such heterogeneity (D'Este and Perkmann, 2011; Lam, 2011; Filippetti and Savona, 2017; Fini and Grimaldi, 2017). The study, thus, agrees with previous works (Azagra-Caro, Aznar-Marqez and Blanco, 2008; Göktepe-Hultén and Mahagaonkar, 2010; D'Este and Perkmann, 2011; Lam, 2011; Huszár, Pronay and Buzás,

2016; Balven *et al*., 2018) in sustaining the importance of providing a wide range of monetary but also non-monetary incentives for AE, which consider the multiple drivers as well as constraining factors around AE, but also the discourse on academic profession and identity.

With the cross-country analysis adopted, the study adds to the literature evidence from different institutional and national contexts which serve to strength the notion of a 'universality' of certain dynamics underpinning AE, linked to the individual scientists, as well as the academic profession and identity. Further considerations are reported in Chapter 10.

9.2 Summary

The study suggests that AE is a multi-dimensional phenomenon, tightly linked with academics' careers and identity. The study shows that individual factors have a critical role in shaping academics' entrepreneurial behaviour. However, while being an individual-choice, AE is enabled and constrained by various 'contexts' in which the individual scientists live and work (e.g. Ylijoki and Henriksson, 2017). In so doing, the study addresses some of the claims made by previous scholars (Göktepe-Hultén and Mahagaonkar, 2010; Lam, 2010, 2011; Ylijoki and Henriksson, 2017; Ambos *et al*., 2018; Balven *et al*., 2018) regarding the need to analyse AE looking at processes which involve the individual and how he/she manages his/her work and roles in the contemporary changing environment. In this regard, the study provides evidence about how the discourse of embracing an entrepreneurial role rotates around the legitimacy of such role. This entails a variety of issues, where promotion criteria but also disciplinary norms and values play a significant role in shaping academics' willingness to embrace an entrepreneurial role.

The cross-country perspective adopted has helped in illuminating the presence of 'universal' or 'international' mechanisms and factors in relation to AE, linked to the individual, in terms of specific attitudes, but also connected to the academic profession. It has also provided insight into the convergence regarding gaps in the implementation phase of the 'third mission' which seemed to be present across universities in different countries, signalling the need for policy-makers and university management to revise certain practices and initiatives. At the same time, the divergences which emerged suggest the persistence of specific national socio-cultural and economic issues as influential upon AE, but also on how academics conceive of their work and career.

All these elements suggest that AE is an 'individual choice made in contexts'. In such a decision, the individual scientist is influenced by his/her skills, attitudes, the support received by the institution, the disciplinary field, the career stage, the opportunities offered by the macro and meso contexts, cultural aspects, which all shape perceptions of the boundaries across organisations and roles, and if and how the *cross* will be ultimately enacted.

The study suggests the need to provide specific approaches in relation to AE, which takes into consideration the needs of sub-populations of academics, which differ for all the factors mentioned above (e.g. Fini and Grimaldi, 2017), as well as to provide monetary but also non-monetary incentives, taking into account an alignment between AE and academics' careers and work-identity.

Chapter 10. Conclusions

10.1 Introduction

The thesis aimed to examine the factors and processes underpinning AE, with a special focus on its interplay with academics' careers. To do so, a multi-dimensional approach was adopted, in line with the mainstream literature on the topic which suggested the presence of a 'significant gap in the literature' regarding a 'multi-level perspective' of AE (Fini and Grimaldi, 2017, p. 10). Thanks to this approach, the study contributes in regard to: (i) the importance of individual variables and processes underpinning AE; (ii) cross-country convergence, linked to aspects of the academic profession and work-identity, as well as similarities in gaps in the implementation of the third mission; (iii) divergence due to national-contexts' policies, socio-cultural and economic aspects.

The present chapter summarises the main evidence and the contribution of the thesis from an empirical, theoretical, methodological perspective, reflecting also on the practical implications of the findings. The chapter ends with consideration of the limitations of the study, suggesting some directions for future research. It must be noted that while the study has reported a variety of factors underpinning AE, it has also shown that these interact one with the other, and these dynamics mitigate or reinforce the role of one or more factors on the others. The chapter starts the discussion with a general overview of the main findings, and their facilitating or constraining role; after that an overview of how these factors appeared to interplay is provided.

10.2 Contributions

The study contributes to the notion of AE as a multi-dimensional phenomenon. The decision to become involved in entrepreneurial activities is for academics an individual choice,

influenced by the meso and macro contexts in which the individual is embedded. It is also a career decision, as academics evaluate costs and benefits of such involvement, especially in relation to their career prospects, interests, orientations, and work-identity. The study has revealed that AE constitutes a form of boundary-crossing for academics; however, perceptions of the boundaries between different organisations and roles are not homogenous across scientists. Diverging attitudes, skills, personal interests, career stage, disciplinary field, sex, national socio-economic and cultural aspects, and the support provided by the university, influence the 'boundaried *or* boundaryless' (Dowd and Kaplan, 2006, p. 2005) nature of AE. As will be discussed later, the study challenges the BC theory in its original definition, where it suggested the erosion of the boundaries across sectors and organisations. The findings reported here instead support the idea of persistence of boundaries, which are differently perceived and crossed according to the factors mentioned above and discussed in previous chapters. To sum-up, the study indicates that:

At the **individual level**, factors such as entrepreneurial alertness and BC mind-set are positive predictors of AE. The positive effect of entrepreneurial alertness which emerged across countries sustains the idea of over-arching or 'supranational' (Miranda, Chamorro, and Rubio, 2018, p. 1021) facilitating factors for AE, which apply in different national and institutional settings. This is an important contribution for the literature as it adds evidence about the 'micro-foundations' of AE (Jain, George and Maltarich, 2009, p. 922). This underlines the need to refocus the attention on the individual scientist in regard to his/her abilities and attitudes which may make an academic more or less entrepreneurial oriented. Regarding entrepreneurial alertness specifically, the study extends the evidence on the effectiveness of this variable upon AE that only one study has previously analysed in the academic context (see Clarysse, Tartari and Salter, 2011). The study reinforces the evidence

by providing solid results thanks to the adoption of a more up-to-date and comprehensive scale to analyse entrepreneurial alertness, as well as it furnishes hints from a practical perspective. Methodological and practical implications will be discussed later.

The importance of the individual dimension is reinforced by evidence from the BC mind-set. Having analysed such aspects in the context of AE provides a unique contribution in the literature, furnishing the requested empirical evidence on the association between having a BC mind-set and the likelihood of engaging in entrepreneurship (Marshall, 2016). However, in relation to this attitude, the study has shown its effect on soft entrepreneurial activities exclusively. Its significance, furthermore, appeared not to apply in every context, corroborating the multi-dimensionality of AE, later further discussed. The exclusive effect of BC mind-set on soft forms of entrepreneurship, while a limitation for the scale, is an interesting finding for AE, as it signals that different processes underpin the variety of entrepreneurial activities in which academics may engage. This adds an explanation regarding the wider diffusion of soft forms of entrepreneurial activities among academics compared to the hard types. As discussed, the ability to cross boundaries of organisations and roles, and the ability to develop relationships outside the current employer have been considered by some scholars as a skill that academics tend to possess, since generally they collaborate with colleagues outside the university they work for (Baruch and Hall, 2004). As nowadays they are being expected not only to cross the boundaries of other research-type of organisations, but also those of the business sector with their collaborations, academics with high BC mind-set may have an advantage, especially in relation to the soft entrepreneurial activities, which particularly require the ability to establish personal connections. In so doing, the study addresses the need for 'better explanations of AE performance' (Balven *et*

al., 2018, p. 38) which could derive from ‘a greater focus on the human aspect of AE’ (ibid.). The usefulness of this insight from a practical perspective will be discussed later.

At the individual level, other factors that have been linked with improving AE are seniority at university, being involved in applied research, and being male. The study argues that senior academics benefit from experience and contacts with industrial partners accumulated over the years, whereas junior scholars often lack these resources and experiences, and are therefore usually less involved in AE. The exposure to AE also makes senior scholars more ‘aware’ of what it may entail, while conversely junior scholars may be less knowledgeable about it, which in turn appeared to negatively impact on their willingness to engage in AE.

Being involved in applied research appears to make academics more ‘open’ towards knowledge and technology transfer activities, seen as *natural* aspect of the research activity, compared to those involved in fundamental research, who tend to be more ‘distant’ or ‘reluctant’. The discipline acts as a constraining factor also for issues such as norms about transparency, data dissemination, and ethics, which while applying to science in general, in medical areas have stronger salience. In such fields, the role of the entrepreneur might also be difficult due to an even more intense workload than in other areas.

Regarding sex differences, the study has shown that especially in Italy women may have a disadvantage in entrepreneurship due to socio-economic and cultural issues. However, the interviews revealed sex discrimination at work and work-life conflicts also in the U.K. Interestingly, such themes were not particularly noticed in the Australian context, suggesting the importance of being aware of national contexts’ peculiarities, and thus the need to take into consideration such potential divergence, and how this may impact upon AE.

The issues at the **meso-level** which emerged as barriers for AE were intense workload, unclarity of career management policies and imbalance, but also lack of support on practical issues. The study has shown that AE may be particularly challenged by difficulties in handling different activities at work. This is coupled by the still dominant role of publications for career promotion, and mixed-messages sent regarding the importance of AE for career advancement. The study has shown that when AE has a positive and clear impact upon academics' careers, scientists tend to become involved in it, and have a more positive opinion about it. Conversely, lack and/or unclear recognition creates 'mixed' positions towards it, or it discourages some from involvement in it.

The findings have also revealed the presence of very practical barriers across countries. Extensive bureaucracy, difficulties in contacting external partners, and others discussed in previous chapters, emerged as negative factors upon academics' entrepreneurial behaviour. These issues are also intertwined with the discourse of lack of time; as academics are already very busy with their traditional tasks at work, they may be challenged in their entrepreneurial activity when this is very time-consuming. Instead, when support is provided, academics tend to be more successful in entrepreneurship, and more positive about it.

At the **macro-level**, issues that drew away from their effectiveness are a rigid labour market, traditional orientations in research, weaker industrialisation and/or presence of not innovation-oriented businesses (such as small/family businesses), lower development of policies towards AE, sex stereotypes, but also diverging access to resources and support between sexes. The study has shown how being embedded in national contexts such as Italy with a low level of industrialisation - at least compared to other European countries - and with businesses often of small scale makes AE more challenging, as the territory does not provide opportunities for academia-industry linkages. Instead it fosters perceptions of

separation between the two sectors. This seemed to have favoured traditional orientations in research, also promoting 'distant' and 'reluctant' opinions about AE. In contrast, in countries such as the U.K., where policies towards AE have a longer tradition and the level of industrialisation and innovativeness is higher compared to Italy, some academics talked about themselves as 'academic and entrepreneur'. However, entrepreneurial academics were found also in Italy and Australia, as discussed in previous chapters; the national context, as also later discussed, is, in fact, only one among the influential or constraining factors, and it may also act as a general influential factor upon AE, without a necessarily negative or positive influence. For instance, while also in Australia some talked about a weak industrialisation of the country, the interesting finding was how the national context's peculiarities were impacting upon AE by influencing research objectives. Some interviewees discussed their involvement in specific research works on, for example, natural resources' conservation or rural aboriginal communities' issues, to address specific societal needs. These areas often stimulate collaborations with the public sector, albeit not exclusively, and they are generally sustained by a strong societal ethos. Thus, the national context impacts on AE through the direction of the research's focus. Its effect appeared also to be more profound on the academic profession itself. While societal aims appeared, in fact, as dominant in the Australian group, they were also frequently mentioned across countries.

The effect of the national context on the academic profession can be broadly applied to all three countries, also in relation to another pervasive theme: funding. As mentioned, initiatives aimed at developing an entrepreneurial model of university were perceived by the vast majority of the participants in all the three countries. Motivated by a variety of factors, ranging from intellectual stimulation or job opportunities for students, to the possibility to develop alternative career pathways, the study has shown that *impact* and gaining resources

for the research activity were the most cited themes. The entrepreneurial university has indeed been a 'wave' (Etzkowitz (2015, p. 9) on which external forces have had a significant push. Academics are 'navigating a sea of change' (Meek and Wood, 2016, p. 1093) which is challenging not only their working practices, but also their work-identity. The study has shown that while some academics are already professionally 'open' towards AE or prone to add a *commercial persona* in to their roles' repertoire, others are not equipped, available and/or interested in such a modification. The study contributes to the literature by providing additional typologies of academics to those identified by previous research, furnishing evidence on alternative strategies enacted; these do not always entail the layering of roles, or the assumption of hybrid identities, but also 'distanced selves', supported by organisational identification processes or cynical attitudes, as well as 'reluctant' positions; but also, 'curious' ones.

All the micro-meso-macro factors reported above, and discussed in previous chapters, emerged as influential on the willingness to modify (or not) the boundaries of the work-identity. Most importantly, the study has shown that these elements act in an intertwined way. In other words, while some elements emerged as generally significant facilitators or barriers, their effect may be mitigated or reinforced by other elements. Regarding BC mind-set for example, this did not emerge as a significant predictor in the British context, where instead coming from medicine was a stronger determinant, in this case negative, for AE. In this context being from medicine furthermore appeared to lower the positive effect of entrepreneurial alertness, as shown in Chapter 5. That said, as discussed earlier, a few examples of 'Academic and entrepreneur' or 'Open' scientists from medicine were found in the U.K. but this was due to a mix of personal interests, skills, support provided by the environment, including recognition for AE in terms of career advancement.

Furthermore, while it has been noted that typical 'academic and entrepreneurs' profiles were found in the U.K. as a result of more advanced policies towards AE, these were also seen in Italy, where AE has a shorter history compared to the U.K. As discussed in previous chapters, in these cases, personal interests, applied orientation of research, being male, and having received support emerged as facilitating factors for one of the cases reported; for another, it was about personal interests, being male, and in a senior position that seemed to sustain the entrepreneurial behaviour, mitigating the negative effect of the low industrialisation of the country and the general less innovative focus.

Other examples may concern career stage. While it has been noted earlier that senior scholars are generally advantaged in AE, not all seniors were prone to entrepreneurship nor interested. Being from a basic-science field of research creates boundaries between 'what we do here' (Ylijoki and Henriksson, 2017, p. 1298) in the scientific community, versus 'what they do there' in industry, making some senior academics embedded, and *loyal*, to specific 'tribes' (ibid.). Disciplinary norms, thus, act as constraining factors upon seniority.

Combinations of various factors were found among all the other categories mentioned in Chapter 8, with the effect of the various elements also discussed in Chapter 9. This work, thus, supports the idea of complexity of AE, echoing previous research (e.g. Cohen, Duberley and McAuley, 1999; Hayter *et al.*, 2018). Multidimensionality does not only entail the presence of micro-meso-macro factors acting upon AE, but also their dynamic interactions. While disentangling the scenario provides insight into the role of each factor, the picture remains somewhat partial, and potentially misleading. When combining the elements, the scenario assumes a more holistic and comprehensive meaning where however it is more challenging to find a single prototype of 'entrepreneurial scientist'; instead it appeared that there is a 'a myriad of positions that are neither old nor new school, but instead

combine characteristics of both' (Owen-Smith and Powell, 2001a, p. 4). The study, in fact, challenges the boundaryless career theory in its early conceptualisation, which emphasises the erosion of boundaries across organisations and roles. While the theory has proved its usefulness to frame entrepreneurship as a boundary-crossing, the study argues that the discourse of 'science and business' is bound *and* boundaryless. Boundaries persist and these are constituted by the academic discipline, the profession, career stage, support received, personal interests and skills, sex, socio-cultural and economic aspects.

The adoption of a multi-dimensional analysis has provided evidence on the role of these factors and their dynamics, especially in combination with a cross-country comparative analysis. The latter has shed light on divergence across countries linked to national-context's peculiarities. At the same time, it has also shown convergence, contributing to the notion of the presence of overarching influences upon AE, linked to individual characteristics as well as the academic profession and identity; the latter seems to still preserve its core and traditional values, in diverging institutional and national contexts. The implication of these findings is that AE should be seen as an individual choice, regarding which the single scientist evaluates its costs and benefits in terms of his/her career and work-identity. Such an evaluation while intra-individual is influenced by the meso and macro contexts in which he/she is embedded. These outcomes provide some useful insight from a practical perspective.

10.3 Practical implications

The findings strongly support the idea that 'one size fits all' approach for AE would be ineffective, as ultimately maintained by some scholars (e.g. Lam, 2011; Philpott *et al*., 2011; Filipetti and Savona, 2017; Fini and Grimaldi, 2017). Policy makers should consider:

i. Divergencies in national contexts

ii. Issues at the meso-level

iii. Divergencies in sub-populations of academics

Regarding point one, the study suggests implementing tailored approaches which take into consideration the level of industrialisation, specificities of types of organisations present in the national context, and peculiar societal needs of each context. In Australia for example issues related to sex divergencies were not particularly noticed, whereas the career stage emerged as a significant negative predictor of AE, more than in the other two countries. This, since explained as an effect of the changing and unstable initiatives promoted regarding the third mission, signals that in this country there is the need to act upon the messages sent from the top. Policy-makers may have to work on providing a clearer and more consistent direction in regard to AE. Furthermore, it seems that AE may be more attractive to academics in Australia if developed as a form of social entrepreneurship, to aligning more with the societal aims particularly present among these academics. The latter however may be a valid initiative also for the other two countries, and perhaps more internationally, considering the discourse around societal aims as widely diffused across academics as part of their profession and identity.

In Italy, policy-makers may consider how to adapt AE to small/family businesses, perhaps by promoting soft forms of activities which may better suit such types of sectors, and providing incentives for these collaborations, rather than extensively focusing on hard entrepreneurial activities. In the U.K., AE may have to be reconsidered more in relation to sub-populations of academics (i.e. those from medicine) as discussed later, with also a revision of the meso-level gaps highlighted by this study.

Regarding the latter, tailored approaches should consider how specific policies are promoted and implemented at **meso-level.** For instance, a revision of career promotion criteria

emerged as a key issue for AE in all the three countries. The study has signalled how universities may have a significant role in promoting entrepreneurship by legitimising it through recognition and promotion criteria. Realigning AE with academics' career pathways may be a strategic solution to encourage it. In this regard, one interviewee from Australia suggested the creation of alternative and different career pathways, with some including a stronger entrepreneurial component and others a more traditional one. This could address inter-individual differences so that those academics who have the interest and capability to engage in entrepreneurial activities may –perhaps more intensely– do so, while not jeopardising their academic career.

The importance of revision and clarification of promotion criteria is linked to the discourse on **workload management.** The study has shown how this is a relevant issue for academics' working practice in general, and for AE specifically, in all the three countries. Academics have to plan and prioritise activities carefully, given the numerous tasks to accomplish; clarity on how to prioritise the agenda may promote AE, while reducing the difficulties associated to the intense workload experienced. Work-life balance is beyond the scope of this work, but the study has found some interesting future research directions in this area, discussed later.

At the meso-level other important issues to consider regard for instance how to make AE a simpler task. This may entail revising the legal aspects and the bureaucracy around it, while also providing, for example, more direct contacts and/or assisting in the creation of academia-industry linkages. In this regard, interviewees suggested the development of some platforms that may connect external organisations with academics, and viceversa. This may benefit academics in general, perhaps encouraging those more reluctant as well as the curious to engage in such activities.

Meso-level initiatives should also consider the provision of training to foster entrepreneurial intentions. Scholars (e.g. Markman and Baron, 2003; Valliere, 2013) maintain that training may improve personal skills and cognitive styles, including entrepreneurial alertness (Valliere, 2013; Ho *et al*., 2018; Neneh, 2019). Training should perhaps also look at providing general entrepreneurship skills. While the importance of this aspect has been underlined by various scholars, studies have reported that training has a more significant effect on soft entrepreneurial activities than the hard types (Abreu and Grinevich, 2013). This evidence is particularly relevant considering, as discussed, that soft forms of entrepreneurship are more diffused among academics. It seems that there is potential to effectively increase AE, if this was considered in its broad definition, i.e. referring to both hard but also soft forms of activities, as well as if it was more effectively supported. This may also entail looking at the individual scientists more attentively. The evidence regarding the impact of BC mind-set on soft activities suggests that universities may consider providing various forms of support and training tailored to specific activities, as underpinned by diverging mechanisms.

The study also suggests that initiatives should be tailored according to **sub-populations of academics.** This signifies looking at individual skills and attitudes, with the aim for instance to promote specific training, as well as looking at elements such as the disciplinary/research field, career stage, and sex. The findings have revealed curiosity for entrepreneurship among groups of academics such as the junior and/or those coming from basic science areas, providing that certain boundaries will be reduced. Junior scholars may particularly benefit from training and exposure towards entrepreneurship. Those coming from basic research areas may be incentivised by the promotion of activities such as the soft types which may better suit specific disciplinary areas. In this regard, initiatives should also look at what

assuming an entrepreneurial role may entail in fields within the health sciences, where issues regarding secrecy and data dissemination as well as workload appeared particularly sensitive.

The study has also shown that the discourse of science in general, as well as the one of science and business more specifically is to some extent gender biased. Universities may have a role in promoting AE by also looking at the difficulties female academics may experience establishing a career at university. While examples of female entrepreneurial academics were reported, the study also discussed some issues this sub-population seems facing, which not only may negatively impact upon AE, but also on female scientists' overall working life.

The study argues that the 'third mission' may become a 'third burden' when it is not aligned with academics' work-identity, but also because it may compete with numerous other tasks, it may increase work-life conflicts for certain groups, or because it is not properly rewarded, or adequately supported, or because it is not in line with the ethos and values of certain 'sub-tribes' within academia. Policy-makers should look at such heterogeneity, determined by micro-meso-macro level factors and their dynamic interactions, otherwise risking reluctance or distanced attitudes from academics. In regard to this, Philpott *et al*., (2011) suggest bottom-up approaches, instead of top-down. The present study argues that top-down approaches are not necessarily ineffective; scientists have demonstrated that they can be receptive to proposals from the top, and able to accommodate for them; the key point is to find a good combination between what is proposed from the top and how this is implemented at the meso level, and ultimately enacted at the micro. More than top-down or bottom-up it could be considered looking at the duality between the two, in a recursive way. In a recent

review Hayter *et al*. (2018) underlined the need to establish '"vertical connections"' between micro-macro, and to 'frame these connections in terms of complex interactions' (p. 1073).

10.4 Methodological contribution

The study provides some methodological contributions. The use of Tang, Kacmar, and Busenitz's (2012) scale to assess academics' entrepreneurial alertness strengthen the evidence regarding the effect of this individual attitude on AE, as the previous study which focused on this aspect adopted a shorter, and less up to date tool (Clarysse, Tartari and Salter, 2011). This in turn furnishes this study and the literature with more solid data. The use of this scale also provides a novel contribution in the area, since it has generally been used in typically business-oriented settings. The authors themselves asked for further validation by adopting it in a variety of business and non-business contexts. Furthermore, the scale has been translated and back-translated and adopted in a non-English-speaking country, thus the study provides evidence on its cross-country utilisation; at the same time, it provides an instrument which could be used in future studies, in either business or non-business-oriented sectors in Italy.

Similar considerations can be made regarding the BC Mind-set Scale (Briscoe, Hall, and DeMuth 2006). Its adoption in the context of AE provides an original contribution, confirming the usefulness of the scale in a variety of contexts, and ultimately addressing the authors' query about what being *boundaryless* may imply. While demonstrating that having a BC career mind-set is a predictor of entrepreneurial behaviour, the scale, as discussed, has also furnished precious and specific insight regarding the different mechanisms underpinning soft and hard entrepreneurial activities. Furthermore, while an Italian version was already available, its utilisation in another Italian setting provide further evidence

regarding the use of this scale in a variety of settings, and samples, as suggested by the authors themselves.

Similarly, the adoption of the D'Este and Patel (2007) adapted version of the academia-industry questionnaire in a variety of contexts furnishes additional evidence and support to the scale. Furthermore, as discussed in the methodology, the scale was slightly modified from the original in relation to two items, therefore the study provides an alternative version which could then be utilised in other English and Italian settings.

The methodological contribution of this work also lies in combining the macro-meso-micro approach with the adoption of a cross-country comparative design. This approach while providing the necessary evidence to address the study's research questions, contributes to the literature on AE enriching it with the much-requested evidence from international settings (e.g. Harley, Muller-Camen, and Collins, 2004; Lam, 2010; Fini and Grimaldi, 2017; Hayter *et al*., 2018; Miranda, Chamorro and Rubio, 2018; Mathisen and Rasmussen, 2019). The specific focus on the U.K., Australia, and Italy provides an original contribution, as these three countries share relevant similarities and differences in regard to their higher education systems (as explained in Chapter 3), yet there are few if any studies which provide systematic comparisons of the impact of their higher education contexts upon scientific careers. Particularly the inclusion of Australia and Italy extends the evidence beyond U.S. and U.K. or other European countries (Tartari and Breschi, 2012; Fini and Grimaldi, 2017; Hayter *et al*., 2018), generally Western Europe (Mathisen and Rasmussen, 2019). This has helped provide knowledge about the effect of peculiarities of national contexts in terms for instance of the impact of socio-cultural and economic issues upon AE, for instance regarding the different diffusion of policies towards AE in the three countries.

The cross-country comparative nature of the study has also shed light on the convergence on certain aspects of AE, particularly the persistence of *continuity* of traditional values, norms, but also aims and motivations among academics which are linked to their academic identity, which appeared to retain its core features across institutional and national contexts, also in times of changes. In so doing, addressing the need for evidence about the 'supranational…factors affecting the academic entrepreneurship spirit' (Miranda, Chamorro and Rubio, 2018, p. 1020). It has also furnished evidence regarding the similarities in regard to the difficulties in the implementation phases at the meso-level, with some issues such as recognition, workload, but also disciplinary issues, being 'international' concerns; thus, signalling similar gaps in the implementation phase to be addressed. This has been particularly possible by analysing 'different types of institutions simultaneously' (ibid. p. 1021).

Another methodological contribution lies in the use of a mixed-methods approach. As maintained by Mathisen and Rasmussen (2019), studies on AE are more frequently mono-method, and this constitutes a limit in regard to a more comprehensive understanding of the phenomenon (Miranda, Chamorro and Rubio, 2018; Mathisen and Rasmussen, 2019). In this study, a multiple level, mixed-methods strategy has strengthened the evidence on the role of specific factors, such as for instance personal skills and abilities, as emerged from both the qualitative and quantitative analyses, providing rounder evidence and thus more solid explanations. It has also helped in providing precious insight about the convergence across countries on themes such as the difficulties faced by women in academia that an exclusive reliance on quantitative data would not have captured. While in fact the quantitative data has signalled an exclusive positive effect of being male in Italy, explained as the result of women' difficulties in establishing a career in academia as well as specific challenges related

to entrepreneurship in general, the interviews revealed that also in the U.K. women have to deal with discrimination, and work-life conflict. In so doing, in turn, the mixed-method approach has provided an insight on the multi-dimensionality of AE, and how the various factors interplay, mitigating and/or reinforcing one another. The use of qualitative and quantitative data has also strengthened the explanation regarding the effect of the national context' policies towards entrepreneurship, and what this may entail at micro-level. For example, the interviews by showing 'mixed' opinions especially among the Australian sample provided explanations for the negative coefficient regarding the career stage especially in this context emerged in the quantitative analysis. The ambiguous messages deriving from policy-makers related to the 'third mission' have likely impacted on how academics approach AE; this is particularly true for junior-middle scholars, who lack training and experience, as reported at the interviews, as well as who as aiming to establish an academic career, they are concentrating on publications. The mixed-methods strategy in summary has helped corroborating the evidence emerged from the two methods, while also overcoming the weaknesses of each, and it has expanded the knowledge.

10.5 Limitations and future directions

The study presents some limitations. First, the cross-sectional nature limits the possibility to make causal inference (Bryman and Bell, 2015). Such an approach does not allow a check on longitudinal changes in academics' entrepreneurial behaviour. This would provide useful information to corroborate the findings about, for instance, how academics' entrepreneurial involvement changes as the career progresses; a point which emerged from this study. Future research in this direction may indeed reveal interesting insights.

Second, the scale adopted to assess the dependent variable (academics' level of entrepreneurial activities) includes both formal and informal types of activities, giving equal

weight to each of them, as they are rated using the same 0-5 frequency scale. While this was a strategy aimed at gathering a broad perspective on AE, it must be acknowledged that some activities may require more time than others (such as patenting versus joint research); therefore, a different scoring system which takes into account such divergence, for instance, may provide more meaningful results. Future research work may consider developing alternative methods in this direction; it would also make a significant contribution from a methodological perspective as the literature lacks such a tool.

Another limit lies in the potential influence of other factors, not included in the study, on both entrepreneurial alertness and the BC mind-set. These are for instance, proactive personality traits (Uy *et al.*, 2015), or self-efficacy, and resilience (Obschonka, Hahn and Bajwa, 2018), just to cite some. Thus, while the present study wanted to focus on the specific effect of certain variables on entrepreneurship, the results are not exhaustive of the numerous other individual variables that might be involved.

The study also acknowledges the subjectivity present in the qualitative component where an interpretivist stance was taken. This is not a limitation in itself, as ultimately such an approach was necessary to explore scientists' sense-making. However, as discussed in Chapter 6, strategies were adopted to mitigate and prevent some of the potential weaknesses of this method.

Other considerations regard the study's focus on exclusively academics working at university, which does not allow to control and explore motivations and career orientations of those who have left academia to pursue only entrepreneurial activities. This might be another direction to take in future works.

Finally, the attention on the STEM disciplines limits the generalisability to other research areas. While such a strategy was adopted to enhance the possibility to appreciate the phenomenon, given the longer history and wider diffusion of AE within this group, future studies may expand towards the arts and social sciences for example. While some works have already taken such direction (e.g. Philpott *et al*., 2011; Hazelkorn, 2014; Olmos-Penuela, Castro-Martinez and D'Este; Olmos-Penuela, Benneworth and Castro-Martinez, 2015; Abreu and Grinevich, 2017), the literature is still dominated by the STEM. As however AE is expanding, including a focus on other fields may prove to be an insightful path.

The study has also signalled directions in relation to academics' work-life balance as a topic to investigate also in relation to the third mission. Evidence from the three countries suggests a contemporary need to revise academics' workload and practices.

Appendices

Survey AE and careers

Thank you for your interest in this research. Before you start the survey, I need to check you know what the research is about, what your involvement will be and confirm that you agree to take part. Please read the following information.

What is the study's scope?

The present study aims to explore how academics collaborate with external organisations, and how these activities are inter-related with their career perspectives. The study adopts a cross-country comparison design, focusing on academics from three different Universities located in Europe and Australia. The results may greatly benefit the understanding of the changes that have been taking place in the recent decades within universities in many countries, providing the ground for future modifications and improvements.*What will I be asked to do if I take part?*

If you decide to take part, you will be asked to complete a very brief web-survey that lasts around 10 minutes.

Am I obliged to take part?

No. The participation is voluntary. Moreover, if you initially decide to take part but you change your mind later you are free to withdraw within six months of the date of your consent. If you decide to withdraw your data will be removed from the research documents.

How data will be collected, stored and utilised?

The web-survey will be administered on-line. All the data will be securely stored in password protected computers, for a period required for the research. Data will be treated

confidentially, and accessed only by me and potentially my supervisors (in anonymous form), if necessary for the analysis and understanding. The data will be utilised in my PhD thesis, and potentially disseminated through conferences, publications, and other similar research-related uses. In all these cases, confidentiality will be respected; data from the survey will be disclosed in aggregate form, and you will not be identified in any case.

What are the potential risks?

There is no known potential risk in participating in this project.

Will I be paid?

Unfortunately, it is not possible to remunerate you for your time, **but you may benefit from the results**, which can provide precious insights on the processes and motivations underpinning these complex activities that are nowadays part of many universities' agenda. *What do I have to do if I wish to take part?* If you want to take part in the study, you just need to continue with the survey. For any further enquiry or comments you may have, please do not hesitate to contact me at: [redacted]. Thank you in advance for your attention! I really hope you will take part in the study.

Consent form

Please note the following:

I have read and understood the information provided, I had the opportunity to ask questions and, in case, these were answered satisfactorily.

I understand that my participation in the present study is voluntary, and that I can withdraw without providing any explanation within 6 months from this consent.

If I have any question about this research I can contact the researcher, Giulia Giunti, at [redacted].

Do you wish to take part? (By clicking on "yes" you give your consent)

- ○ yes (1)
- ○ no (2)

If 2:

I am really sorry that you decided not to take part in this project. If you wish to change your mind and continue, please click the "take part" option below. I really hope you will consider this option.

- ○ Do not want to take part (2)
- ○ Take part (1)

What is your position at university?

- ○ PhD student/or Teaching Fellow/ and/or honorary academic staff (0)
- ○ Post-doctoral researcher (1)
- ○ Research Fellow (2)
- ○ Lecturer (3)
- ○ Reader (4)
- ○ Professor (5)

If 0:

Thank you for your interest. However, PhD students and teaching fellows have been excluded from the sample since generally they have less opportunities to be involved in entrepreneurial activities.

Moreover, since the study focuses on academics currently working in this university, honorary academics have been also excluded because in many cases are no longer part of the university or they work for different organisations.

Academia-Industry collaborations

In this section I am interested in discovering in which kind of entrepreneurial activities you might have been involved in ***the last 24 months,*** and how often. Please select the option that applies to you for each activity listed below: Note: ***Joint research*** *projects* refer to collaboration agreements between university and industry that involve research work undertaken by both parties / ***Contract research*** refers to research commissioned by industry and undertaken only by university researchers / ***Consultancy work*** refers to work commissioned by industry, which does not involve original research (e.g. conducting routine tests or providing advice to industry) / ***Secondment*** refers to the temporary allocation of an employee in another organisation, i.e. industry.

	0 times (1)	1-2times (2)	3-5 times (3)	6-9 times (4)	≥ 10 times (5)
1. Creation of new physical facilities with industry funding (e.g. new laboratory, other buildings on campus)	○	○	○	○	○
2. Setting up equity interests in companies (e.g. spin-off companies)	○	○	○	○	○
3. A new joint research agreement (original research work undertaken by both partners	○	○	○	○	○
4. A new contract research agreement (original research work done by University alone)	○	○	○	○	○
5. A new consultancy agreement (no original research undertaken)	○	○	○	○	○
6. Training of company employees (through course enrollment or through temporary personnel sharing)	○	○	○	○	○
7. Postgraduate training in the company (e.g. joint supervision of PhDs)	○	○	○	○	○
8. Secondments to industry (short or long term)	○	○	○	○	○
9. Attendance at conferences with both industry and university participation (9)	○	○	○	○	○
10. Attendance at industry sponsored meetings	○	○	○	○	○
11. Patenting	○	○	○	○	○
12. Other activities related to the protection of Intellectual Property Rights (IPRs)	○	○	○	○	○

Exploring your career attitudes

This section aims to explore your *career attitudes and preferences.* Please indicate the extent to which the following statements are true for you, using the following response scale. Please answer freely, there is no right or wrong answer, but only your personal choice!

	to little or no extent (1)	to a limited extent (2)	to some extent (3)	to a considerable extent (4)	to a great extent (5)
1. I seek job assignments that allow me to learn something new.	○	○	○	○	○
2. I would enjoy working on projects with people across many organizations.	○	○	○	○	○
3. I enjoy job assignments that require me to work outside of the organization.	○	○	○	○	○
4. I like tasks at work that require me to work beyond my own department.	○	○	○	○	○
5. I enjoy working with people outside of my organization.	○	○	○	○	○
6. I enjoy jobs that require me to interact with people in many different organizations.	○	○	○	○	○
7. I have sought opportunities in the past that allow me to work outside the organization.	○	○	○	○	○
8. I am energized in new experiences and situations.	○	○	○	○	○
9. I like the predictability that comes with working continuously for the same organization.	○	○	○	○	○
10. I would feel very lost if I couldn't work for my current organization.	○	○	○	○	○
11. I prefer to stay in a company I am familiar with rather than look for employment elsewhere.	○	○	○	○	○
12. If my organization provided lifetime employment, I would never desire to seek work in other organizations.	○	○	○	○	○
13. In my ideal career I would work for only one organization.	○	○	○	○	○

How "alert" are you for business opportunities?

The following questions refer to **activities you may enact <u>in order to identify business opportunities</u>** with profit potential. They **do not refer** to activities related **to the academic work**, but to the possibility to identify business opportunities.

	Strongly disagree [1]	[2]	[3]	[4]	Strongly agree [5]
1. I have frequent interactions with others to acquire new information about business opportunities.	○	○	○	○	○
2. I always keep an eye out for new business ideas when looking for information.	○	○	○	○	○
3. I read newss, magazines, or trade publications regularly to acquire new business information.	○	○	○	○	○
4. In order to identify business opportunities, I browse the Internet every day.	○	○	○	○	○
5. I am an avid information seeker.	○	○	○	○	○
6. I am always actively looking for new information.	○	○	○	○	○
7. I see links between seemingly unrelated pieces of information.	○	○	○	○	○
8. I am good at "connecting dots".	○	○	○	○	○
9. I often see connections between previously unconnected domains of information.	○	○	○	○	○
10. I have a gut feeling for potential opportunities.	○	○	○	○	○
11. I can distinguish between profitable opportunities and not-so-profitable opportunities.	○	○	○	○	○
12. I have a knack for telling high-value opportunities apart from low-value opportunities.	○	○	○	○	○
13. When facing multiple opportunities, I am able to select the good ones.	○	○	○	○	○

Socio-demographic section

In this section, I am interested in gathering some socio-demographic information that are very important for the study. I would like to remind you that data will be treated confidentially. This information serves here to understand if some socio-demographic elements (i.e. age) may have an influence on the process of engaging with industry. Could you please specify your gender?

- ○ Female (2)
- ○ Male (1)

What is your age in years?

In which College do you work?

- ○ College of Engineering and Physical Sciences (EPS) (which includes Chemical Engineering, Chemistry, Civil Engineering, Computer Science, Electronic, Electrical and Systems Engineering, Mathematics, Physics and Astronomy) (1)
- ○ College of Life and Environmental Sciences (LES) (which includes Biosciences, Geography, Earth and Environmental Sciences, Psychology, Sport, Exercise and Rehabilitation) (2)
- ○ College of Medical and Dental Sciences (3)

Could you please specify in which School do you work?

- ○ Biosciences (4)
- ○ Geography, Earth and Environmental Sciences (5)

Could you please specify in which School do you work?

- ○ Chemical Engineering (6)
- ○ Chemistry (7)
- ○ Civil Engineering (8)
- ○ Computer Science (9)
- ○ Electronic, Electrical and Systems Engineering (10)
- ○ Mathematics (11)
- ○ Mechanical Engineering (12)
- ○ Metallurgy and Materials (13)
- ○ Physics and Astronomy (14)

Do you wish to help further?

For this study, I aim also to gather additional and direct information on academic entrepreneurship and academics' careers. I would like, thus, to invite you to a one-to-one interview, which will last around 30- 40 minutes.

If you wish to take part, please fill the form below. In this way, I can contact you to arrange a date, time and location that are for you more convenient for the interview.

If you wish to receive more information about the interview, please do not hesitate to contact me at: [redacted]. As for survey, your participation is completely voluntary.

I sincerely thank you for your attention, and I really hope you will decide to take part at the interview. This is a crucial step since it may allow your experiences, opinions and suggestions to be listened and to contribute not only to the project but to the understandingof these challenges transformations that are taking place within universities worldwide, providing the ground for future improvements.

- Full name (1) _____
- Telephone (2) _____
- Email (3) _____
- If you wish, indicate here a preferred time to contact you (4) _____

Table A1. Results of the robust linear regression models

	U.K.			Australia			Italy		
	1a	1b	1c	2a	2b	2c	3a	3b	3c
Entrepreneurial alertness	0.228***	0.242**	0.287***	0.116**	0.062	0.114**	0.176***	0.096**	0.190***
	(0.041)	(0.076)	(0.052)	(0.039)	(0.052)	(0.041)	(0.034)	(0.037)	(0.034)
BC mind-set	0.028	0.027	0.026	0.090*	0.091*	0.090*	0.111**	0.090*	0.111**
	(0.044)	(0.046)	(0.043)	(0.043)	(0.043)	(0.043)	(0.040)	(0.042)	(0.040)
Discipline (medicine = 1)	-1.719**	-1.675**	3.747*	-1.275	-1.394+	-2.555	0.689	0.667	4.775
	(0.618)	(0.601)	(1.887)	(0.855)	(0.839)	(3.094)	(0.803)	(0.790)	(3.053)
Sex (male = 1)	-0.360	0.418	0.019	0.374	-2.248	0.357	1.362*	-3.726+	1.388*
	(0.700)	(2.469)	(0.686)	(0.595)	(2.359)	(0.600)	(0.599)	(2.058)	(0.592)
Age	0.039	0.038	0.029	-0.021	-0.026	-0.020	-0.027	-0.027	-0.032
	(0.033)	(0.032)	(0.033)	(0.035)	(0.036)	(0.037)	(0.030)	(0.030)	(0.029)
Role:									
Post-doc	0.431	0.353	0.228	-2.272	-2.312	-2.257	-2.883*	-3.360**	-2.960*
	(2.203)	(2.053)	(2.130)	(1.417)	(1.413)	(1.422)	(1.413)	(1.241)	(1.486)
Research fellow	-1.681	-1.732	-1.784+	-2.959**	-2.969**	-2.947**	-1.340	-1.496	-1.364
	(1.061)	(1.089)	(1.045)	(1.104)	(1.111)	(1.112)	(2.178)	(2.109)	(2.155)
Lecturer	-1.478+	-1.535*	-1.366+	-3.256**	-3.322**	-3.239**	-1.650*	-1.602*	-1.737*
	(0.766)	(0.768)	(0.751)	(1.084)	(1.087)	(1.095)	(0.761)	(0.758)	(0.767)
Associate prof.	-0.661	-0.699	-0.322	-1.623	-1.552	-1.608	-0.871	-0.852	-0.913
	(1.458)	(1.463)	(1.469)	(0.988)	(0.987)	(0.995)	(0.702)	(0.696)	(0.711)
Entrepreneurial alertness X male		-0.022			0.071			0.137*	
		(0.078)			(0.068)			(0.058)	
Entrepreneurial alertness X discipline			-0.149**			0.035			-0.109
			(0.055)			(0.087)			(0.086)
Constant	7.337**	6.961*	5.395*	11.610***	13.755***	11.616***	6.810**	10.706***	6.580*
	(2.508)	(2.824)	(2.647)	(3.018)	(3.564)	(3.025)	(2.596)	(2.908)	(2.601)
Respondents	196	196	196	223	223	223	247	247	247
Log Likelihood	-555.4	-555.3	-551.6	-645.2	-644.6	-645.1	-681.2	-677.4	-679.9
Df	9	10	10	9	10	10	9	10	10
r-squared	0.343	0.343	0.368	0.19	0.195	0.191	0.318	0.339	0.325

Note: standard errors in parentheses; p< 0.05*, p< 0.01**, p< 0.001***

Table A2. Results of the robust linear regression for 'hard' and 'soft' entrepreneurial activities

	U.K.						Australia						Italy					
	13a (AIH)	13b (AIH)	13c (AIH)	14a (AIS)	14b (AIS)	14c (AIS)	15a (AIH)	15b (AIH)	15c (AIH)	16a (AIS)	16b (AIS)	16c (AIS)	17a (AIH)	17b (AIH)	17c (AIH)	18a (AIS)	18b (AIS)	18c (AIS)
EA	0.058***	0.063*	0.081***	0.170***	0.179***	0.206***	0.030**	0.002	0.028**	0.085*	0.060	0.086*	0.034***	0.028*	0.035***	0.141***	0.068*	0.155***
	(0.013)	(0.026)	(0.017)	(0.030)	(0.053)	(0.037)	(0.010)	(0.009)	(0.010)	(0.034)	(0.049)	(0.036)	(0.007)	(0.012)	(0.008)	(0.030)	(0.033)	(0.030)
BC mind-set	-0.017	-0.017	-0.017	0.044	0.044	0.043	0.009	0.009	0.009	0.082*	0.082*	0.082*	0.016	0.014	0.016	0.095**	0.076*	0.095**
	(0.013)	(0.014)	(0.012)	(0.035)	(0.035)	(0.034)	(0.011)	(0.011)	(0.011)	(0.038)	(0.038)	(0.038)	(0.012)	(0.012)	(0.012)	(0.033)	(0.035)	(0.033)
Discipline (med=1)	-0.663***	-0.648***	1.449**	-1.056*	-1.027*	2.299	0.216	0.153	-1.447	-1.491+	-1.547*	-1.108	0.113	0.111	0.400	0.576	0.556	4.375
	(0.187)	(0.176)	(0.498)	(0.493)	(0.494)	(1.554)	(0.270)	(0.263)	(0.949)	(0.759)	(0.752)	(2.810)	(0.218)	(0.219)	(0.737)	(0.669)	(0.651)	(2.770)
Sex (male=1)	-0.102	0.163	0.046	-0.258	0.255	-0.025	0.194	-1.200**	0.171	0.181	-1.048	0.186	0.132	-0.262	0.134	1.230*	-3.464+	1.254**
	(0.212)	(0.782)	(0.197)	(0.546)	(1.842)	(0.552)	(0.151)	(0.460)	(0.154)	(0.534)	(2.184)	(0.537)	(0.196)	(0.529)	(0.196)	(0.475)	(1.817)	(0.467)
Age	0.010	0.010	0.006	0.029	0.028	0.023	-0.011	-0.014	-0.010	-0.010	-0.012	-0.010	-0.002	-0.002	-0.002	-0.025	-0.025	-0.030
	(0.010)	(0.009)	(0.009)	(0.027)	(0.027)	(0.027)	(0.011)	(0.011)	(0.011)	(0.031)	(0.031)	(0.031)	(0.008)	(0.008)	(0.008)	(0.026)	(0.026)	(0.025)
Post-doc	0.613	0.586	0.534	-0.182	-0.233	-0.306	-0.562	-0.583	-0.542	-1.710	-1.729	-1.715	-0.613+	-0.649+	-0.618+	-2.271+	-2.710*	-2.342+
	(0.769)	(0.706)	(0.740)	(1.496)	(1.418)	(1.453)	(0.388)	(0.383)	(0.385)	(1.245)	(1.248)	(1.249)	(0.355)	(0.347)	(0.361)	(1.178)	(1.054)	(1.245)
Research fellow	-0.451	-0.469	-0.491+	-1.229	-1.263	-1.293	-0.612*	-0.617*	-0.596*	-2.347*	-2.352*	-2.350*	-0.296	-0.308	-0.297	-1.044	-1.188	-1.067
	(0.303)	(0.312)	(0.289)	(0.849)	(0.869)	(0.845)	(0.298)	(0.296)	(0.297)	(0.978)	(0.984)	(0.984)	(0.435)	(0.436)	(0.435)	(1.788)	(1.710)	(1.764)
Lecturer	-0.368	-0.387	-0.324	-1.110+	-1.148+	-1.041+	-0.884**	-0.919**	-0.862**	-2.372*	-2.403*	-2.377*	-0.505*	-0.501*	-0.511*	-1.145+	-1.100+	-1.226*
	(0.239)	(0.235)	(0.227)	(0.627)	(0.632)	(0.623)	(0.281)	(0.279)	(0.280)	(0.980)	(0.988)	(0.986)	(0.225)	(0.225)	(0.228)	(0.616)	(0.615)	(0.620)
Associate prof.	0.089	0.076	0.220	-0.750	-0.775	-0.542	-0.899***	-0.861***	-0.879***	-0.724	-0.691	-0.729	-0.284	-0.283	-0.287	-0.586	-0.569	-0.626
	(0.407)	(0.406)	(0.396)	(1.130)	(1.135)	(1.144)	(0.245)	(0.247)	(0.241)	(0.902)	(0.900)	(0.907)	(0.222)	(0.222)	(0.224)	(0.568)	(0.562)	(0.574)
EAX male		-0.007			-0.014			0.038**			0.033			0.011			0.126*	
		(0.025)			(0.057)			(0.014)			(0.062)			(0.016)			(0.050)	
EAXdiscipline			-0.057***			-0.091*			0.045			-0.010			-0.008			-0.102
			(0.016)			(0.045)			(0.028)			(0.082)			(0.022)			(0.077)
Constant	3.469***	3.341***	2.719***	3.868+	3.620	2.676	4.065***	5.206***	4.074***	7.544**	8.549**	7.542**	2.957***	3.259**	2.941***	3.853+	7.447**	3.639+
	(0.680)	(0.836)	(0.720)	(2.090)	(2.241)	(2.206)	(0.811)	(0.822)	(0.804)	(2.692)	(3.270)	(2.698)	(0.836)	(1.008)	(0.831)	(2.145)	(2.381)	(2.154)
Respondents	196	196	196	196	196	196	223	223	223	223	223	223	247	247	247	247	247	247
Log Likelihood	-321.2	-321.1	-314.8	-509.2	-509.2	-506.9	-355.2	-353.0	-354.4	-615.1	-614.9	-615.1	-362.1	-361.8	-362.1	-639.4	-634.8	-637.8
Df	9	10	10	9	10	10	9	10	10	9	10	10	9	10	10	9	10	10
r-squared	0.272	0.273	0.318	0.328	0.328	0.344	0.152	0.169	0.158	0.164	0.165	0.164	0.187	0.189	0.187	0.302	0.327	0.31

Note: standard errors in parentheses; p< 0.05*, p< 0.01**, p< 0.001***; AI= Academia-Industry activities, EA = entrepreneurial alertness; med. = medicine; AIH = academia-industry hard entrepreneurial activities; AIS = academia-industry soft entrepreneurial activities.

Interview Guide

Semi-structured interview for academics

"Thank you for taking part in this interview. As previously mentioned, this study aims to understand academics' attitudes towards the possibility to embrace an entrepreneurial role and their career perspectives. I will ask you some questions regarding the possibility to engage with industry for commercial scopes, and if you already do it how do you manage it in relation to your academic role, and which are your experiences and perceptions.
The interview will last around 1 hour, and you are free to interrupt it and withdraw from it at any time. As I mentioned in the information sheet, the interview will be recorded and transcribed, and the data will be kept confidential.
You are free to ask any question during the interview, and also before we start."

Background info

Current role at University: "can I ask you, which is your current role at the University?"
Department of affiliation: "which is your department of affiliation?"
Discipline of specialisation: "and your discipline of specialisation?"
Time spent at the University of (name of university)*: "how long have you been working at the University of (name of university)?"
Gender (gender to be noted)

Micro-level*:*

1. Could you describe to me your career pathway, how it has started and evolved?
2. There have been any changes in your career perspectives?
3. What is your attitude towards the possibility to embrace an entrepreneurial role?
4. Do you collaborate with industry or other external organisations?

- Can you give some examples of types of organisations and activities you are/have been involved in?
  Prompt: e.g. patenting, creation of spin-offs…
- What do you enjoy of it?
- What do you find frustrating or difficult?

5. How do you manage your different commitments?

- Academic/entrepreneurial role

6. How do you configure the possibility to be involved in entrepreneurial activities in relation to your career? (In other words, do you consider it bringing any advantage to your career?)

Meso-level:

7. Could you give a brief overview of the level of involvement in entrepreneurial activities, with industry and other external organisations, in your department?

- Can you give some examples of types of organisations (sectors) and activities in which more often your department is involved in?
  Prompt: e.g. patenting, creation of spin-offs…

8. How these activities are supported within your department?
9. What do you consider are the main barriers?
10. How would you describe the level of support in entrepreneurial activities deriving- more generally- from the University of (name of university)*

- TTOs/BuzzInn…

11. What do you consider are the main barriers?
12. Would you suggest any change and/or improvement?
13. If you have worked in other universities, can you tell the main differences in relation to these issues, in comparison to the University of?

Macro- level:

14. Do you think there have been changes in the U.K.[**] regarding the trend towards entrepreneurship in academia, in the recent years?
15. What is your position in relation to these changes?

Future plans (Micro)

16. Could you describe any plan or idea you have for your future career?
    Prompt: academia/other organisations…
17. Has this plan changed over the years?

- Is this related, anyhow, to the involvement in entrepreneurial activities?

Would you like to add anything else?

Thank you for taking part in this interview, your contribution will be precious.

[*]names of specific Universities

[**] Australia/Italy

Table A3. Final template for the U.K. university

1. Previous individual career pathway
2. Individual level of involvement in entrepreneurial activities
2.1. Involvement in entrepreneurial activities 2.1.1. With industry 2.1.1.1. Types of activities 2.1.1.2. Types of sectors 2.1.1.3. Activities management 2.1.1.4. Drivers & benefits 2.1.1.5. Constraining factors 2.1.2. With public sector 2.1.2.1. Types of activities 2.1.2.2. Types of sectors 2.1.2.3. Activities management 2.1.2.4. Drivers & benefits 2.1.2.5. Constraining factors 2.2. No involvement in entrepreneurial activities 2.2.1. Motivations 2.2.2. Positives aspects 2.2.3. Constraining factors
3. Departmental level of entrepreneurial activity
3.1. Presence of entrepreneurial activities 3.1.1. Types of sectors 3.1.2. Types of activities 3.2. No entrepreneurship 3.3. Culture within the department 3.4. Support from the department 3.5. Lack of awareness of what colleagues do 3.6. Individualised effort more than departmental
4. Changes and improvements suggested
5. Support from the university
6. Recognition from university for the AE
7. Differences with other universities
8. Perceptions of changes at national level in entrepreneurial tendency 8.1. Feelings/opinions related to these changes
9. Individual career perspective (future)
9.1. Entrepreneurial academics 9.1.1. Academia 9.1.2. Industry 9.2. Non-entrepreneurial academics 9.2.1. Academia 9.2.2. Interest in entrepreneurship or industry
10. Other issues

Table A4. Final template for Australia

1. Previous individual career pathway
2. Individual level of involvement in entrepreneurial activities
2.1. Involvement in entrepreneurial activities 2.1.1. With industry 2.1.1.1. Types of activities 2.1.1.2. Types of sectors 2.1.1.3. Activities management 2.1.1.4. Drivers & benefits 2.1.1.5. Constraining factors 2.1.2. With public sector 2.1.2.1. Types of activities 2.1.2.2. Types of sectors 2.1.2.3. Activities management 2.1.2.4. Drivers & benefits 2.1.2.5. Constraining factors 2.2. No involvement in entrepreneurial activities 2.2.1. Motivations 2.2.2. Positives aspects 2.2.2.1. Potential benefits 2.2.2.2. Potential enjoyable aspects 2.2.3. Constraining factors
3. Departmental level of entrepreneurial activity
3.1. Presence of entrepreneurial activities 3.1.1. Types of sectors 3.1.2. Types of activities 3.2. No entrepreneurship
4. Culture within the department
4.1. Support from the department 4.2. Lack of awareness of what colleagues do 4.3. Individualised effort more than departmental
5. Changes and improvements suggested
6. Support from the university
6.1. Dedicated services and offices 6.2. Encouragement 6.3. Financial support 6.4. Lack of awareness of support 6.5. Lack of support 6.6. Information sharing 6.7. Individual responsibility
7. Recognition from university for the AE
8. Differences with other universities
9. Perceptions of changes at national level in entrepreneurial tendency 9.1. No changes perceived 9.2. Changes perceived 9.2.1. Feelings/opinions related to these changes 9.3. Unable to answer because not much involved in entrep.
10. Individual career perspective (future)
10.1.Entrepreneurial academics 10.1.1. Academia 10.1.2. Industry 10.2. Non-entrepreneurial academics 10.2.1. Academia 10.2.2. Interest in entrepreneurship or industry
11. Other issues

Table A5. Final template for Italy

1. Previous individual career pathway
2. Individual level of involvement in entrepreneurial activities
2.1. Involvement in entrepreneurial activities 2.1.1. With industry 2.1.1.1. Types of activities 2.1.1.2. Types of sectors 2.1.1.3. Activities management 2.1.1.4. Drivers & benefits 2.1.1.5. Constraining factors 2.1.2. With public sector 2.1.2.1. Types of activities 2.1.2.2. Types of sectors 2.1.2.3. Activities management 2.1.2.4. Drivers & benefits 2.1.2.5. Constraining factors 2.2. No involvement in entrepreneurial activities 2.2.1. Motivations 2.2.2. Positives aspects 2.2.2.1. Potential benefits 2.2.2.2. Potential enjoyable aspects 2.2.3. Constraining factors
3. Departmental level of entrepreneurial activity
3.1. Presence of entrepreneurial activities 3.1.1. Types of sectors 3.1.2. Types of activities 3.1.3. It depends on the discipline 3.1.4. Seniority 3.2. No entrepreneurship 3.2.1. Discipline 3.2.2. Italian context 3.2.3. Instrumentation
4. Culture within the department
4.1. Support from the department 4.2. Lack of awareness of what colleagues do 4.3. Individualised effort more than departmental 4.4. Examples of entrepreneurship 4.5. Critical issues in patenting
5. Changes and improvements suggested
6. Support from the university
6.1. Dedicated services and offices 6.2. Encouragement 6.3. Financial support 6.4. Lack of awareness of support 6.5 Lack of support 6.6. PhD plus
7. Recognition from university for the AE
8. Differences with other universities
9. Perceptions of changes at national level in entrepreneurial tendency 9.1. No changes perceived 9.2. Changes perceived 9.2.1. Feelings/opinions related to these changes 9.3. Unable to answer because not much involved in entrep.
10. Individual career perspective (future)
10.1. Entrepreneurial academics 10.1.1. Academia 10.1.2. Industry 10.2. Non-entrepreneurial academics 10.2.1. Academia 10.2.2. Interest in entrepreneurship or industry
11. Other issues

Bibliography

Abramo, G., D'Angelo, C. A., and Rosati, F. (2015) 'The determinants of academic career advancement: evidence from Italy', *Science and Public Policy*, 42 (6), pp. 761–774.

Abreu, M., and Grinevich, V. (2013) 'The nature of academic entrepreneurship in the UK: widening the focus on entrepreneurial activities', *Research Policy*, 42 (2), pp. 408–422.

Abreu, M., and Grinevich, V. (2017) 'Gender patterns in academic entrepreneurship', *Journal of Technology Transfer*, 42, pp. 763–794.

Adams, J. D., Chiang, E. P., and Starkey, K. (2001) 'Industry–university cooperative research centers', *Journal of Technology Transfer*, 26 (1-2), pp. 73–86.

Agarwal, R., and Shah, S. K. (2014) 'Knowledge sources of entrepreneurship: firm formation by academic, user and employee innovators', *Research Policy*, 43 (7), pp. 1109–1133.

Agrawal, A. (2006) 'Engaging the inventor: exploring licensing strategies for university inventions and the role of latent knowledge', *Strategic Management Journal*, 27 (1), pp. 63–79.

Agrawal, A., and Henderson, R. (2002) 'Putting patents in context: exploring knowledge transfer from MIT', *Management Science*, 48 (1), pp. 44–60.

Ahl, H. (2006) 'Why research on women entrepreneurs needs new directions', *Entrepreneurship Theory and Practice*, 30 (5), pp. 595–621.

Aldridge, T. T., and Audretsch, D. (2011) 'The Bayh–Dole Act and scientist entrepreneurship', *Research Policy*, 40 (8), pp. 1058–1067.

Algieri, B., Aquino, A., and Succurro, M. (2013) 'Technology transfer offices and academic spin-off creation: the case of Italy', *The Journal of Technology Transfer*, 38 (4), pp. 382–400.

Allen, I.E., Elam, N., Langowitz, N. and Dean, M. (2007) '*Global Entrepreneurship Monitor Report on Women and Entrepreneurship'*, Babson College, Babson Park: MA and London Business School: London.

Allinson, C. W., Chell, E., and Hayes, J. (2000) 'Intuition and entrepreneurial behaviour', *European Journal of Work and Organizational Psychology*, 9 (1), pp. 31–43.

Allmer, T. (2018) 'Precarious, always-on and flexible: a case study of academics as information workers', *European Journal of Communication*, 33 (4), pp. 381–395.

Altbach, P. G. (1996) *The international academic profession: portraits of fourteen countries – special report*. Princeton, NJ: Carnegie Foundation for the Advancement of Teaching.

Ambos, T. C., Makela, K., Birkinshaw, J., and D'Este, P. (2008) 'When does university research get commercialized? Creating ambidexterity in research institutions', *Journal of Management Studies,* 45 (8), pp. 1424–1447.

Andersen, L. B., and Pallensen, T. (2008) 'Not just for money? How financial incentives affect the number of publications of Danish research institutions', *International Public Management Journal,* 11 (1), pp. 28–47.

Antoncic, B., Kregar, T.B., Singh, G., and DeNoble, A.F. (2015) The Big Five Personality-Entrepreneurship relationship: evidence from Slovenia, 53(3), pp. 819-841.

Archer, M., Bhaskar, R., Collier, A., Lawson, T., and Norrie, A. (eds) (1998) *Critical realism: essential readings*. London: Routledge.

Arenius, P., and Minniti, M. (2005) 'Perceptual variables and nascent entrepreneurship', *Small Business Economics,* 24 (3), pp. 233–247.

Arthur, M. B. (2014) 'The boundaryless career at 20: where do we stand, and where can we go?', *Career Development International,* 19 (6), pp. 627–640.

Arthur, M. B., and Rousseau, D. M. (1996) *The boundaryless career: a new employment principle for a new organizational era*. Oxford: Oxford University Press.

Arvanitis, S., Kubli, U., and Woerter, M. (2008) 'University–industry knowledge and technology transfer in Switzerland: what university scientists think about co-operation with private enterprises', *Research Policy,* 37 (10), pp. 1865–1883.

Ashforth, B. E., Harrison, S. H., and Corley, K. G (2008) 'Identification in organizations: an examination of four fundamental questions', *Journal of Management,* 34 (3), pp. 325–374.

Ashforth, B. E., and Humphrey, R. H. (1993) 'Emotional labor in service roles: the influence of identity', *The Academy of Management Review,* 18 (1), pp. 88–115.

Ashforth, B. E., and Johnson, S. A. (2001) 'Which hat to wear? The relative salience of multiple identities in organizational contexts', in Hogg, M. A., and Terry, D. J. (eds) *Social identity processes in organizational contexts*. Philadelphia, PA: Psychology Press, pp. 31–18.

Ashforth, B. E., Kreiner, G. E., and Fugate, M. (2000) 'All in a day's work: boundaries and micro role transitions', *Academy of Management Review*, 25 (3), pp. 472–491.

Audretsch, D., Lehmann, E., and Paleari, S. (2015) 'Academic policy and entrepreneurship: a European perspective', *Journal of Technology Transfer*, 40 (3), pp. 363–368.

Audretsch, D., Lehmann, E., and Wright, M. (2014) 'Technology transfer in a global economy', *Journal of Technology Transfer*, 39 (3), doi:10.1007/s10961-012-9283-6.

Australian Government (2018) *Engagement and impact assessment*. Available at: https://www.arc.gov.au/engagement-and-impact-assessment (Accessed 13 March 2019).

Azagra-Caro, J. M., Aznar-Marqez, J., and Blanco, J. M. (2008) 'Interactive vs. non-interactive knowledge production by faculty members', *Applied Economics*, 40 (10), pp. 1289–1297.

Azoulay, P., Ding, W., and Stuart, T. (2007) 'The determinants of faculty patenting behaviour: demographics or opportunities?', *Journal of Economic Behaviour and Organization*, 63 (4), pp. 599–623.

Bagdadli, S., Solari, L., Usai, A., and Grandori, A. (2003) 'The emergence of career boundaries in unbounded industries: career odysseys in the Italian New Economy', *The International Journal of Human Resource Management*, 14 (5), pp. 788–808.

Bains, W. (2005) 'How academics can make extra money out of their science', *Journal of Commercial Biotechnology*, 11 (4), pp. 353–363.

Baldini, N., Fini, R., and Grimaldi, R. (2015) 'The transition towards entrepreneurial universities: an assessment of academic entrepreneurship in Italy', in Link, A. N., Siegel, D. S., and Wright, M. (eds) *Chicago handbook of university technology transfer and academic entrepreneurship*. Chicago, IL: University of Chicago Press, pp. 218–244.

Baldini, N., Fini, R., Grimaldi, R., and Sobrero, M. (2010) 'The institutionalisation of university patenting activity in Italy: diffusion and evolution of organisational practices', *Cambridge Journal of Economics "universities and the knowledge economy" workshop*, Cambridge, 28–29 June.

Baldini, N., Grimaldi, R., and Sobrero, M. (2007) 'To patent or not to patent? A survey of Italian inventors on motivations, incentives, and obstacles to university patenting', *Scientometrics*, 70 (2), pp. 333–354.

Balven, R., Fenters, V., Siegel, D. S., and Waldman, D. (2018) 'Academic entrepreneurship: the roles of organizational justice, championing, education, work–life balance, identity, and motivation', *Academy of Management Executive*, 32 (1), doi:10.5465/amp.2016.0127.

Baron, R. A. (2006) 'Opportunity recognition as pattern recognition: how entrepreneurs "connect the dots" to identify new business opportunities', *Academy of Management Perspectives,* 20 (1), pp. 104–119.

Baruch, Y. (1999) 'Response rate in academic studies: a comparative analysis', *Human Relations*, 52 (4), pp. 421–438.

Baruch, Y. (2014) 'The development and validation of a measure for protean career orientation', *The International Journal of Human Resource Management*, 25 (19), pp. 2702–2723.

Baruch.Y., and Hall, D. T. (2004) 'The academic career: a model for future careers in other sectors?', *Journal of Vocational Behaviour,* 64 (2), pp. 241–262.

Baskaran, A., and Boden, M. (2004) 'Science: a controversial commodity', *Science, Technology and Society,* 9 (1), pp. 1–26.

Baum, J. R., Frese, M., and Baron, A. A. (2014) *The psychology of entrepreneurship*. Abingdon: Taylor & Francis.

Baum, J. R., and Locke, E. A. (2004) 'The relationship of entrepreneurial traits, skill, and motivation to subsequent venture growth', *Journal of Applied Psychology,* 89 (4), pp. 587–598.

Bence, V., and Oppenheim, C. (2005) 'The evolution of the UK's Research Assessment Exercise: publications, performance and perceptions', *Journal of Educational Administration and History*, 37 (2), pp. 137–155.

Benneworth, P., and Jongbloed, B. W. (2010) 'Who matters to universities? A stakeholder perspective on humanities, arts and social sciences valorisation', *Higher Education*, 59 (5), pp. 567–588.

Bercovitz, J., and Feldman, M. (2008) 'Academic entrepreneurs: organizational change at the individual level', *Organization Science*, 19 (1), pp. 69–89.

Bercovitz, J., Feldman, M., Feller, I., and Burton, R. (2001) 'Organizational structure as a determinant of academic patent and licensing behavior: an exploratory study of Duke, Johns Hopkins, and Pennsylvania State Universities', *The Journal of Technology Transfer,* 26 (1), pp. 21–35.

Bergmann, H., Hundt, C., and Sternberg, R. (2016) 'What makes student entrepreneurs? On the relevance (and irrelevance) of the university and the regional context for student start-ups', *Small Business Economics*, 47 (1), pp. 53–76.

Berzonsky, M. D. (1992) 'Identity style and copying strategies', *Journal of Personality*, 60 (4), pp. 771–788.

Bhidé, A. V. (2000) *The origin and evolution of new businesses*. New York, NY: Oxford University Press.

Bianchi, M., Parisi, V., and Salvatore, R. (2016) 'Female entrepreneurs: motivations and constraints – an Italian regional study', *International Journal of Gender and Entrepreneurship*, 8 (3), pp. 198–220.

Biddle, C., and Schafft, K. A. (2015). 'Axiology and anomaly in the practice of mixed methods research: pragmatism, valuation and the "transformative paradigm"', *Journal of Mixed Methods Research*, 9 (4), pp. 320–334.

Biemann, T., Zacher, H., and Feldman, D. (2012) 'Career patterns: a twenty-year panel study', *Journal of Vocational Behavior*, 81 (2), pp. 159–170.

Boden, R., Cox, D., and Nedeva, M. N. (2006) 'The appliance of science? New public management and strategic change', *Technology Analysis and Strategic Management,* 18 (2), pp. 1–17.

Bolzani, D., Fini, R., Grimaldi, R., and Sobrero, M. (2014) 'University spin-offs and their impact: kongitudinal evidence from Italy', *Economia e Politica Industriale*, 41 (4), pp. 179–205.

Brandstätter, H. (2011). 'Personality aspects of entrepreneurship: a look at five meta-analyses', *Personality and Individual Differences*, 51 (3), pp. 222–230.

Braun, V., and Clarke, V. (2006) 'Using thematic analysis in psychology', *Qualitative Research in Psychology*, 3 (2), pp. 77–101.

Briscoe, J. P., and Finkelstein, L. M. (2009) 'The "new career" and organizational commitment', *Career Development International*, 14 (3), pp. 242–260.

Briscoe, J. P., and Hall, D. T. (2006) 'The interplay of boundaryless and protean careers: combinations and implications', *Journal of Vocational Behaviour,* 69, pp. 4–18.

Briscoe, J. P., Hall, D. T., and DeMuth, R. L. F. (2006) 'Protean and boundaryless careers: an empirical exploration', *Journal of Vocational Behaviour,* 69, pp. 30–47.

Brislin, R.W. (1980) 'Translation and content analysis of oral and written material', in Triandis, H. C., and Berry, J. W. (eds) *Handbook of cross-cultural psychology: methodology*. Boston, MA: Allyn and Bacon, pp. 389–444.

Brockhaus, R. H. (1982) 'The psychology of the entrepreneur', in Kent, C. A., Sexton, D. L., and Vesper, K. H. (eds) *Encyclopedia of Entrepreneurship*. Englewood Cliffs, NJ: Prentice-Hall, pp. 39–57.

Brooks, J., McCluskey, S., Turley, E., and King, N. (2012) 'The utility of template analysis in qualitative psychology research', *Qualitative Research in Psychology*, 12 (2), pp. 202–222.

Brown, A. D., and Humphreys, M. (2006) 'Organizational identity and place: a discursive exploration of hegemony and resistance', *Journal of Management Studies*, 43 (2), pp. 231–257.

Bruni, A., Gherardi, S., and Poggio, B. (2004) *Gender and entrepreneurship: an ethnographic approach*. London: Routledge.

Bryan, M., and Nandi, A. (2015) *Working hours, work identity and subjective wellbeing*. London: Institute for Social and Economic Research.

Bryman, A. (2012) *Social research methods.* 4th edn. Oxford: Oxford University Press.

Bryman, A., and Bell, E. (2015) *Business research methods*. Oxford: Oxford University Press.

Buenstorf, G. (2009) 'Is commercialization good or bad for science? Individual-level evidence from the Max Planck Society', *Research Policy,* 38 (2), pp. 281–292.

Butler, L. (2008) 'Using a balanced approach to bibliometrics: quantitative performance measures in the Australian Research Quality Framework', *Ethics in Science and Environmental Policies,* 8 (1), pp. 1–10.

By, R. T., Diefenbach, T., and Klarner, P. (2008) 'Getting organisational change right in public services: the case of European higher education', *Journal of Change Management,* 8 (1), pp. 21–35.

Calderini M., Franzoni C., and Vezzulli A. (2007) 'If star scientists do not patent: the effect of productivity, basicness and impact on the decision to patent in the academic world', *Research Policy,* 36 (3), pp. 303–319.

Callero, P. L. (1985) 'Role-identity salience', *Social Psychology Quarterly*, 48 (3), 203–215.

Campbell, E. G., Clarridge, B. R., Gokhale, M., Birenbaum, L., Hilgartner, S., Holtzman, N. A., and Blumenthal, D. (2002) 'Data withholding in academic genetics', *The Journal of the American Medical Association*, 287 (4), pp. 473–480

Campbell, E. G., Weissman, J. S., Causino, N., and Blumenthal, D. (2000) 'Data-withholding in academic medicine: characteristics of faculty denied access to research results and biomaterials', *Research Policy,* 29 (2), pp. 303–312.

Capano, G. (2010) 'A Sisyphean task: evaluation and institutional accountability in Italian higher education', *Higher Education Policy*, 23 (1), 39–62.

Carifio, L., and Perla, R. (2008) 'Resolving the 50-year debate around using and misusing Likert scales', *Medical Education,* 42 (12), pp. 1150–1152.

Castro-Martínez, E., Molas-Gallart, J., and Olmos-Peñuela, J. (2010) 'Knowledge transfer in the social sciences and the humanities: informal links in a public research organization', Working Paper No 2010/12, Polytechnic University of Valencia Ingenio, Valencia, Spain.

Caulfield, T., Harmon, S. H., and Joly, Y. (2012) 'Open science versus commercialization: a modern research conflict?', *Genome Medicine*, 4 (2), doi:10.1186/gm316.

Caza, B. B., and Creary, S. J. (2016) 'The construction of professional identity', in Wilkinson, A., Hislop, D., and Coupland, C. (eds) *Perspectives on contemporary professional work: challenges and experiences*. Cheltenham: Edward Elgar Publishing, pp. 259–285.

Chait, R. P., ed. (2002) *The questions of tenure.* Cambridge MA: Harvard University Press.

Chan, K. Y., Ho, M.-H. R., Chernyshenko, O. S., Bedford, O., Uy, M., Gomulya, D., Sam, Y. L., and Phan, W. M. (2012) 'Entrepreneurship, professionalism, leadership: a framework and measure for understanding boundaryless careers', *Journal of Vocational Behaviour,* 81 (1), pp. 73–88.

Chandler, J., Barry, J., and Clark, H. (2002) 'Stressing academe: the wear and tear of the new public management', *Human Relations*, 55 (9), pp. 1051–1069.

Chandrasekharan, S., and Cook-Deegan, R. (2009) 'Gene patents and personalized medicine - what lies ahead?', *Genome Medicine*, 1 (9), doi:10.1186/gm92.

Chen, C. C., Greene, P. G., and Crick, A. (1998) 'Does entrepreneurial self-efficacy distinguish entrepreneurs from managers?', *Journal of Business Venturing,* 13 (4), 295–316.

Cherney, A., Head, B., Boreham, P., Povey, J., and Ferguson, M. (2012) 'Perspectives of academic social scientists on knowledge transfer and research collaborations: a cross-sectional survey of Australian academics', *The Policy Press,* 8 (4), pp. 433–453.

Cherryholmes, C. H. (1992) 'Notes on pragmatism and scientific realism', *Educational Researcher*, 21 (6), pp. 13–17.

Cho, M.K., Illangasekare S., Weaver, M.A., Leonard, D.G., and Merz, J.F. (2003) 'Effects of patents and licenses on the provision of clinical genetic testing services', *The Journal of Molecular Diagnostic*, 5(1), pp. 3-8.

Choak, C. (2012) 'Asking questions: interviews and evaluations', in Bradford, S., and Cullen, F. (eds) *Research and research methods for youth practitioners*. London: Routledge, pp. 90–112.

Chudzikowski, K. (2012) 'Career transitions and career success in the "new" career era', *Journal of Vocational Behaviour*, 81 (2), pp. 298–306.

Clark, P. (2007) 'The commercialisation of university research and economic productivity', *Higher Education Management and Policy,* 19 (1), pp. 133–144.

Clarke, C., Knights, D., and Jarvis, C. (2012) 'A labour of love? Academics in business schools', *Scandinavian Journal of Management*, 28 (1), pp. 5–15.

Clarke, V., and Braun, V. (2017) 'Thematic analysis', *Journal of Positive Psychology*, 12 (3), pp. 297–298.

Clarysse, B., and Moray, N. (2004) 'A process study of entrepreneurial team formation: the case of a research based spin-off', *Journal of Business Venturing*, 19 (1), pp. 55–79.

Clarysse, B., Tartari, V., and Salter, A. (2011) 'The impact of entrepreneurial capacity, experience and organizational support on academic entrepreneurship', *Research Policy,* 40 (8), pp. 1084–1093.

Cohen, L., and Duberley, J. (2015) ‘Three faces of context and their implications for career: a study of public sector careers cut short’, *Journal of Vocational Behaviour*, 91, pp. 189–202

Cohen, L., Duberley, J., and Mallon, M. (2004) ‘Social constructionism in the study of career: accessing the parts that other approaches cannot reach’, *Journal of Vocational Behaviour*, 64, pp. 407–422.

Cohen, L., Duberley, J., and McAuley, J. (1999) ‘Fueling discovery or monitoring productivity: research scientists’ changing perceptions of management’, *Organization*, 6 (3), pp. 473–497.

Cohen, L., and Mallon, M. (2001) ‘My brilliant career? Using stories as a methodological tool in careers research’, *International Studies of Management & Organization*, 31 (3), pp. 48–68.

Cohen, L., and Ravishankar, M. N. (2012) ‘Doing qualitative business and management research in international and intercultural contexts’, in Symon, G., and Cassell, C. (eds) *Qualitative organizational research: core methods and current challenges*. London: Sage, Ch. 10.

Cohen, W. M., Nelson, R. R., and Walsh, J. P. (2002) ‘Links and impacts: the influence of public research on industrial R&D’, *Management Science,* 48 (1), pp. 1–23.

Colapinto, C. (2011) ‘Exploring academic entrepreneurship in the Milan area’, *Industry and Higher Education,* 25 (1), pp. 39–44.

Colosi, L. (2006) *Designing an effective questionnaire*. Ithaca, NY: Cornell Cooperative Extension. Available at: https://www.human.cornell.edu/sites/default/files/PAM/Parenting/professional%20pages/Designing-20an-20Effective-20Questionnaire.pdf (Accessed: 11 June 2015).

Colyvas, J. A., Snellman, K., Bercovitz, J., and Feldman, M. (2012) ‘Disentangling effort and performance: a renewed look at gender differences in commercializing medical school research’, *The Journal of Technology Transfer*, 37 (4), pp. 478–489.

Commonwealth of Australia (2000). *The chance to change: final report by the Chief Scientist*. Canberra, Australia: Commonwealth Department of Industry, Science and Resources.

Crespo, M., and Dridi, H. (2007) ‘Intensification of university–industry relationships and its impact on academic research’, *Higher Education*, 54 (1), pp. 61–84.

Creswell, J. W. (2003) *Research design: qualitative, quantitative, and mixed methods approaches*. 2nd edn. Thousand Oaks, CA: Sage.

Creswell, J. W., Plano Clark, V. L., Gutmann, M. L., and Hanson, W. E. (2003) 'Advanced mixed methods research designs', in Tashakkori, A., and Teddlie, C. (eds) *Handbook of mixed methods in social and behavioral research*. Thousand Oaks, CA: Sage, pp. 209–240.

Cui, Y., Sun, C., Xiao, H., and Zhao, C. (2016) 'How to become an excellent entrepreneur: the moderating effect of risk propensity on alertness to business ideas and entrepreneurial capabilities', Technological Forecasting and Social Change, 112, pp. 171-177.

D'Este, P., Mahdi, S., and Neely, A. (2010). 'Academic entrepreneurship: what are the factors shaping the capacity of academic researchers to identify and exploit entrepreneurial opportunities?', DRUID working paper, Copenhagen Business School, Department of Industrial Economics and Strategy, Aalborg University, Denmark.

D'Este, P., and Patel, P. (2007) 'University–industry linkages in the UK: what are the factors underlying the variety of interactions with industry?', *Research Policy,* 36 (9), pp. 1295–1313.

D'Este, P., and Perkmann, M. (2011) 'Why do academics engage with industry? The entrepreneurial university and individual motivations', *The Journal of Technology Transfer,* 36 (3), pp. 316–339.

Dany, F., Louvel, S., and Valette, A. (2011) 'Academic careers: the limits of the "boundaryless approach" and the power of promotion scripts', *Human Relations,* 64 (7), pp. 971–996.

Dasgupta, P., and David, P. A. (1994) 'Toward a new economics of science', *Policy Research,* 23 (5), pp. 487–521.

Davari, A., Emami, A., Ramadani, V., and Taherkhani, S. (2018) 'Factors influencing academic entrepreneurship: a case-based study', *Journal of Science and Technology Policy Management,* 9 (3), pp. 284–295.

David, P. A. (1998) 'Common agency contracting and the emergence of "open science" institutions', *American Economic Review,* 88 (2), pp. 15–21.

Debackere, K., and Veugelers, R. (2005) 'The role of academic technology transfer organizations in improving industry science links', *Research Policy,* 34 (3), pp. 321–342.

Deem, R., and Brehony, K. J. (2005) 'Management as ideology: the case of new managerialism in higher education', *Oxford Review of Education*, 31 (2), pp. 217–235.

Deem, R., Hillyard, S., and Reed, M. (2008) *Knowledge, higher education, and the new managerialism: the changing management of UK universities*. London: Oxford University Press.

Dees, J. G. (1998) 'The meaning of "social entrepreneurship"', working paper, Stanford University Graduate School of Business, Stanford, CA.

Dees, J. G., and Anderson, B. (2006) 'Framing a theory of social entrepreneurship: building on two schools of practice and thought', *ARNOVA Occasional Paper Series*, 1 (3), pp. 39–66.

DeFilippi, R. J., and Arthur, M. B. (1994) 'The boundaryless career: a competency-based perspective', *Journal of Organisational Behaviour,* 15 (4), pp. 307–324.

Denscombe, M. (2008) 'Communities of practice: a research paradigm for the mixed methods approach', *Journal of Mixed Methods Research*, 2 (3), pp. 270–283.

Dillman, D. A., Smyth, J. D., and Christian, L. M. (2014) *Internet, phone, mail, and mixed-mode surveys: the tailored design method*. Hoboken, NJ: John Wiley & Sons.

Ding, W., and Choi, E. (2011) 'Divergent paths to commercial science: a comparison of scientists' founding and advising activities', *Research Policy*, 40 (1), pp. 69–80.

Ding, W. W., Murray, F., and Stuart, T. E. (2006) 'Gender differences in patenting in the academic life sciences', *Science*, 313 (5787), pp. 665–667.

Donovan, C. (2008) 'The Australian Research Quality Framework: a live experiment in capturing the social, economic, environmental, and cultural returns of publicly funded research', *New Directions for Evaluation*, 118, pp. 47–60.

Dowd, K. O., and Kaplan, D. M. (2005) 'The career life of academics: boundaried or boundaryless?', *Human Relations*, 58 (6), pp. 699–721.

Duberley, J., and Cohen, L. (2010) 'Gendering career capital: an investigation of scientific careers', *Journal of Vocational Behaviour,* 76 (2), pp. 187–197.

Duberley, J., Cohen, L., and Leeson, E. (2007) 'Entrepreneurial academics: developing scientific careers in changing university settings', *Higher Education Quarterly*, 61 (4), pp. 479–497.

Duberley, J., Cohen, L., and Mallon, M. (2006) 'Constructing scientific careers: change, continuity and context', *Organization Studies*, 27 (8), pp. 1131–1151.

Duberley, J., Mallon, M., and Cohen, L. (2006) 'Exploring career transitions: accounting for structure and agency', *Personnel Review*, 35 (3), pp.281–296.

Dugas, D., Stich, A.E., Harris, L.N., and Summers, K.H. (2018) ''I'm being pulled in too many different directions': academic identity tensions at regional public universities in challenging economic times', *Studies in Higher Education*, pp 1-15.

Dutton, J. E., Roberts, L. M., and Bednar, J. (2010) 'Pathways for positive identity construction at work: four types of positive identity and the building of social resources', *Academy of Management Review*, 35 (2), pp. 285–293.

Eaton, S. C., and Bailyn, L. (2000) 'Career as life path: tracing work and life strategies of biotech professionals', in Peiperl, M., Arthur, M., Goffee, R., and Morris, T. (eds) *Career frontiers: new conceptions of working lives*. Oxford: Oxford University Press, pp. 177–198.

Elzinga, A. (1983) *Research, bureaucracy and the drift of epistemic criteria.* Gothenburg, Sweden: Department of Theory of Science, Gothenburg University.

Enache, M., Sallan, J., Simo, P., and Fernandez, V. (2011) 'Career attitudes and subjective career success: tackling gender differences', *Gender in Management*, 26 (3), pp. 234–250.

Enders, J., and Kaulisch, M. (2006) 'The binding and unbinding of academic careers', in Teichler, U. (ed.) *The formative years of scholars.* London: Portland Press, pp. 85–95.

Etzkowitz, H. (1983) 'Entrepreneurial scientists and entrepreneurial universities in American academy science', *Minerva*, 21 (2-3), pp. 198–233.

Etzkowitz, H. (1998) 'The norms of entrepreneurial science: cognitive effects of the new university–industry linkages', *Research Policy*, 27 (8), pp. 823–833.

Etzkowitz, H. (2001) 'Beyond the endless frontier: from the land grant to the entrepreneurial university', in: Wolf, S. A., and Zilberman, D. (eds) *Knowledge generation and technical change*. Dordrecht: Kluwer, pp. 3–26.

Etzkowitz, H. (2003) ‘Innovation in innovation: the triple helix of university–industry–government relations’, *Social Science Information*, 42 (3), pp. 293–337.

Etzkowitz, H., and Leydesdorff, L. (1995) ‘The triple helix – university–industry–government relations: a laboratory for knowledge-based economic development’, *EASST Review*, 14 (1), pp. 14–19.

Etzkowitz, H., and Ranga, M. (2008) ‘Gender patterns in technology transfer: social innovation in the making?’, *Research Global*, 8 (2), pp. 4–5.

Etzkowitz, H., Ranga, M., Benner, M., Guaranys, L., Maculan, A. M., and Kneller, R. (2008) ‘Pathways to the entrepreneurial university: towards a global convergence’, *Science and Public Policy*, 35 (9), pp. 681–695.

Etzkowitz, H., Webster, A., Gebhardt, C., and Cantisano Terra, B. R. (2000) ‘The future of the university and the university of the future: evolution of ivory tower to entrepreneurial paradigm’, *Research Policy*, 29 (2), pp. 313–330.

Fabrizio, K. R., and Di Minin, A. (2008) ‘Commercializing the laboratory: faculty patenting and the open science environment, *Research Policy*, 37 (5), pp. 914–931.

Faught, K. S., Whitten, D., and Green, K. W. (2004) ‘Doing survey research on the internet: yes, timing does matter’, *Journal of Computer Information Systems*, 44 (3), pp. 26–34.

Feilzer, M. Y. (2010) ‘Doing mixed methods research pragmatically: implications for the rediscovery of pragmatism as a research paradigm’, *Journal of Mixed Methods Research*, 4 (1), pp. 6–16.

Fellnhofer, K., and Puumalainen, K. (2017) ‘Can role models boost entrepreneurial attitudes?’, *International Journal of Entrepreneurship and Innovation Management*, 21 (3), pp. 274–290.

Ferrero, M. C. A., and Bessiere, V. (2016) ‘From lab to venture: cognitive factors influencing researchers’ decision to start a venture’, *Journal of Enterprising Culture*, 24 (2), pp. 101–131.

Festinger, L. (1957) *A theory of cognitive dissonance*. Stanford, CT: Stanford University Press.

Field, A. (2013) *Discovering Statistics using IBM SPSS Statistics*, (4th ed.) London: Sage.

Filippetti, A., and Savona, M. (2017) 'University–industry linkages and academic engagements: individual behaviours and firms' barriers – introduction to the special section', *The Journal of Technology Transfer,* 42 (4), pp. 719–729.

Fini, R., and Grimaldi, R. (2017) 'Process approach to academic entrepreneurship: evidence from the globe', *The World Scientific Reference on Entrepreneurship,* 4 (4), pp. 1–17.

Fini, R., Grimaldi, R., and Sobrero, M. (2009) 'Factors fostering academics to start up new ventures: an assessment of Italian founders' incentives', *Journal of Technology Transfer,* 34 (4), pp. 380–402.

Fini, R., Lacetera, N., and Shane, S. (2010) 'Inside or outside the IP system? Business creation in academia', *Research Policy*, 39 (8), pp. 1060–1069.

Fleming, P., and Sturdy, A. (2009) '"Just be yourself!": towards neo-normative control in organisations?', *Employee Relations*, 31 (6), pp. 569–583.

Flick, U. (2009) *An introduction to qualitative research.* 4th edn. Thousand Oaks, CA,: Sage Publications.

Florida, R. (2003) 'Cities and the creative class', *City & Community*, 2 (1), pp. 3–19.

Franceschet, M., and Costantini, A. (2011) 'The first Italian research assessment exercise: a bibliometric perspective', *Journal of Infometrics*, 5 (2), pp. 275–291.

Gaglio, C. M., and Katz, J. A. (2001) 'The psychological basis of opportunity identification: entrepreneurial alertness', *Small Business Economics*, 16 (2), pp. 95–111.

Gappa, J. M. (2002) 'Academic careers for the 21st century: more options for new faculty', in Smart, J. C. (ed.) *Higher education: handbook of theory and research,* vol. 17. New York, NY: Agathon Press, pp. 425–475.

George, G., Jain, S., and Maltarich, M. A. (2005) 'Academics or entrepreneurs? Entrepreneurial identity and invention disclosure behaviour of university scientists', research paper, doi:10.2139/ssrn.799277.

Gerli, F., Bonesso, S., and Pizzi, C. (2015) 'Boundaryless career and career success: the impact of emotional and social competencies', *Frontiers in Psychology*, doi:10.3389/fpsyg.2015.01304.

Geuna, A. (1999) *The economics of knowledge production. funding and the structure of university research*. Cheltenham: Edward Elgar.

Geuna, A., and Muscio, A. (2009) 'The governance of university knowledge transfer: a critical review of the literature', *Minerva,* 47 (1), pp. 93–114.

Geuna, A., and Nesta, L. J. J. (2006) 'University patenting and its effects on academic research: the emerging European evidence', *Research Policy,* 35 (6), pp. 790–807.

Geuna, A., and Piolatto, M. (2016) 'Research assessment in the UK and Italy: Costly and difficult, but probably worth it (at least for a while)', *Research Policy,* 45 (1), pp. 260–271.

Gibbons, M., Limoges, C., Nowotny, H., Schwarztman, S., and Scott, P. (1994) *The new production of knowledge: the dynamics of science and research in contemporary societies*. London: Sage.

Giddens, A. (1984) *The constitution of society*. Cambridge: Polity Press.

Gieryn, T. (1983) 'Boundary-work and the demarcation of science from non-science: strains and interests in professional ideologies of scientists', *American Sociological Review*, 48 (6), pp. 781–795.

Gieryn, T. F. (1999) *Cultural boundaries of science: credibility on the line*. Chicago, IL: University of Chicago Press.

Gillham, B., ed. (2005) *Research interviewing: the range of techniques.* Milton Keynes: Open University Press.

Glenna, L., Welsh, R., Ervin, D. E., and Lacy, W. B. (2011) 'Commercial science, scientists' values, and university biotechnology research agendas', *Research Policy,* 40 (7), pp. 957–968.

Godin, B., and Gingras, Y. (2000) 'The place of universities in the system of knowledge production', *Research Policy,* 29 (2), pp. 273–278.

Goel, R. K., and Göktepe-Hultén, D. (2017) 'Risk attitudes, patenting and invention disclosures by academic researchers', *The Journal of Technology Transfer,* 44 (1), pp. 155–166.

Goel, R. K., Göktepe-Hultén, D., and Ram, R. (2015) 'Academics' entrepreneurship propensities and gender differences', *The Journal of Technology Transfer,* 40 (1), pp. 161–177.

Goethner, M., Obschonka, M., Silbereinsen, R. K., and Cantner, U. (2012) 'Scientists' transition to academic entrepreneurship: economic and psychological determinants', *Journal of Economic Psychology,* 33 (3), pp. 628–641.

Göktepe-Hultén, D., and Mahagaonkar, P. (2010) 'Inventing and patenting activities of scientists: in the expectation of money or reputation?', *The Journal of Technology Transfer,* 35 (4), pp. 401–423.

Greene, J. C., and Caracelli, V. J. (1997) 'Defining and describing the paradigm issue in mixed-method evaluation', *New Directions for Evaluation*, 74, pp. 5–17.

Greene, J. C., Caracelli, V. J., and Graham, W. F. (1989) 'Toward a conceptual framework for mixed-method evaluation designs', *Educational Evaluation and Policy Analysis*, 11 (3), pp. 255–274.

Grimaldi. R., Kenney, M., Siegel, D. M., and Wright, M. (2011) '30 years after Bayh–Dole: reassessing academic entrepreneurship', *Research Policy,* 40 (8), pp. 1045–1057.

Grimpe, C., and Hussinger, K. (2013) 'Formal and informal technology transfer from academia to industry: complementary effect and innovation performance', *Industry and Innovation,* 20 (8), pp. 683–700.

Guan, Y., Arthur, M. B., Khapova, S. N., Hall, R. J., and Lord, R. G. (2019) 'Career boundarylessness and career success: a review, integration and guide to future research', *Journal of Vocational Behaviour*, 110, pp. 390–402.

Guerrero, M., Urbano, D., Cunningham, J., and Organ, D. (2014) 'Entrepreneurial universities in two European regions: a case study comparison', *Journal of Technology Transfer,* 39 (3), pp. 415–434.

Gulbrandsen, M. (2005) '"But Peter's in it for the money": the liminality of entrepreneurial scientists', *VEST Journal for Science and Technology Studies*, 18 (1-2), pp. 49–75.

Gulbrandsen, M., and Smeby, J. (2005) 'Industry funding and university professors' research performance', *Research Policy*, 34 (6), pp. 932–950.

Gulbrandsen, M., and Thune, T. (2017) The effect of non-academic work experience on external interaction and research performance, *Journal of Technology Transfer*, 42, pp. 795-813.

Gunz, H., Mayrhofer, W., and Tolbert, P. S. (2011a) 'Career as a social and political phenomenon in the globalized economy', *Organization Studies*, 32 (2), pp. 1613–1620.

Gunz, H., Mayrhofer, W., and Tolbert, P. S. (2011b) 'Introduction to special section: careers in context', *Organization Studies*. Available at: http://digitalcommons.ilr.cornell.edu/articles/503/ (Accessed: 20 February 2019).

Gupta, V. K., Turban, D. B., and Bhawe N. M. (2008) 'The effect of gender stereotype activation on entrepreneurial intentions', *Journal of Applied Psychology,* 93 (5), pp. 1053–1061.

Haddow, G. (2007) 'Academic libraries and the Research Quality Framework', *AARL: Australian Academic and Research Libraries*, 38 (1), pp. 26–39.

Hakala, J. (2009) 'The future of the academic calling? Junior researchers in the entrepreneurial university', *Higher Education*, 57 (2), pp. 173–190.

Hall, B. H., Link, A. N., and Scott, J. T. (2000) 'Universities as research partners', *Review of Economics and Statistics*, 85 (2), pp. 485–491.

Hall, D. T., ed. (1976) *Careers in organizations.* Glenview, IL: Scott, Foresman.

Hannon, P. D. (2013) 'Why is the entrepreneurial university important?', *Journal of Innovation Management*, 1 (2), pp. 10–17.

Hansen, D. J., Shrader, R., and Monllor, J. (2011) 'Defragmenting definitions of entrepreneurial opportunity', *Journal of Small Business Management, 49 (2), pp. 283–304.*

Harley, S., Muller-Camen, M., and Collin, A. (2004) 'From academic communities to managed organisations: the implications for academic careers in UK and German universities', *Journal of Vocational Behaviour*, 64 (2), pp. 329–345.

Harman, G. (2005) 'Australian social scientists and transition to a more commercial university environment', *Higher Education Research and Development,* 24 (1), pp. 79–94.

Harman, G. and Harman, K. (2004) Governments and universities as the main drivers of enhanced Australian University research commercialisation capability, *Journal of Higher Education Policy and Management*, 26(2), pp. 153-169

Haussler, C., and Colyvas, J. A. (2011) 'Breaking the ivory tower: academic entrepreneurship in the life sciences in UK and Germany', *Research Policy,* 40 (1), pp. 41–54.

Hawkins, R., Langford, C. H., and Saunders, C. (2015) 'Assessing the practical implications of social knowledge: a survey of six leading Canadian universities', *Research Policy,* 44 (1), pp. 83–95.

Hayter, C. S., Nelson, A. J., Zayed, S., and O'Connor, A. C. (2018) 'Conceptualizing academic entrepreneurship ecosystems: a review, analysis and extension of the literature', *Journal of Technology Transfer,* 43 (4), pp. 1039–1082.

Hazelkorn, H. (2014) 'Making an impact: new directions for arts and humanities research', *Arts and Humanities in Higher Education,* 14(1), pp. 25-44.

Henkel, M. (2000) *Academic identities and policy change in higher education*. London: Jessica Kingsley.

Henkel, M. (2005) 'Academic identity and autonomy in a changing policy environment', *Higher Education*, 49 (1-2), pp. 155–176.

Henkel, M. (2010) 'Introduction: changes and continuity in academic and professional identities', in Gordon, G., and Whitchurch, C. (eds) *Academic and professional identities in higher education: the challenges of a diversifying workforce*. New York, NY: Routledge, pp. 3–12.

Hines, G. (2019) 'REF 2021: How can industry help make an impact?', *SCI* [website]. Available from: https://www.soci.org/news/general-news/ref-2021 (Accessed: 1 March 2019).

Hood, C. (1991) 'A public management for all seasons?', *Public Administration,* 69 (1), pp. 3–19.

Ho M-H.R., Uy, M.A., Kang, B.N.Y and Chan, K-Y. (2018) 'Impact of entrepreneurship training on entrepreneurial efficacy and alertness among adolescent youth', Frontiers in Education, 3(13), pp. 1-10.

Howard, J. A. (2000) 'Social psychology of identities', *Annual Review of Sociology*, 26, pp. 367–393.

Husu, L. (2005) 'Women's work-related and family-related discrimination and support in academia', in Segal, M. T., and Demos, V. (eds) *Gender realities: local and global*. Bingley: Emerald Group, pp. 161–199.

Huszár, S., Prónay, S., and Buzás, N. (2016) 'Examining the differences between the motivations of traditional and entrepreneurial scientists', *Journal of Innovation and Entrepreneurship,* 5 (25), pp. 1–22.

Hytti, U. (2010) 'Contextualizing entrepreneurship in the boundaryless career', *Gender in Management: An International Journal,* 25 (1), pp. 64–81.

Iacobucci, D., and Micozzi, A. (2012) 'Entrepreneurship education in Italian universities: trend, situation and opportunities', *Education + Training,* 54 (8/9), pp. 673–696.

Ibarra, H. (1999) 'Provisional selves: experimenting with image and identity in professional adaptation', *Administrative Science Quarterly,* 44 (4), pp. 764–791.

IISR (2007). *Cancellation of Research Quality Framework implementation* [media release]. Canberra: Department of Innovation, Industry, Science and Research.

Inkson, K. (2006) 'Protean and boundaryless careers as metaphors', *Journal of Vocational Behaviour,* 69 (1), pp. 48–63.

Inkson, K., Gunz, H., Ganesh, S., and Roper, J. (2012) 'Boundaryless careers: bringing back boundaries', *Organization Studies,* 33 (3), pp. 323–340.

Israel, M. (2008) 'The commercialisation of university-based criminological research in Australia', *Australian and New Zealand Journal of Criminology,* 33 (1), pp. 1–20.

Ivankova, N. V., Creswell, J. W., and Stick, S. L. (2006) 'Using mixed-methods sequential explanatory design: from theory to practice', *Field Methods,* 18 (1), pp. 3–20.

Jain, S., George, G., and Maltarich, M. (2009) 'Academics or entrepreneurs? Investigating role identity modification of university scientists involved in commercialization activity', *Research Policy,* 38 (6), pp. 922–935.

Jaremka, L. M., Bunyan, D. P., Collins, N. L., and Sherman, D. K. (2011) 'Reducing defensive distancing: self-affirmation and risk regulation in response to relationship threats', *Journal of Experimental Social Psychology,* 47, pp. 264–268.

Jiao, H., Cui, Y., Zhu, Y., and Chen, J. (2014) 'Building entrepreneurs' innovativeness through knowledge management: the mediating effect of entrepreneurial alertness', *Technology Analysis & Strategic Management*, 26 (5), pp. 510–516.

Joly, Y., and Tonin, P. N. (2014) 'Social, ethical and legal considerations raised by the discovery and patenting of the BRCA1 and BRCA2 genes', *New Genetics and Society*, 33 (2), pp. 167-180.

Kaish, S., and Gilad, B. (1991) 'Characteristics of opportunities search of entrepreneurs versus executives: sources, interests, general alertness', *Journal of Business Venturing,* 6 (1), pp. 45–61.

Kalaitzi, S., Czabanowska, K., Fowler-Davis, S., and Brand, H. (2017) 'Women leadership barriers in healthcare, academia and business', *Equality, Diversity and Inclusion,* 36 (5). pp. 457–474.

Kalar, B., and Antoncic, B. (2015) 'The entrepreneurial university, academic activities and technology and knowledge transfer in four European countries', *Technovation*, 36-37, pp. 1–11.

Kalleberg, A. (2000) 'Nonstandard employment relations: part-time, temporary and contract work', *Annual Review of Sociology,* 26, pp. 341–365.

Karabey, C. N. (2012) 'Understanding entrepreneurial cognition through thinking style, entrepreneurial alertness and risk preference: do entrepreneurs differ from others?', *Procedia – Social and Behavorial Sciences*, 58, 861–870.

Kaulisch, M., and Enders, J. (2005) 'Careers in overlapping institutional contexts', *Career Development International,* 10 (2), pp. 130–144.

Kenney, M., and Goe, W. R. (2004) 'The role of social embeddedness in professorial entrepreneurship: a comparison of electrical engineering and computer science at UC Berkeley and Stanford', *Research Policy,* 33 (5), pp. 691–707.

King, N. (2004) 'Using templates in the thematic analysis of text', in Cassell, C., and Symon, G. (eds) *Essential guide to qualitative methods in organizational research*. London: Sage, pp. 256–270.

King, N. (2012) 'Doing template analysis', in Symon, G. (ed.) *Qualitative organizational research: core methods and current challenges*. London: Sage, pp. 426–450.

King, N., and Brooks, J. (2017) *Template analysis for business and management students: mastering business research methods*. London: Sage.

Kirzner, I. M. (1973) *Competition and entrepreneurship*. Chicago, IL: University of Chicago Press.

Kirzner, I. M. (1997) 'Entrepreneurial discovery and the competitive market process: an Austrian approach', *Journal of Economic Literature*, 35 (1), 60–85.

Klosften, M., and Jones-Evans, D. (2000) 'Comparing academic entrepreneurship in Europe: the case of Sweden and Ireland', *Small Business Economics*, 14 (4), pp. 299–309.

Kochenkova, A., Grimaldi, R., and Munari, F. (2015) 'Public policy measures in support of knowledge transfer activities: a review of academic literature', *The Journal of Technology Transfer*, 41 (3), pp. 407–429.

Kogan, M., El-Kawas, E., and Moses, I. (1994) *Staffing in higher education: meeting new challenges.* London: Jessica Kingsley.

Kremelberg, D. (2011) *Practical statistics: a quick and easy guide to IBM® SPSS® Statistics, STATA, and other statistical software*. Thousand Oaks, CA: Sage Publications.

Kvale, S. (2007) *Doing interviews.* Thousand Oaks, CA: Sage Publications.

Kwok, J. T. (2013) *Impact of ERA research assessment on university behaviour and their staff.* Melbourne: NTEU National Policy and Research Unit. Available from: http://apo.org.au/files/Resource/NTEU_ImpactOfEra_April2013.pdf (Accessed: 10 November 2015).

Lam, A. (2007) 'Knowledge networks and careers: academic scientists in industry-university links', *Journal of Management Studies,* 44(6), pp. 993-1016.

Lam, A. (2010) 'From ivory tower traditionalists to entrepreneurial scientists? Academic scientists in fuzzy university–industry boundaries', *Social Studies of Science*, 40 (2), pp. 307–340.

Lam, A. (2011) 'What motivates academic scientists to engage in research commercialization: "gold", "ribbon" or "puzzle"?', *Research Policy,* 40 (10), pp. 1354–1368.

Lam, A., and Campos, A. (2015) '"Content to be sad" or "runaway apprentice"? The psychological contract and careers of young scientists in the entrepreneurial university', *Human Relations*, 68 (5), pp. 811–841.

Landry, R., Amara, N., and Rherrad, I. (2006) 'Why are some university researchers more likely to create spin-offs than others? Evidence from Canadian universities', *Research Policy,* 35 (10), pp. 1599–1615.

Langley, C., and Parkinson, S. (2009) *Science and the corporate agenda: the detrimental effects of commercial influence on science and technology*. Folkestone: Scientists for Global Responsibility.

Langowitz, N., and Minniti, M. (2007). 'The entrepreneurial propensity of women', *Entrepreneurship: Theory and Practice*, 31 (3), pp. 341–364.

Laudel, G., Bielick, J., and Gläser, J. (2018) '"Ultimately the question always is: 'What do I have to do to do it right?'" Scripts as explanatory factors of career decisions', *Human Relations,* doi:10.1177/0018726718786550.

Le Feuvre, N. (2009) 'Exploring women's academic careers in cross‐national perspective: lessons for equal opportunity policies', *Equal Opportunities International,* 28 (1), pp. 9–23.

Lee, Y. S. (1996) '"Technology transfer" and the research university: a search for the boundaries of university–industry collaboration', *Research Policy,* 25 (6), pp. 843–863.

Lee, Y. S. (1998) 'University–industry collaboration on technology transfer: views from the ivory tower', *Policy Studies Journal,* 26 (1), pp. 69–84.

LeVine, R., and Campbell, D. (1972) *Ethnocentrism, theories of conflict, ethnic attitudes, and group behavior.* New York, NY: Wiley.

Lewis-Beck, M. S., Bryman, A., and Liao, T. F. (2004) *The SAGE encyclopedia of social science research methods*. Thousand Oaks, CA: Sage Publications.

Lewis, K.V., Harris, C. Morrison, R. and Ho, M. (2015) 'The entrepreneurship-motherhood nexus', *Career Development International*, 20(1), pp. 21 – 37.

Lieff, S., Baker, L., Mori, B., Egan-Lee, E., Chin, K., and Reeves, S. (2012) 'Who am I? Key influences on the formation of academic identity within a faculty development program', *Medical Teacher,* 34 (3), pp. 208–215.

Lile, J. (2013) 'Toward a structural understanding of identity formation: a review and extension of theory', *Identity,* 13 (4), pp. 318–347.

Lile, J. (2015) 'The relationship of identity boundaries to identity statuses and styles: an empirical examination of the structural model of identity formation', *Identity,* 15 (2), pp. 113–125.

Link, A. N., and Siegel, D. S. (2005) 'Generating science-based growth: an econometric analysis of the impact of organizational incentives on university–industry technology transfer', *European Journal of Finance,* 11 (3), pp. 169–182.

Link, A. N., Siegel, D. S., and Bozeman, B. (2007) 'An empirical analysis of the propensity of academics to engage in informal university technology transfer', *Industrial and Corporate Change,* 16 (4), pp. 641–655.

Lo Presti, A., Nonnis, M., and Briscoe, J. P. (2011) 'The protean and boundaryless career in Italy: Game on?', in Cortini, M., Tanucci, G., and Morin, E. (eds) *Boundaryless careers and occupational well-being*. London: Palgrave Macmillan, pp. 7–16.

Lockett, A., and Wright, M. (2005) 'Resources, capabilities, risk capital and the creation of university spin-out companies', *Research Policy*, 34 (7), pp. 1043–1057.

Lockett, A., Wright, M., and Franklin, S. (2003) 'Technology transfer and universities' spin-out strategies', *Small Business Economics*, 20 (2), pp. 185–200.

Mael, F. A., and Ashforth, B. E. (1992) 'Alumni and their alma mater: a partial test of the reformulated model of organizational identification', *Journal of Organizational Behavior*, 13 (2), 103–123.

Mahoney, D. (1994) 'Government and the universities: the "new mutuality" in Australian higher education – a national case study', *Journal of Higher Education*, 65 (2), pp. 123–146.

Makhbul, Z. M. (2011) 'Entrepreneurial success: an exploratory study among entrepreneurs', *International Journal of Business and Management,* 6 (1), pp. 116–125.

Mallon, M., Duberley, J., and Cohen, L. (2005) 'Careers in public sector science: orientations and implications', *R&D Management*, 35 (4), pp. 395–407.

Marginson, S. (2002) 'Nation-building universities in a global environment: the case of Australia', *Higher Education*, 43 (3), pp. 409–428.

Marginson, S., and Considine, M. (2000) *The enterprise university: power, governance and reinvention in Australia*. Cambridge: Cambridge University Press.

Markman, G. D., and Baron, R. A. (2003) 'Person–entrepreneurship fit: why some people are more successful as entrepreneurs than others', *Human Resource Management Review*, 13 (2), pp. 281–301.

Marshall, D. R. (2016) 'From employment to entrepreneurship and back: a legitimate boundaryless view or a bias-embedded mindset?', *International Small Business Journal*, 34 (5), pp. 683–700.

Martin, B. R. (2011) 'The Research Excellence Framework and the "impact agenda": are we creating a Frankenstein monster?', *Research Evaluation*, 20 (3), 247–254.

Mason, J. (2006) ‘Six strategies for mixing methods and linking data in social science research’, *NCRM Working Paper Series*, 4/06, ESRC National Centre for Research Methods, University of Southampton, Southampton.

Mathias, B. D., and Williams, D. W. (2017) ‘The impact of role identities on entrepreneurs’ evaluation and selection of opportunities’, *Journal of Management*, 43 (3), pp. 892–918.

Mathisen, M. T., and Rasmussen, E. (2019) ‘The development, growth, and performance of university spin-offs: a critical review’, *Journal of Technology Transfer*, doi:10.1007/s10961-018-09714-9.

Matlin, M. W. (2002) *Cognition.* 5th edn. Fort Worth, TX: Harcourt College Publishers.

Matlin, M. W., and Foley, H. J., eds (1997) *Sensation and perception.* Needham Heights, MA: Allyn and Bacon.

Matthews, B., and Ross, L. (2010) *Research methods*. London: Pearson Longman.

Mazgan, N. (2011) ‘Success factors and developmental barriers of spin-off enterprises in the Slovenian market’, research paper, Faculty of Economics, University of Ljubljana, Slovenia.

Mertz, J.F., Antigone, J.K., Leonard, D. G.B., and Cho, M. (2002) ‘Diagnostic testing fails the test. The pitfalls of patents are illustrated by the case of haemochromatosis’, *Nature*, 7, pp. 577-579.

McAlpine, L. (2012) ‘Academic work and careers: relocation, relocation, relocation’, *Higher Education Quarterly*, 66 (2), pp. 174–188.

McInnis, C. (2012) ‘Traditions of academic professionalism and shifting academic identities’, in Gordon, G., and Whitchurch, C. (eds) *Academic and professional identities in higher education*. New York, NY: Routledge, pp. 147–165.

McMullen, J. S., and Shepherd, D. A. (2006) ‘Entrepreneurial action and the role of uncertainty in the theory of the entrepreneur’, *Academy of Management Review,* 31 (1), pp. 132–152.

Meek, W. R., and Wood, M. S. (2016) ‘Navigating a sea of change: identity misalignment and adaptation in academic entrepreneurship’, *Entrepreneurship: Theory and Practice*, 33 (4), pp. 1093–1119.

Merton, R. K. (1968) *Social theory and structure.* New York, NY: Free Press.

Meyer-Krahmer, F., and Schmoch, U. (1998) 'Science-based technologies: university–industry interactions in four fields', *Research Policy*, 27 (8), pp. 835–851.

Minniti, M. (1999) *Global entrepreneurship monitor executive report: national entrepreneurship assessment*. Babson Park, MA: The W. F. Glavin Center for Global Entrepreneurial Leadership, Babson College.

Minniti, M., Arenius, P., and Langowitz, N. (2005) *Global entrepreneurship monitor 2004 report on women and entrepreneurship*. Babson Park, MA: Babson College Centre for Women's Leadership and London Business School.

Mir, R., and Watson, R. (2000) 'Strategic management and the philosophy of science: towards a constructivist methodology', *Strategic Management Journal*, 21 (9), pp. 941–953.

Miranda, F. J., Chamorro-Mera, A., and Rubio, S. (2017) 'Academic entrepreneurship in Spanish universities: an analysis of determinants of entrepreneurial intention', *European Research on Management and Business Economics*, 23 (2), 113–122.

Miranda, F. J., Chamorro, A., and Rubio, S. (2018) 'Re-thinking university spin-off: a critical literature review and a research agenda', *Journal of Technology Transfer*, 43, pp. 1007–1038.

Mitchell, R. K., Busenitz, L., Lant, T., McDougall, P. P., Morse, E. A., and Smith, B. J. (2002) 'Toward a theory of entrepreneurial cognition: rethinking the people side of entrepreneurship research', *Entrepreneurship: Theory and Practice*, 27 (2), pp. 93–104.

Molina-Azorin, J., and Cameron, R. A. (2010) 'The application of mixed methods in organisational research: a literature review', *Electronic Journal of Business Research Methods*, 8 (2), 95–105.

Molino, M., Dolce, V., Cortese, C. G., and Ghislieri, C. (2018) 'Personality and social support as determinants of entrepreneurial intention: gender differences in Italy', *PLoS ONE*, 13 (6), pp. 1–19.

Moog, P., Werner, A., Houweling, S., and Backes-Gellner, U. (2015) 'The impact of skills,working time allocation and peer effects on the entrepreneurial intentions ofscientists', *Journal of Technology Transfer*, 40 (3), pp. 493–511.

Morse, J. (1991). Approaches to qualitative-quantitative methodological triangulation. *Nursing Research*, 40(2), pp. 120-123.

Mosey, S., and Wright, M. (2007) 'From human capital to social capital: a longitudinal study of technology–based academic entrepreneurs', *Entrepreneurship: Theory and Practice*, 31 (6), pp. 909–935.

Munari, F., Rasmussen, E., Toschi, L., and Villani, E. (2016) 'Determinants of the university technology transfer policy-mix: a cross-national analysis of gap-funding instruments', *Journal of Technology Transfer*, 41 (6), pp. 1377–1405.

Murray, F. (2002) 'Innovation as co-evolution of scientific and technological networks: exploring tissue engineering', *Research Policy*, 31 (8-9), pp. 1389–1403.

Murray, F., and Graham, L. (2007) 'Buying science and selling science: gender differences in the market for commercial science', *Industrial and Corporate Change*, 16 (4), pp. 657–689.

Murray, F., and Stern, S. (2007) 'Do formal intellectual property rights hinder the free flow of scientific knowledge? An empirical test of the anti-commons hypothesis', *Journal of Economic Behavior and Organization*, 63 (4), pp. 648–685.

Muscio, A. (2008). 'Technology transfer in Italy: results of a survey on university departments', *L'Industria*, special issue, pp. 245–268.

Muscio, A. (2010) 'What drives the university use of technology transfer offices? Evidence from Italy', *The Journal of Technology Transfer*, 35 (2), pp. 181–202.

Musselin, C. (2010) 'The impact of changing recruitment practices on academic profiles', in Gordon, G., and Whitchurch, C. (eds) *Academic and professional identities in higher education: the challenges of a diversifying workforce*. New York, NY: Routledge, pp. 125–137.

Mussweiler, T. (2003) 'Comparison processes in social judgment: mechanisms and consequences', *Psychological Review*, 110 (3), pp. 472–489.

Mussweiler, T., and Strack, F. (2000) 'Consequences of social comparison: selective accessibility, assimilation, and contrast', in Suls, J., and Wheeler L. (eds) *Handbook of social comparison: theory and research*. Boston, MA: Springer, pp.253–270.

Naz, S., Fazal, S., and Khan, M. I. (2017) 'Perceptions of women academics regarding work–life balance: a Pakistan case', *Management in Education*, 31 (2), pp. 88–93.

Nedeva, M., and Boden, R. (2006) 'Changing science: the advent of neo-liberalism', *Prometheus*, 24 (3), pp. 269–281.

Nelsen, L. L., and Bierer, B. E. (2011) 'Biomedical innovation in academic institutions: mitigating conflict of interest', *Science Translational Medicine,* 3 (100), doi:10.1126/scitranslmed.3002184.

Nelson, R. R. (2001) 'Observations on the post-Bayh-Dole rise of patenting at American universities', *The Journal of Technology Transfer,* 26 (1-2), pp. 13–19.

Neneh, B. N. (2019) 'From entrepreneurial alertness to entrepreneurial behavior: the role of trait competitiveness and proactive personality', *Personality and Individual Differences,* 138, pp. 273–279.

NetVal (2010) *La valorizzazione dei risultati della ricerca pubblica cresce: la sfida continua.* Available at: http://www.netval.it/contenuti/file/Rapporto%20Netval%202009.pdf (Accessed: 10 November 2015).

Newman, I., and Benz, C. R. (1998) *Qualitative-quantitative research methodology: Exploring the interactive continuum*. Carbondale, IL: Southern Illinois University Press.

Nilsson, A. S., Rickne, A., and Bengtsson, L. (2010) 'Transfer of academic research: uncovering the grey zone', *Journal of Technological Transfer,* 35 (6), pp. 617–636.

Nixon, J. (1996) 'Professional identity and the restructuring of higher education', *Studies in Higher Education,* 21 (1), pp. 5–16.

Noble, D., ed. (1977) *America by design: science, technology and the rise of corporate capitalism.* New York, NY: Oxford University Press.

Norman, G. (2010) 'Likert scales, levels of measurement and the "laws" of statistics', *Advances in Health Sciences Education: Theory and Practice*, 15 (5), pp. 625–632.

Nunnally, J. C., ed. (1978) *Psychometric theory.* 2nd edn. New York, NY: McGraw-Hill.

Obschonka, M., Hahn, E., and Bajwa, N. H. (2018) 'Personal agency in newly arrived refugees: The role of personality, entrepreneurial cognitions and intentions, and career adaptability', *Journal of Vocational Behaviour,* 105, pp. 173–184.

Obschonka, M., Hakkarainen, K., Lonka, K., and Salmela-Aro, K. (2017) 'Entrepreneurship as a twenty-first century skill: entrepreneurial alertness and intention in the transition to adulthood', *Small Business Economy*, 48 (4), pp. 487–501

Obschonka, M., Moeller, J., and Goethner, M. (2019) 'Entrepreneurial passion and personality: the case of academic entrepreneurship', *Frontiers in Psychology*, 9 January, doi:10.3389/fpsyg.2018.02697.

Obschonka, M., Silbereisen, R. K., Cantner, U., and Goethner, M. (2015) 'Entrepreneurial self-identity: predictors and effects within the theory of planned behaviour framework', *Journal of Business Psychology,* 30 (4), pp. 773–794.

Obschonka, M., and Stuetzer, M. (2017) 'Integrating psychological approaches to entrepreneurship: the Entrepreneurial Personality System (EPS)', *Small Business Economics*, 49 (1), pp. 203–231.

Obschonka, M., Zhou, M., Zhou, Y., Zhang, J., and Silbereisen, R. K. (2018) '"Confucian" traits, entrepreneurial personality, and entrepreneurship in China: a regional analysis', *Small Business Economics*, doi:10.1007/s11187-018-0103-8.

OECD (2016) *Women entrepreneurship: Key findings – Italy*. Washington, DC: OECD.

Olmos-Peñuela, J., Benneworth, P., and. Castro-Martínez, E. (2015) 'Are sciences essential and humanities elective? Disentangling competing claims for humanities' research public values', Arts and Humanities in Higher Education, 14(1), pp. 61-78.

Olmos-Peñuela, J., Castro-Martínez, E., and D'Este, P. (2014) 'Knowledge transfer activities in social sciences and humanities: explaining the interactions of research groups with non-academic agents', *Research Policy*, 43 (4), pp. 696–706.

Onwuegbuzie, A. J., and Leech, N. L. (2006) 'Linking research questions to mixed methods data analysis procedures 1', *The Qualitative Report*, 11(3), pp. 474–498.

Owen-Smith, J., and Powell, W. (2001a) 'Careers and contradictions: faculty responses to the transformation of knowledge and its uses in the life sciences', *Research in the Sociology of Work,* 10, pp. 109–140.

Owen-Smith, J., and Powell, W. W. (2001b) 'To patent or not: faculty decision and institutional success at technology transfer', *The Journal of Technology Transfer*, 26 (1-2), pp. 99–114.

Patton, M. Q. (2015) *Qualitative evaluation and research methods.* Thousand Oaks, CA: Sage.

Penfield, T., Baker, M. J., Scoble, R., and Wykes, M.C. (2014) 'Assessment, evaluations and definitions of research impact: a review', *Research Evaluation*, 23(1), pp. 21-32.

Perkmann. M., Tartari, V., McKelvey, V. M., Autio, E., Brostrom, A., D'Este, P., Fini, R., Grimaldi, R., Geuna, A., Hughes, A., Krabel, S., Kitson, M., Llerena, P., Lisson, F., Salter, A., and Sobrero, M. (2013) 'Academic engagement and commercialisation: A review of the literature on university–industry relations', *Research Policy,* 42 (2), pp. 423–442.

Perkmann, M., and Walsh, K. (2007) 'University–industry relationships and open innovation: Towards a research agenda', *International Journal of Management Reviews*, 9 (4), pp. 259–280.

Perkmann, M., and Walsh, K. (2009) 'The two faces of collaboration: impacts of university-industry relations on public research', *Industrial and Corporate Change*, 18 (6), pp. 1033–1065.

Petrella, F., and Richez-Battesti, N. (2014) 'Social entrepreneur, social entrepreneurship and social enterprise: semantics and controversies', *Journal of Innovation Economics & Management*, 14 (2), pp. 143–156.

Phan, P. H., and Siegel, D. S. (2006) 'The effectiveness of university technology transfer', *Foundations and Trends in Entrepreneurship,* 2 (2), pp. 77–144.

Philpott, K., Dooley, L., O'Reilly, C., and Lupton, G. (2011) 'The entrepreneurial university: examining the underlying academic tensions', *Technovation*, 31 (4), pp. 161–170.

Pilegaard, M., Moroz, P. W., and Neergaard, H. (2010) 'An auto-ethnographic perspective on academic entrepreneurship: implications for research in the social sciences and humanities', *Academy of Management Perspectives*, 24 (1), pp. 46–61.

Pines, A.M., Lerner, M., and Schwartz, D. (2010) 'Gender differences in entrepreneurship: Equality, diversity and inclusion in times of global crisis', *Equality, Diversity and Inclusion: An International Journal*, 29(2), pp.186-198

Pratt, M. G., Rockmann, K. W., and Kaufmann, J. B. (2006) 'Constructing professional identity: the role of work and identity learning cycles in the customization of identity among medical residents', *Academy of Management Journal*, 49 (2), pp. 235–262.

Pringle, J., and Mallon, M. (2003) 'Challenges for the boundaryless career odyssey', *The International Journal of Human Resource Management*, 14 (5), pp. 839–853.

Prodan, I., and Drnovsek, M. (2010) 'Conceptualizing academic–entrepreneurial intentions: an empirical test', *Technovation*, 30 (5-6), pp. 332–347.

Rasmussen, E., Mosey, S., and Wright, M. (2014) 'The influence of university departments on the evolution of entrepreneurial competencies in spin-off ventures', *Research Policy*, 43 (1), pp. 92–106.

Rasmussen, E., Mosey, S., and Wright, M. (2015) 'The transformation of network ties to develop entrepreneurial competencies for university spin-offs', *Entrepreneurship & Regional Development*, 27 (7-8), pp. 430–457.

Ratner, K., and Berman, S. I. (2016) 'Identity boundaries: an empirical perspective', *Personality and Individual Differences*, 90, pp. 89–92.

Rauch, A., and Hulsink, W. (2015) 'Putting entrepreneurship education where the intention to act lies: an investigation into the impact of entrepreneurship education on entrepreneurial behavior', *Academy of Management Learning and Education*, 14 (2), pp. 187–204.

Rebora, G., and Turri, M. (2013) 'The UK and Italian research assessment exercises face to face', *Research Policy*, 42 (9), pp. 1657–1666.

REF (2011) *Assessment framework and guidance on submissions*. London: Research Excellence Framework. Available from: http://www.ref.ac.uk/pubs/2011-02/ (Accessed: 12 June 2015).

REF (2014) *Research Excellence Framework*. London: Research Excellence Framework. Available from: http://www.ref.ac.uk/pubs/2011-02/ (Accessed: 23 May 2014).

REF (2021) *Research Excellence Framework*. London: Research Excellence Framework. Available from https://www.ref.ac.uk/ (Accessed: 17 March 2019).

Reichhardt, C. S., and Cook, T. D. (1979) 'Beyond qualitative versus quantitative methods', in Cook, T. D., and Reichhardt, C. S. (eds) *Qualitative and quantitative methods in evaluation research*. Beverly Hills, CA: Sage Publications, pp. 7–32.

Reynolds, P. D., Bygrave, W. D., Autio, E., Cox, L. W., and Hay, M. (2002) *Global entrepreneurship monitor: 2002 executive report*. Babson Park, MA: Babson College, London Business School and Kauffman Foundation.

Rhoades, G. (2012) 'Envisioning invisible workforce: enhancing intellectual capital', in Gordon, G., and Whitchurch, C. (eds) *Academic and professional identities in higher education*. New York, NY: Routledge, pp. 35–53.

Rinaldi, A., and Tagliazuchi, G. (2018) 'Women entrepreneurs in Italy: a prosopographic study', *Department of Economics Papers*, No. 0129, Faculty of Economics "Marco Biagi", University of Modena and Reggio Emilia, Italy.

Ritchie, J., Lewis, J., and Elam, G. (2003) 'Designing and selecting samples', in Ritchie, J., and Lewis, J. (eds) *Qualitative research practice*. London: SAGE, pp. 77–108.

Rodrigues, R., Guest, D., and Budjanovcanin, A. (2016) 'Bounded or boundaryless? An empirical investigation of career boundaries and boundary crossing', *Work, Employment and Society,* 30 (4), pp. 669–686.

Rolfo, S., and Finardi, U. (2014) 'University third mission in Italy: organization, faculty attitude and academic specialization', *The Journal of Technology Transfer*, 39 (3), pp. 472–486.

Romano Bergstrom, J. C., Olmsted-Hawala, E. L., and Jans, M. (2013) 'Age-related differences in eye tracking and usability performance: website usability for older adults', *International Journal of Human-Computer Interaction*, 29 (8), pp. 541–548.

Rosa, P., and Dawson, A. (2006) 'Gender and the commercialization of university science: academic founders of spinout companies', *Entrepreneurship and Regional Development*, 18 (4), pp. 341–366.

Rosenberg, N. (2002) *America's university/industry interfaces 1945–2000*. Working paper, Department of Economics, Stanford University, Stanford, CT.

Rothaermel, F. T., Agung, S. D., and Jiang, L. (2007) 'University entrepreneurship: a taxonomy of the literature', *Industrial and Corporate Change*, 16 (4), pp. 691–791.

Roundy, P. T., Harrison, D. A., Khavul, S., Pérez-Nordtvedt, L., and McGee, J. E. (2018) 'Entrepreneurial alertness as a pathway to strategic decisions and organizational performance', *Strategic Organization*, 16 (2), pp. 192–226.

Rubens, A., Spigarelli, F., Cavicchi, A., and Rinaldi, C. (2017) 'Universities' third mission and the entrepreneurial university and the challenges they bring to higher education institutions', *Journal of Enterprising Communities: People and Places in the Global Economy*, 11 (3), pp. 354–372.

Sá, E., Dias, D., and Sá, M. J. (2018) 'Towards the university entrepreneurial mission: Portuguese academics' self-perspective of their role in knowledge transfer', *Journal of Further and Higher Education*, 40 (60), pp. 784–796.

Sarsons, H. (2017) ‘Recognition for group work: gender differences in academia’, *American Economic Review: Papers and Proceedings*, 107 (5), pp. 141–145.

Sauermann, H., and Cohen, W. M. (2010) ‘What makes them tick? Employee motives and firm innovation’, *Management Science*, 56 (12), pp. 2134–2153.

Saunders, M., Lewis, P., and Thornhill, A. (2016) *Research methods for business students*. 7th edn. London: Pearson Education.

Saunders, N. K., and Townsend, K. (2016) ‘Reporting and justifying the number of interview participants in organization and workplace research’, *British Journal of Management*, 27 (4), pp. 836–852.

Schrauf, R. W. (2018) ‘Mixed methods designs for making cross-cultural comparisons’, *Journal of Mixed Methods Research*, 12 (4), pp. 477–494.

Settles, I. H. (2004) ‘When multiple identities interfere: the role of identity centrality’, *Personality and Social Psychology Bulletin*, 30 (4), pp. 487–500.

Shane, S. (2004) *Academic entrepreneurship*. Cheltenham: Edward Elgar.

Shane, S., Dolmans, S. A. M., Jankowski, J., Reymen, I. M. M. J., Georges, A., and Romme, L. (2015) ‘Academic entrepreneurship: which inventors do technology licensing officers prefer for spinoffs?’, *Journal of Technology Transfer*, 40 (2), pp. 273–292.

Shane, S., and Stuart, T. (2002) ‘Organizational endowments and the performance of university start-ups’, *Management Science*, 48 (1), pp. 154–170.

Shaw, A. K., and Stanton, D. E. (2012) ‘Leaks in the pipeline: separating demographic inertia from ongoing gender differences in academia’, *Proceedings of the Royal Society B: Biological Sciences*, 279 (1743), pp. 3736–3741.

Shinn, T., and Lamy, E. (2006) ‘Paths of commercial knowledge: forms and consequences of university–enterprise synergy in scientist-sponsored firms’, *Research Policy*, 35 (10), pp. 1465–1476.

Siegel, D. S., Veugelers, R., and Wright, M. (2007) ‘Technology transfer offices and commercialization of university intellectual property: performance and policy implications’, *Oxford Review of Economic Policy*, 23 (4), pp. 640–660.

Siegel, D. S., Waldman, D. A., and Link, A. N. (2003) ‘Assessing the impact of organizational practices on the productivity of university technology transfer offices: an exploratory study’, *Research Policy*, 32 (1), pp. 27–48.

Siegel, D.S., Westhead, and Wright, M. (2003) 'Science parks and performance of new technology-based firms: a review of recent U.K. evidence and an agenda for future research', *Small Business Economics*, 20(2), pp. 177-184.

Siegel, D. S. and Wright, M. (2015) 'Academic entrepreneurship: time for a rethink?', *British Journal of Management,* 26 (4), pp. 582–595.

Slaughter, S. (2001) Professional values and the allure of the market. *Academe,* 87 (5), pp. 22–26.

Slaughter, S., and Leslie, L. L. (1997) *Academic capitalism: politics, policies, and the entrepreneurial university*. Baltimore, MD: Johns Hopkins University Press.

Slaughter, S., and Rhoades, G. (2004) *Academic capitalism and the new economy: markets, state and higher education*. Baltimore, MD: Johns Hopkins University Press.

Smith, K. (2012) 'Fools, facilitators and flexians: academic identities in marketised environments', *Higher Education Quarterly*, 66 (2), pp. 155–173.

Soderberg, A. (2006) 'Narrative interviewing and narrative analysis in a study of cross-border merger', *Management International Review*, 46 (4), pp. 397–416.

Steele, C. M. (1997) 'A threat in the air: how stereotypes shape intellectual identity and performance', *American Psychologist*, 52 (6), pp. 613–629.

Stephan, P. E., and El-Ganainy, A. (2007) 'The entrepreneurial puzzle: explaining the gender gap', *The Journal of Technology Transfer,* 32 (5), pp. 475–487.

Stephan, P. E., Gurmu, S., Sumell, A. J., and Black, G. (2007) 'Who's patenting in the university? Evidence from the survey of doctorate recipients', *Economics of Innovation and New Technology,* 16 (2), pp. 71–99.

Stolz, P. G., ed. (2000) *Adversity quotient at work*. New York, NY: Harper Collins.

Stryker, S. (1968) 'Identity salience and role performance', *Journal of Marriage and the Family*, 30 (4), 558–564.

Stryker, S., and Serpe, R. T. (1982) 'Commitment, identity salience, and role behavior: a theory and research example', in Ickes, W., and Knowles, E. S. (eds) *Personality, roles, and social behavior*. New York, NY: SpringerVerlag, pp. 199–218.

Stuart, T. E., and Ding, W. W. (2006) 'When do scientists become entrepreneurs? The social structural antecedents of commercial activity in the academic life sciences', *American Journal of Sociology*, 112 (1), pp. 97–144.

Sullivan, G. M., and Artino, A. R. (2013) 'Analyzing and interpreting data from Likert-type scales', *Journal of Graduate Medical Education*, 5 (4), pp. 541–542.

Sullivan, M. D., and Meek, W. R. (2012) 'Gender and entrepreneurship: a review and process model', *Journal of Managerial Psychology*, 27 (5), pp. 428–458.

Sullivan, S. E., and Arthur, M. B. (2006) 'The evolution of the boundaryless career concept: examining physical and psychological mobility', *Journal of Vocational Behaviour*, 69 (1), pp. 19–29.

Sullivan, S. E., and Baruch, Y. (2009) 'Advances in career theory and research: a critical review and agenda for future exploration', *Journal of Management*, 35 (6), pp. 1542–1571.

Symon, G., and Cassell, C. (2012) *Qualitative organizational research: core methods and current challenges*. London: SAGE.

Tams, S., and Arthur, M. B. (2010) 'New directions for boundaryless careers: agency and interdependence in a changing world', *Journal of Organizational Behavior*, 31 (5), pp. 629–646.

Tang, J., Kacmar, K. M., and Busenitz, L. W. (2012) 'Entrepreneurial alertness in the pursuit of new opportunities', *Journal of Business Venturing*, 27 (1), pp. 77–94.

Tartari, V., and Breschi, S. (2012) 'Set them free: scientists' evaluations of the benefits and costs of university–industry research collaboration', *Industrial and Corporate Change*, 21 (5), pp. 1117–1147.

Tartari, V., Perkmann, M., and Salter, A. (2014) 'In good company: the influence of peers on industry engagement by academic scientists', *Research Policy*, 43 (7), pp. 1189–1203.

Tartari, V., Salter, A., and D'Este, P. (2012) 'Crossing the Rubicon: exploring the factors that shape academics' perceptions of the barriers to working with industry', *Cambridge Journal of Economics*, 36 (3), pp. 655–677.

Tashakkori, A., and Creswell, J. W. (2007) 'Editorial: exploring the nature of research questions in mixed methods research', *Journal of Mixed Methods Research*, 1 (3), pp. 207–211.

Tashakkori, A., and Teddlie, C. (1998) *Mixed methodology: combining qualitative and quantitative approaches*. Thousand Oaks, CA: Sage.

Tashakkori, A., and Teddlie, C. (2003) *Handbook of mixed methods in social & behavioral research*. Thousand Oaks, CA: Sage.

Terry, D. J., Hogg, M. A., and White, K. M. (1999) 'The theory of planned behaviour: self-identity, social identity and group norms', *British Journal of Social Psychology*, 38 (3), pp. 225–244.

Timonen, H., and Paloheimo, K. (2008) 'The emergence and diffusion of the concept of knowledge work', *The Electronic Journal of Knowledge Management,* 6 (2), pp. 177–190.

Tracy, S. J. (2010) 'Qualitative quality: eight "big-tent" criteria for excellent qualitative research', *Qualitative Inquiry*, 16 (10), pp. 837–851.

Trede, F., Macklin, R., and Bridges, D. (2012) 'Professional identity development: a review of the higher education literature', *Studies in Higher Education*, 37 (3), pp. 365–384.

Tseng, F. C., Huang, M. H., and Chen, D. Z. (2018) 'Factors of university–industry collaboration affecting university innovation performance', *Journal of Technology Transfer*, doi:10.1007/s10961-018-9656-6.

Urbano, D., and Guerrero, M. (2014) 'Entrepreneurial universities: socio-economic impacts of academic entrepreneurship in a European region', *Economic Development Quarterly*, 27 (1), pp. 40–55.

Usunier, J.-C., Van Herk, H., and Lee, J. A. (2017) *International and cross-cultural management research*. 2nd edn. London: Sage.

Uy, M. A., Chan, K., Sam, Y. L., Ho, R. M., and Chernyshenko, O. S. (2015) 'Proactivity, adaptability and boundaryless career attitudes: the mediating role of entrepreneurial alertness', *Journal of Vocational Behaviour,* 86, pp. 115–123.

Valliere, D. (2013) 'Towards a schematic theory of entrepreneurial alertness', *Journal of Business Venturing,* 28 (3), pp. 430–422.

Van Looy, B., Callaert, J., and Debackere, K. (2006) 'Publication and patent behavior of academic researchers: conflicting, reinforcing or merely co-existing?', *Research Policy,* 35 (4), pp. 596–608.

Van Looy, B., Landoni, P., Callaert, J., Van Pottelsberghe, B., Sapsalis, E., and Debackere, K. (2011) 'Entrepreneurial effectiveness of European universities: an empirical assessment of antecedents and trade-offs', *Research Policy*, 40 (4), pp. 553–564.

Van Maanen, J., and Schein, E. H. (1979) 'Toward a theory of organizational socialization', in Staw, B.M. (ed.) *Research in organizational behaviour*. Greenwich, CT: JAI Press, pp. 209–264.

Verbruggen, M. (2012) 'Psychological mobility and career success in the "new" career climate', *Journal of Vocational Behaviour*, 81 (2), pp. 289–297.

Verduyn, P., Van Mechelen, I., Kross, E., Chezzi, C., and Van Bever, F. (2012) 'The relationship between self-distancing and the duration of negative and positive emotional experiences in daily life', *Emotion*, 12 (6), pp. 1248–1263.

Volmer, J., and Spurk, D. (2011) 'Protean and boundaryless career attitudes: relationships with subjective and objective career success', *Zeitschrift für ArbeitsmarktForschung*, 43 (3), pp. 207–218.

Walsh, J. P., and Huang, H. (2014) 'Local context, academic entrepreneurship and open science: publication secrecy and commercial activity among Japanese and US scientists', *Research Policy*, 43 (2), pp. 245–260.

Watermeyer, R. (2014) 'Issues in the articulation of "impact": the responses of UK academics to "impact" as a new measure of research assessment', *Studies in Higher Education*, 39 (2), pp. 359–377.

Weiss, D., and Freund, A. M. (2012) 'Still young at heart: negative age-related information motivates distancing from same-aged people', *Psychology and Aging*, 27 (1), pp. 173–180.

Whetten, D. (2006) 'Albert and Whetten revisited: strengthening the concept of organizational identity', *Journal of Management Inquiry*, 15 (3), pp. 219–234.

Winter, R. (2009) 'Academic manager or managed academic? Academic identity schisms in higher education', *Journal of Higher Education Policy and Management*, 31 (2), pp. 121–131.

Wood, M. S. (2011) 'A process model of academic entrepreneurship', *Business Horizons*, 54 (2), pp. 153–161.

Wooldridge, J. (2016) *Introductory Econometrics: A Modern Approach*, (4th ed), South Western: Cengage Learning.

Wright, M., Clarysse, P., Mustar, P., and Lockett, A. (2007) *Academic entrepreneurship in Europe*. Cheltenham: Edward Elgar.

Wu, Y., Welch, E. W., and Huang, W.-L. (2015) ‘Commercialization of university inventions: individual and institutional factors affecting licensing of university patents’, *Technovation*, 36, pp. 12–25.

Ylijoki, O. H. (2008) ‘A clash of academic cultures: the case of Dr. X’, in Välimaa, J., and Ylijoki, O. H. (eds) *Cultural perspectives on higher education*. Dordrecht: Springer, pp. 75–89.

Ylijoki, O.-H. (2010) ‘Future orientations in episodic labour: short-term academics as a case in point’, *Time & Society*, 19 (3), pp. 365–386.

Ylijoki, O., and Henriksson, L. (2017) ‘Tribal, proletarian and entrepreneurial career stories: junior academics as a case in point’, *Studies in Higher Education*, 42 (7) pp. 1292–1308.

Ylijoki, O., and Ursin, J. (2013) ‘The construction of academic identity in the changes of Finnish higher education’, *Studies in Higher Education*, 38 (8), pp. 1135–1149.

Zhao, H., Hills, G. E., and Seibert, S. E. (2005) ‘The mediating role of self-efficacy in the development of entrepreneurial intentions’, *Journal of Applied Psychology*, 90 (6), pp. 1265–1272.