POLITECNICO DI MILANO

School of Industrial and Information Engineering

Master of Science in Management Engineering

STUDENT ENTREPRENERUSHIP: THE IMPACT OF THE THESIS SUPERVISOR ON STUDENTS' ENTREPRENEURIAL ENTRY

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List of contents

List of Figures

List of Tables

ABSTRACT

The purpose of this thesis is to study the relationship between students and their thesis supervisor, to improve the understanding of student entrepreneurship and its determinants. In line with most studies, we linked student entrepreneurial entry to intention models, based on the principles of the Theory of Planned Behaviour and the Social Learning Theory. In the specific, we assumed that the role model represented by a thesis supervisor with entrepreneurial experience can predict the entrepreneurial entry of the supervised student. We focused on student entrepreneurs who graduated from Politecnico di Milano and we collected information from several sources (PoliMi academic office, the Italian Business Register, PoliMi web site, LinkedIn and the Internet in general) to perform a quantitative analysis based on secondary data. Consistently with extant studies, we developed some reasonable hypotheses and tested them through a probit regression model. The estimates provide evidence of the direct effect of the thesis supervisor's entrepreneurial activity on the supervised student's entrepreneurial entry, while the interactions with some moderators are not significant. The infrequency of the observed phenomenon and the scope of the sample, indeed, forced us to work with small numbers that represent the main limitation of our research work. Other limitations pertain to missing data and lack of time to perform additional checks of robustness. Nevertheless, the results of the estimates provide insights for university managers, who should create a pro-entrepreneurship environment to promote student entrepreneurial entry, both indirectly, by means of academic entrepreneurship, and directly. Overall, this research work presents few points of novelty. First, it examines a new type of relationship as antecedent of students' entrepreneurial entry. Secondly, it exploits the role model framework in a new context, i.e. entrepreneurial behaviour in the university environment. Finally, it suggests to practitioners a new approach to foster the creation of new firms by students.

EXECUTIVE SUMMARY

"Entrepreneurs do more than anybody thinks possible with less than anybody thinks possible, regardless of the field in which they work".

John Doerr
Funder of Netscape, Google, and Amazon

Research objectives

Entrepreneurship, in general, represents a crucial factor for economic development, as it creates job opportunities and attracts talent and investments. Institutions are devoting increasing effort to encourage the creation of new ventures and support their first steps by means of different policies.

This research work focuses on the specific environment of universities, which are a key source of knowledge and idea generation that, possibly, leads to startup foundation. Aware of such potential, universities are enlarging their scope of activity, adding to the teaching and research activities several initiatives of knowledge and technology transfer as well as the commercial exploitation of the outcomes of their core activities. The main reasons behind the so-called "third mission" of entrepreneurship universities are: the possibility to address resource constraints, the competitive pressure among universities and the increase in governmental funds to sustain R&D activities.

Up to present, both policies and studies mainly focused on academic entrepreneurship, while new ventures created by alumni attracted less attention or has been erroneously interpreted under the same dynamics that rule among academics. However, we found evidence that student entrepreneurship deserves dedicated studies as (a) it is subject to its peculiar dynamics and (b) it has a greater magnitude than academic entrepreneurship in terms of both quantity and quality of founded startups. These findings are based on

the idea that students' profile is particularly favourable to entrepreneurship if compared to academic entrepreneurs or prospective entrepreneurs. The growing number of entrepreneurship-oriented education programs prove that even practitioners recognised the relevance of the phenomenon and its peculiarities.

Research framework

So far, the studies conducted on startups created by alumni focused on two main aspects: the determinants of the phenomenon and the role that universities play to foster it. Antecedents of an entrepreneurial behaviour can be found both in the individual personality and in the surrounding context and most studies agree on combining the two dimensions to have a better understanding. A quite comprehensive explanation of the phenomenon can be achieved through the analysis of personal relationships, which depend on both individual and contextual variables. Two main groups of relationships have been considered as antecedents of student entrepreneurial entry, i.e. the relationship with parents and the relationship with university peers. The first one represents an example of the role model effect, in which a self-employed parent provides a model that the offspring can observe and imitate. The second is an expression of the peer-effect, which leads youngsters to imitate the entrepreneurial behaviour, possibly observed from fellows. On the other hand, studies that explore the role of universities, bring to surface the importance of the educational environment to foster the creation of new ventures by alumni and suggest that entrepreneurship-oriented programs should leverage on the practical dimension. Overall, the insights and limitations of the two streams of research led us to focus on the relationship that student entrepreneurs develop with their thesis supervisor that, possibly, represents an entrepreneurial role model. By doing so, we contribute to the analysis of personal relationships and of the university environment as antecedents of the entrepreneurial entry by alumni.

The decision to start a business is usually explained based on intention models, which are best explained by Ajzen's Theory of Planned Behaviour. The underlying idea is that

a certain behaviour, here the decision to become an entrepreneur, is determined by the individual intentions that, in turn, depend on some antecedents. Ajzen's model calls these antecedents attitude towards the behaviour, social norm and perceived behavioural control; slightly different antecedents have been subsequently introduced to develop more sophisticated intention models tailored to entrepreneurial entry (see Chapter2). Clearly, intentions do not automatically turn into behaviour, but they depend on individual perceptions of feasibility that, in turn, are affected by the possibility to observe a certain behaviour and its outcome. Another important theory behind the understanding of the phenomenon under scrutiny is Bandura's Social Learning Theory, which provides a comprehensive explanation of observational learning, i.e. human learning based on social relationships and subsequent behaviours.

Acknowledged that entrepreneurial entry is likely to be shaped by personal relationships due to contributions to the individual's human and social capital, we deepened the analysis of social interactions by exploring the role model effect and more general gains in terms of competences and resources. Exposure to entrepreneurial role models is mentioned by the OECD and the European Commission as an antecedent of new ventures' creation. Indeed, the possibility to observe an example of the behaviours pertaining to specific contexts provides evidence of the feasibility and reduces the uncertainty associated to that behaviour. Additionally, role models bring with them valuable contacts and insights on norms to observe. The role model effect is mainly attributed to parental ties, but references to the world of education are not missing, although limited to certain domains (see Chapter2). Besides being a source of potential role models, social interactions provide competences and resources. A clear example is the intergenerational transmission of job-related competences between family members, as well as financial support provided by wealthy families to offspring who want to start a business. Even interactions developed in the educational and work environments represent sources of valuable competences and resources for prospective entrepreneurs. Indeed, they improve one's ability to identify opportunities and contribute to find business contacts.

Focusing on role modelling, we clustered current studies based on the effects of some features that moderates its effect on entrepreneurial entry. A first cluster focuses on personality of the individual, a second one on other individual traits and a third group considers some characteristics pertaining to the relationship with the model.

Research method

To cover the gaps of extant literature, we developed some hypotheses. First, we assumed that the thesis supervisor is a role model for the supervised student and, therefore, the entrepreneurial activity of the first, if any, can predict the entrepreneurial entry of the latter. In a second moment, we developed additional hypotheses based on the potential effects of moderators related to either the individual or the relationship. Overall, the moderating effects can be summarised as follows:

- *Gender proximity and geographical proximity increase the role model effect*
- *Closeness between the area of expertise of the two increases the role model effect*
- *A higher academic status of the thesis supervisor increases the role model effect*
- *Female students perceive a stronger role model effect*
- *Belonging to an entrepreneurial family affects the role model effect*

To observed the hypothesised effects, we collected information about students who obtained a Laurea Magistrale at Politecnico di Milano between July 2005 and December 2009 (see Chapter4 for more details). Data from a database managed by the PoliMi Academic Office were combined with additional information provided by the Italian Business Register about companies founded by PoliMi alumni up to December 2013. We focused on student entrepreneurs, defined as those who founded a venture few years after graduation, which account for 13,551 individuals. To study the relationship with role models, we collected additional information on the thesis supervisors, especially looking at their entrepreneurial profile. We obtained a quite comprehensive overview by using a stricter and a broader definitions of supervisor entrepreneur, furthermore we performed a triangulation of data sources. We found complete information on 549

academics, who supervised 7,462 individuals. This number defined our sample. Among them, 207 students, i.e. 2.77% of the sample, founded a venture after 5 years from graduation.

To test the hypotheses, we used a probit model, whose variables are described below:

D_STUDENT_FOUNDER_5	Dummy variable equal to 1 if the student founded a venture after 5 years from graduation
D_SUPERVISOR_ENTREPRENEUR_STRICT	Dummy variable equal to 1 if thesis supervisor founded a firm
D_SUPERVISOR_ENTREPRENEUR_BROAD	Dummy variable that equals 1 if the thesis supervisor founded an accelerator, association, innovation observatory, periodical or blog, PhD school, research centre or laboratory
D_SAME_GENDER	Dummy variable equal to 1 if the supervisor and the student have the same gender
SAME_SSD	Dummy variable equal to 1 if the supervisor's SSD and the student's specialization SSD are the same
D_STATUS	Dummy variable equal to 1 if the supervisor is either a full or an associate professor
D_FULL	Dummy variable equal to 1 if the supervisor is a full professor
D_WOMAN	Dummy variable equal to 1 if the student is a woman
D_PRIOR_SHAREHOLDER	Dummy variable equal to 1 if the student is among the shareholders of a firm before graduation
D_CONTACTS_STRICT	Dummy variable equal to 1 if the thesis supervisor work(ed) as managers or belong(ed) the board of directors of one or more ventures

D_CONTACTS_BROAD	Dummy variable equal to 1 if the supervisor provides consultancy services or lead research projects funded by firms.
LN_DISTANCE_BIRTHPLACE	Variable that express the distance between the birthplace and Milan
D_HIGH_INCOME	Dummy variable equal to 1 if the student belongs to the highest contribution income class
AGE_GRADUATION	Variable that expresses the student's age at graduation

As a first step, we analysed some basics statistics on the occurrences of venture creation by both students and their thesis supervisors. Then we focused on the regression analysis considering entrepreneurial entry after 1, 3 and 5 years from graduation. finally, to rule out a possible alternative explanation of the student's entrepreneurial entry, we considered contacts developed by the thesis supervisor due to working experiences. If this is the case, indeed, we may observe the foundation of a startup by students without any role model effect.

Main findings

The estimates provide statistical evidence that the thesis supervisor's entrepreneurial experience can predict, to some extent, the entrepreneurial entry of the supervised student. Such findings are robust compared to the alternative explanation based on contacts, as proved by the analysis of marginal results. Some basics statistics suggest that the moderators increase the number of student entrepreneurs with a thesis supervisor entrepreneur. However, the estimates on the interactive effects are not statistically significant, which is not surprising if we consider that both students and thesis supervisors are not commonly involved in entrepreneurship and venture creation by alumni, in the specific, is a rare phenomenon. Aware that the main limitations of our research depend on small numbers and missing data rather than on an unsuitable use

of the employed model, we believe that the role model effect can provide a reasonable lens to study the relationship between the thesis supervisor and the supervised student. All things considered, the outcome of this study provides interesting insights for practitioner, especially university managers who have a pro-entrepreneurship orientation. The positive effect of entrepreneurial role models from the academic world, indeed, suggests that it is possible to foster student entrepreneurship by acting on a smaller scale phenomenon, i.e. academic entrepreneurship. More than this, the creation of a pro-entrepreneurship environment is expected to have a double effect on student entrepreneurship: by direct means of legitimation of the entrepreneurial activity and by indirect means of available entrepreneurial role models.

Thesis outline

Chapter1 fulfils the purpose to introduce the topic of this thesis work and its relevance. In Chapter2, we resume the key findings on student entrepreneurship, considering theirs gaps as it comes to analysing the impact of relationships on entrepreneurial entry, especially of those developed by students in the academic environment. In a second section of the literature review, we introduce the core elements of the theoretical frameworks used to explain entrepreneurial entry, in general. Finally, we summarize the main insight on the study of relationships as antecedent of entrepreneurial intentions. The research question is expressed through the hypotheses described in Chapter3, while the research methodology is explained in Chapter4, which contains a description of the Dataset, the Sample and the Econometric Model. The most relevant results of the estimates are collected and commented in Chapter5, while the Appendix contains more detailed charts for comparative purposes. Finally, Chapter6 provides an overview on the theoretical contributions, practical implications and limitations to be considered for future research development.

EXECUTIVE SUMMARY – ITALIAN VERSION

"l'imprenditore fa più di quanto si pensa sia possibile con meno di quanto si pensa sia possibile, indipendentemente dal campo in cui lavora".

John Doerr
Finanziatore di Netscape, Google e Amazon

Obiettivi della ricerca

L'imprenditorialità rappresenta un fattore fondamentale per lo sviluppo economico in quanto crea opportunità d'impiego e attrae talenti e investimenti. Non sorprende, dunque, che le istituzioni si stiano dirigendo sempre più verso l'incoraggiamento e la creazione di nuove imprese, tramite la promulgazione di norme dedicate.

La presente ricerca si concentra, nello specifico, sull'ambiente universitario, che rappresenta una delle – se non la – principali fonti di creazione del sapere e della generazione di nuove idee che, verosimilmente, rappresentano il germe della fondazione di nuove imprese. Consce di tale potenziale, le università stanno ampliando il proprio raggio d'azione, affiancando, alle attività didattiche e di ricerca, diverse iniziative di *knowledge & technology transfer,* volte al trasferimento alla commercializzazione del sapere e delle tecnologie generati dalle attività suddette. È questa la cosiddetta *terza missione* delle università, che, in sintesi, nasce da tre fondamentali esigenze: le necessità finanziarie, la competizione con altri atenei per quanto riguarda la produzione di contenuti fruibili, la possibilità di ricevere fondi governativi erogati in favore delle attività di Ricerca e Sviluppo.

Ad oggi, e la legislazione e la ricerca si sono principalmente concentrate sulla creazione d'impresa da parte di docenti universitari e altri accademici – sempre per quanto riguarda l'ambiente universitario – dedicando scarsa attenzione al fenomeno

dell'imprenditorialità studentesca, che è stata erroneamente interpretata sulla base delle stesse dinamiche che caratterizzano la prima. Viceversa, alcuni studi sottolineano la necessità di studiare l'imprenditorialità studentesca come un fenomeno indipendente dalla fondazione d'impresa da parte di accademici in quanto (a) è soggetta a dinamiche proprie e (b) ha una magnitudine maggiore in termini e di quantità e di qualità delle imprese fondate. Simili risultati si fondano sull'idea che il profilo dello studente[1] è particolarmente favorevole all'imprenditorialità, se messo a confronto con quello di accademici e altri potenziali imprenditori. Gli accademici, in termini generali, non dispongono delle competenze manageriali fondamentali per trasformare il frutto della ricerca in idee commercializzabili. D'altro canto, potenziali imprenditori, al di fuori del mondo accademico, difficilmente dispongono delle competenze che consentono di far propria la conoscenza generata da università e centri di ricerca e metterla al servizio della propria idea di business (Colombo et al., 2012). Al contrario, gli studenti si trovano in una posizione privilegiata in quanto dotati una formazione che combina competenze manageriali e capacità di assorbire conoscenza e risulta, pertanto, orientata all'imprenditorialità. Il crescente numero di programmi di educazione orientati all'imprenditorialità dimostra che tale fenomeno interessa in maniera crescente il mondo istituzionale, oltre a quello della ricerca.

Ambito della ricerca

Gli studi condotti sulla creazione di startup da parte di studenti universitari vertono su due principali aspetti: l'analisi dei fattori determinanti del fenomeno e il ruolo che l'università, come istituzione, gioca nel promuovere il fenomeno stesso. Gli antefatti del comportamento imprenditoriale si possono ricercare e nella personalità dell'individuo e nel contesto; la maggior parte degli studi mira ad ottenere una visione più completa del fenomeno tramite un uso congiunto delle due dimensioni. Le relazioni interpersonali dipendono dall'una e dall'altra sfera e forniscono, di conseguenza, una chiave di lettura ottimale. In merito allo studio della scelta imprenditoriale da parte degli studenti,

[1] Da intendersi come studente di facoltà tecniche e manageriali.

l'analisi delle relazioni copre due aree in particolare: le relazioni con i genitori e le relazioni con i colleghi universitari (peers). Il primo tipo di relazione esemplifica l'effetto di *role model*, dove il genitore rappresenta un modello che i figli possono facilmente osservare e imitare. Il secondo tipo di relazione, invece, è soggetto al cosiddetto *peer-effect*, letteralmente l'effetto dei pari, che porta uno studente a subire l'influenza di propri compagni di studi. Entrambi gli effetti ben si prestano alla spiegazione delle dinamiche che stanno alla base della scelta di intraprendere la carriera imprenditoriale. Dagli studi che analizzano il ruolo delle università, inoltre, emerge l'importanza che l'ambiente educativo ha in merito alla promozione della creazione di imprese da parte degli studenti, con particolare enfasi sulla dimensione pratica delle iniziative implementate. In termini generali, l'apporto e i limiti dei due rami della ricerca presa in considerazione, ci hanno condotti a focalizzare la nostra attenzione sulla relazione che studenti imprenditori sviluppano con il proprio relatore di tesi, il quale si presta a rappresentare un modello di ruolo per lo studente stesso. Nella fattispecie, ci proponiamo di valutare se esista una relazione tra la scelta imprenditoriale di uno studente e l'attività imprenditoriale del relatore di tesi dello stesso. In tal modo, la presente ricerca contribuisce ad arricchire lo studio dell'impatto che le relazioni interpersonali e l'ambiente universitario hanno sull'imprenditorialità studentesca.

La decisione di avviare un business viene spesso spiegata sulla base della Teoria del Comportamento Ragionato di Ajzen. L'idea fondamentale è che un determinato comportamento – nella fattispecie la decisione di diventare imprenditore – assunto da un individuo è determinato dalle intenzioni dello stesso, le quali a loro volta sono precedute da tre fattori che Ajzen identifica come attitudine verso il comportamento in oggetto (*attitude towards the behaviour)*, norme sociali (*social norms*) e percezione del controllo che l'individuo ha sul comportamento stesso (*perceived behavioural control*). La scelta di altri, seppur affini, antecedenti delle intenzioni individuali ha portato allo sviluppo di modelli alternativi, alcuni dei quali appositamente ideati per spiegare il comportamento imprenditoriale (si veda Capitolo2). Chiaramente, le intenzioni non hanno come esito immediato il comportamento atteso, ma sono soggette alla percezione che l'individuo ha in merito alla fattibilità del comportamento, la quale, a sua

volta, dipende dalla possibilità di osservare il comportamento in oggetto e il suo esito in determinate situazioni. Ciò porta ad analizzare un'altra teoria per meglio comprendere il fenomeno oggetto del presente studio. La Teoria dell'Apprendimento Sociale di Bandura fornisce una spiegazione esaustiva del processo di apprendimento basato sull'osservazione, secondo il quale un individuo impara sulla base delle relazioni sociali e si comporta di conseguenza.

Riconosciuta la plausibilità del fatto che la scelta imprenditoriale sia influenzata dalle relazioni interpersonali, il presente studio ne approfondisce l'analisi considerando due aspetti fondamentali: l'effetto di *role model* e un più generale contributo in termini di competenze e risorse. La Commissione Europea e l'OECD hanno citato l'esposizione a modelli imprenditoriali tra i fattori che determinano la creazione di nuove imprese. Difatti, la possibilità di osservare i comportamenti esemplari, relativi a uno specifico contesto, ne dimostra la fattibilità, riducendo così l'incertezza associata agli stessi comportamenti. Inoltre, un modello di ruolo fornisce contatti importanti, nonché consigli sulle norme da osservare. L'effetto di *role model* è più frequentemente attributo alle relazioni familiari, specialmente al legame coi genitori; non di meno, sono presenti anche riferimenti all'ambiente educativo, seppur circoscritti a ambiti particolari (si veda Capitolo2).

Le interazioni sociali, oltre a offrire potenziali modelli di ruolo, costituiscono un'importante fonte di competenze e risorse per l'individuo. Ne è un chiaro esempio il meccanismo di trasmissione inter-generazionale di competenze specifiche di un business familiare, così come il supporto finanziario che i giovani imprenditori possono ricevere dalla famiglia. Anche le relazioni stabilite in ambito educativo e lavorativo rappresentano una fonte di competenze e risorse utili ai potenziali imprenditori; è in tali ambiti, infatti, che l'individuo ha la possibilità di migliorare le proprie capacità di identificare valide opportunità e stringere contatti utili.

Concentrandoci sull'effetto di *role model*, abbiamo classificato gli studi esistenti sulla base di determinate caratteristiche che ne moderano l'impatto sulla scelta imprenditoriale. Un primo gruppo si concentra sulla personalità dell'individuo, un

secondo gruppo su altri tratti individuali e un terzo sulle caratteristiche della relazione tra l'individuo e il modello (per maggiori dettagli si veda Capitolo2).

Metodo della ricerca

Partendo dai limiti delle ricerche ad ora condotte sull'imprenditorialità studentesca, abbiamo sviluppato una serie di ipotesi. L'assunzione di base è che il relatore di tesi eserciti un effetto di *role model* sullo studente assistito; nello specifico, l'interesse ricade sugli accademici che hanno un profilo imprenditoriale che, si suppone, possa esercitare un effetto positivo sulla decisione dello studente assistito di diventare imprenditore. Successivamente, sono state sviluppate ulteriori ipotesi sul ruolo di alcune caratteristiche, dello studente e della sua relazione con il relatore, che verosimilmente alterano l'effetto diretto del modello di ruolo. Tali effetti moderatori possono essere riassunti come segue:

- L'effetto è più intenso se individuo e modello sono dello stesso sesso e provengono dalla stessa area geografica
- L'effetto e più intenso se individuo e modello afferiscono alla stessa area disciplinare
- L'effetto è più intenso se il modello gode di uno status accademico di rilievo
- L'effetto è più intenso se lo studente è di sesso femminile
- L'effetto è alterato dalla presenza di altri modelli di ruolo, per esempio familiari

Per valutare le ipotesi formulate e la loro validità, abbiamo raccolto informazioni su studenti che hanno conseguito il titolo di Laurea Magistrale (LM) presso il Politecnico di Milano tra Luglio 2005 e Dicembre 2009. La principale base di dati, ottenuta tramite l'Ufficio Accademico del PoliMi, è stata arricchita con informazioni fornite dalla Camera del Commercio per quanto riguarda le aziende fondate dai suddetti studenti fino a Dicembre 2013. Partendo dalla popolazione iniziale così definita, gli studenti che hanno fondato un'impresa negli anni immediatamente successivi alla laurea sono risultano essere 13,551. Un ulteriore passo verso lo studio della relazione tra studente e modello è stato rappresentato dalla raccolta di informazione sui relatori di tesi degli studenti

sotto osservazione, con particolare attenzione all'attività imprenditoriale dei relatori stessi. Per avere una visione più esaustiva della dinamica del *role model*, abbiamo elaborato una duplice definizione del profilo imprenditoriale degli accademici e abbiamo vagliato diverse fonti. Abbiamo concentrato l'analisi sui docenti che avessero assistito almeno 10 studenti nell'elaborazione della tesi magistrale e siamo stati in grado di raccogliere informazioni complete su 549 relatori, che corrispondono a 7,462 studenti degli iniziali 13,551. Abbiamo quindi focalizzato il campo di attenzione sugli studenti che hanno fondato una startup entro i primi 5 anni dal conseguimento della LM, i quali costituiscono il 2.77% del campione di 7,462 individui, ossia 207 studenti.

Il test d'ipotesi è stato condotto tramite un modello probit di regressione binaria, le cui variabili sono descritte a seguire.

D_STUDENTE_FONDATORE_5	Variabile binaria che vale 1 se lo studente ha fondato un'impresa entro i primi 5 anni dal conseguimento della LM
D_SUPERVISORE_IMPRENDITORE	Variabile binaria che vale 1 se il relatore ha fondato una o più imprese
D_SUPERVISORE_IMPRENDITORE_AMPIA	Variabile binaria che vale 1 se il relatore ha fondato un acceleratore d'impresa, un'associazione, un osservatorio, un periodico o blog, un'accademia, un centro di ricerca o un laboratorio
D_STESSO_SESSO	Variabile binaria che vale 1 se studente e relatore hanno lo stesso sesso
STESSO_SSD	Variabile binaria che vale 1 se studente e relatore appartengono allo stesso settore disciplinare
D_STATUS	Variabile binaria che vale 1 se il relatore è un professore ordinario o associato
D_ORDINARIO	Variabile binaria che vale 1 se il relatore è un professore ordinario
D_DONNA	Variabile binaria che vale 1 se lo studente è di sesso femminile

D_SOCIO_PRIMA	Variabile binaria che vale 1 se lo studente risulta essere socio di un'impresa prima del conseguimento della LM
D_CONTATTI_ STRICT	Variabile binaria che vale 1 se il relatore è (stato) manager o membro del BoD di una o più aziende
D_CONTATTI_ AMPIA	Variabile binaria che vale 1 se il relatore svolge o ha svolto servizi di consulenza o ricerca per una o più aziende
LN_DISTANZA_ NASCITA	Variabile che esprime la distanza da Milano del luogo di nascita dello studente
D_REDDITO_ALTO	Variabile binaria che vale 1 se lo studente appartiene alla più alta fascia di contribuzione in base al reddito familiare
ETÀ_LAUREA	Variabile che indica l'età dello studente al conseguimento della LM

Per prima cosa, abbiamo analizzato alcune statistiche generali per valutare l'occorrenza del fenomeno imprenditoriale e tra i relatori e tra gli studenti del campione. Successivamente, abbiamo valutato il modello di regressione binomiale guardando alla fondazione di impresa dopo 1, 3 e 5 anni dal conseguimento della LM. Infine, abbiamo escluso possibili spiegazioni alternative del fenomeno di imprenditorialità studentesca; a tal proposito, abbiamo valutato l'impatto di contatti maturati dai docenti universitari con il mondo delle imprese, che potrebbero facilitare la fondazione d'impresa da parte dello studente assistito, anche in mancanza dell'effetto di *role model*.

Principali risultati

I risultati delle stime consentono di affermare che l'esperienza imprenditoriale del relatore di tesi può anticipare, entro certi limiti, la decisione dello studente assistito di diventare imprenditore a sua volta. Un'ulteriore conferma viene dal test di robustezza: l'effetto di *role model* risulta, infatti, essere più importante di quello derivante dai

contatti maturati dal relatore a seguito di relazioni con il mondo delle imprese. Le statistiche sull'occorrenza del fenomeno suggeriscono un'influenza positiva da parte dei moderatori, che però non trova riscontro nelle stime della regressione. La scarsa significatività di tali risultati è principalmente giustificata dai piccoli numeri con cui ci si è interfacciati a causa della rarità del fenomeno sotto osservazione. Infatti, nella maggior parte dei casi, sia i relatori che gli studenti del campione risultano non essere coinvolti in attività imprenditoriali.

Consapevoli del fatto che i limiti della presente ricerca dipendono soprattutto dai piccoli numeri e da informazioni mancanti, piuttosto che da un inappropriato uso dei modelli teorici, crediamo, dunque, che l'effetto di *role model* offra un'appropriata prospettiva per l'interpretazione della relazione tra uno studente e il suo relatore di tesi come antecedente della creazione d'impresa da parte dello studente stesso. In virtù delle considerazioni fatte, i risultati del presente studio offrono interessanti spunti per la gestione di università con un orientamento imprenditoriale. Infatti l'effetto positivo che i modelli imprenditoriali provenienti dall'ambiente accademico hanno sulla creazione di startup da parte degli studenti, suggerisce la possibilità di stimolare quest'ultima agendo su un fenomeno di portata minore, l'imprenditorialità accademica. Nientemeno, la creazione di un ambiente a favore dell'imprenditorialità può sortire un duplice effetto sulla fondazione di startup da parte degli studenti: un effetto diretto tramite la legittimazione dell'attività imprenditoriale e un effetto indiretto per mezzo dei modelli imprenditoriali rappresentati dagli accademici.

Struttura della tesi

Il Capitolo1 ha lo scopo di introdurre l'argomento della presente tesi e sottolinearne l'importanza. Nel Capitolo2 vengono esposti i principali studi condotti ad ora sul fenomeno dell'imprenditorialità studentesca e vengono messi in luce i principali limiti di tali studi, in particolare per quanto concerne l'impatto delle relazioni interpersonali sviluppate dagli studenti in ambito accademico. Una seconda sezione dell'analisi della letteratura si concentra, invece, sui riferimenti teorici tipicamente citati per giustificare la decisione di fondare un'impresa. Il capitolo si conclude con una sintesi dei principali risultati sullo studio delle relazioni come fattore determinante delle intenzioni imprenditoriali. L'obiettivo della ricerca è espresso tramite la formulazione delle ipotesi descritte nel Capitolo3, mentre il Capitolo4 specifica le modalità di ricerca, tramite la descrizione della base di dati, del campione e del modello econometrico adoperati. I risultati più significativi sono commentati nel Capitolo5, mentre si rimanda all'Appendice una visione più completa dei risultati per scopi comparativi. Per concludere, il Capitolo6 offre una panoramica dei contributi teorici apportati dal presente studio, suggerisce implicazioni di tipo pratico e rende nota dei limiti che caratterizzano l'analisi condotta, offrendo spunto per gli studi a venire.

CHAPTER 1: INTRODUCTION

Up to the present, research on startups founded to commercially exploit knowledge generated by universities almost exclusively focused on the so-called academic entrepreneurship, referred to as all activities leading to the creation of a new venture with the purpose of exploiting results of academic research developed by academic researchers and staff. In contrast, Bergmann et al. (2016) pointed out how the results generated in the field of academic entrepreneurship literature cannot be easily transferred to students, due to the differences between the two groups in terms of features and dynamics and, therefore, suggested to dedicate a distinct field of research to student entrepreneurship. The authors develop a model to explain student entrepreneurship in a contextual perspective; they refer to two studies (Geissler, 2013; Walter et al., 2013) suggesting that students and faculty members are affected by different determinants as it comes to entrepreneurial entry. Foremost, students are unlikely to have industry experience, therefore contextual variables can be assumed to be more important for their entrepreneurial entry than for academics, who are at a later stage of their professional career; e.g. Geissler et al. (2013) proved that qualification programs are most important for shaping students' entrepreneurial climate but least important for faculty members.

Åstebro et al. (2012) provided evidence that startups founded by graduate students from technical universities in the three years immediately after graduation, or while they were students, outnumber the start-ups founded by faculty by 5-6 times. It is not simply a matter of volume effect driven by the larger number of students graduated: recent graduates are twice as likely as their faculty to create a start-up within three years from graduation. According to SESTAT data, which the study was based on, "the fraction of start-up owners among recent graduates is 6.4% for all universities and colleges and

5.2% for top-rated schools. These fractions are several times higher than the fraction of start-up owners among faculty, which is 1.3% for all schools and 1.6% for top-rated schools. Indeed, start-ups by recent graduates outnumber start-ups by faculty by a factor of 24.3 among all colleges and universities and by a factor of 11.7 when looking only at top-rated schools" (Åstebro et al., 2012). The authors also compared the quality of start-ups by recent graduates to the quality of academic start-ups. To evaluate the quality of recently created ventures, earnings and survival rates are taken into account; "of course, it makes little sense to simply compare the earnings of start-ups by recent graduates, most of whom are young individuals starting their labour market participation, with those of start-ups by faculty, who on average have had much longer labour market experience and are often more educated (have a Ph.D. degree). The comparison, however, is not about absolute levels of such earnings but about comparing earnings of start-up owners with their peers. If it turns out that faculty who launch their own start-ups do much better compared to their peers who do not launch startups, while the same is not true of recent graduates, then the quality concerns would be well-founded. However, as we show, not only is the above statement not true, but, if anything, start-ups by recent graduates outperform start-ups by former university employees relative to their corresponding peers by a rather significant margin, especially if start-ups by recent graduates make use of education they received in school" (Åstebro et al., 2012).

These results, providing practical evidence of student start-ups superior performances against academic start-ups, find a conceptual support in the idea that alumni happen to be in a much more suitable position with respect to both academic entrepreneurs and prospective entrepreneurs aiming to exploit knowledge that spills from universities. Because of their education path and career choice, academics lack the managerial competences needed by a nascent entrepreneur to transfer research-based knowledge into marketable outcomes, indeed they are likely to have greater experience with research accumulated in academic laboratories but, on average, they will exhibit less industry work experience, both in technical and commercial functions, than those of other newly created ventures. Additionally, academic founders are likely to lack the

"leadership experience", either obtained through a managerial position in another firm or in prior self-employment episodes (Colombo et al., 2012). Therefore, either they develop these competences internally, or acquire them through hiring or alliances; however, it is quite unlikely for academics to obtain the most suitable resources to fill their gaps, as they will hardly ally with already operating firms. Indeed, their social capital is generally oriented to the research environment, thus leading to establish homogeneous relationships with other academics or researchers from public research centres, which provide the team with the desired competences enlargement. On the other hand, prospective entrepreneurs, trying to exploit knowledge generated from universities, may lack the absorptive capacity to access such knowledge and transfer it into a business idea (Colombo et al., 2012). Conversely, student entrepreneurs find themselves in a better position because, in contrast with academics, they do not need a 'genetic mutation' to develop the so-called entrepreneur-specific knowledge and embrace the entrepreneurial career and, in contrast with other prospective entrepreneurs, they are better able to exploit knowledge generated from universities, due to the higher absorptive capacity they developed through their academic studies.

Besides scholars, also policy makers and university managers attributed poor importance to student entrepreneurs, which is quite surprising if we consider the changes recently occurred in the university system. Universities are the best place for knowledge creation and transfer, as well as innovation production and absorptive capacity enhancement. Consistently, it is not uncommon that, on the same level of education and research, the entrepreneurial activity is considered as the "third mission" of universities, including, but not limited to: patenting, licensing, creating new firms, facilitating technology transfer through incubators and science parks, and facilitating regional economic development (Rothaermel, F. T et al., 2007). With the passage of the Bayh-Dole Act[2] in 1980, an alternative archetype of academic entrepreneurship has been articulated to encourage the commercial activity of universities. Since then, university managers have shown a growing willingness to enhance the knowledge and

[2] The Bayh-Dole Act (PL 96-517) allows to transfer the exclusive control over government-funded inventions to universities for further development and commercialization. Universities can license the inventions to other parties and retain any licensing fees that may result.

technology transfer activity, as proved by the growing number and variety of network mechanisms developed within the institutional environment (e.g., technology-transfer offices, incubators and science parks), aimed at facilitating the exploitation of research-based knowledge through patenting, licensing and new ventures creation. For sure, financial resource constraints account as one of the drivers for the aim to commercialize the knowhow internally developed through research programmes: engaging in entrepreneurial activities offers a valid response to the decreased amount of investments by governments to raise university budgets. Another reason is the competitive pressure among universities; that is, if rival institutions and aspirational peers (e.g., institutions such as Stanford and MIT) are effective in this arena, there will be a certain pressure to be competitive. A third operational reason for pursuing academic entrepreneurship, even when it is not effective, is the growth of funding from federal agencies to support academic entrepreneurship (e.g., the U.S. government's Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR) Programs), (Wright et al., 2015).

Only recently, some university managers developed a deeper interest towards the theme of entrepreneurship among students (besides academics). This is proved by the increasing number of entrepreneurship courses in university programs to provide undergraduates with competences that may be useful to start a business, in line with the idea that entrepreneur-specific knowledge may be "facilitated through intended and unintended consequences of research universities: encouraging individuals to become entrepreneurs, facilitating their social processes, enhancing their reputations, as well as training them to solve problems, all of which can become valuable inputs to new venture development" (Hsu et al., 2007). It is common to think about universities as sources of knowledge spillovers, but these are not limited to university technology; they "also include knowledge, norms and attitudes about technology-based entrepreneurship", an important mechanism not yet captured by the existing literature analysing the impact of universities on new ventures creation (Hsu et al., 2007). We can, indeed, speak of entrepreneurship education as the building of knowledge and skills either "about" or "for the purpose of" entrepreneurship, as part of recognized education programs at

primary, secondary or tertiary-level educational institutions (Global Entrepreneurship Monitor, 2010), that primarily aims at sensitizing and qualifying students for an entrepreneurial career (Walter S. G., Parboteeah K. P., Walter A., 2013). “It includes instruction in opportunity recognition, obtaining resources, and initiating a business venture in the face of risk. It also includes instruction in business management processes such as business planning, capital development and marketing” (Muofhe et al., 2011, p3). The idea that entrepreneurship courses are important for the development of a proper university ecosystem facilitating entrepreneurship is supported by Wright et al. (2015), who suggest that such ecosystem should include: property-based institutions (incubators/accelerators and science/technology/research parks), a substantial growth in the number of entrepreneurship courses and programs on campus, the establishment and growth of entrepreneurship centres, a rise in the number of “surrogate” entrepreneurs on campus to stimulate commercialization and start-up creation, and a rapid increase in alumni support of various aspects of this entrepreneurial ecosystem, including alumni commercialization funds and student business plan competitions. Several additional studies have shown a positive effect of university entrepreneurship education on students’ self-employment intentions (Bandura, 1986; Boyd & Vozikis, 1994; Charney & Libecap, 2000; Noel, 2002; Peterman & Kennedy, 2003; Arenius & Minniti, 2005; Lee et al., 2005; Zhao et al., 2005; Fayolle et al., 2006; Souitaris et al., 2007; Dickson et al., 2008; Pruett et al., 2009; Turker et al., 2009; Walter et al., 2013; Sieger et al., 2014).

Acknowledged that individual traits are not enough to explain the motivations that lead individuals to choose the entrepreneurial career and aware of the growing attention towards the importance of the educational environment in shaping entrepreneurial intentions, diverse set of variables could be exploited to analyse student entrepreneurial entry. For example, the concentration of entrepreneurs in regions such as Silicon Valley has triggered speculation that the interaction of high-skilled individuals with similar interests lead to powerful peer effects among entrepreneurs. The “peer effect” provides an example of what is achievable by others in a similar position (i.e. peers) and is also an important vehicle of knowledge transfer and resources exchange. With respect to the

specific field of student entrepreneurship, Lerner et al. (2013) proved that social interactions among students leave an imprint on their decision to become entrepreneurs. However, at this point of their career, individuals have not yet developed a wide set of experiences improving their personal competences and leading to affect the decisions of peers. Therefore, it could be interesting to study the relationships with more expert people, rather than peers, to understand student entrepreneurship. For instance, Geissler et al. (2013) suggest to look at role models as an important factor that influences the entrepreneurial climate perceived in the university environment. Turker et al. (2009) highlight the importance of mentoring and support of professional people in many areas as a possible determinant of entrepreneurial intentions and, therefore, strongly suggest to consider such factors in the further studies. Also Engle et al. (2010) suggest that "parents, teachers, mentors and other role models can have a great deal of influence on the degree to which a country's powerful entrepreneurial engine can generate economic development and prosperity" (p.51).

CHAPTER 2: LITTERATURE REVIEW

The following chapter will start from the analysis of the studies conducted so far on the theme of student entrepreneurship, highlighting the main results achieved and the gaps to be filled. The second section will introduce the few theoretical lenses that allow to better understand the mechanism that we are interested to analyse as an explanation of student entrepreneurial entry. The third section of the chapter will be focused on the study of those relationships that may impact on the decision to start a business, trying to understand which are the main contributions and gaps of the research conducted so far. Finally, the fourth section takes into account the most relevant parameters that moderates the above-mentioned impacts, according to the existing studies.

2.1 PREVIOUS STUDIES ON STUDENT ENTREPRENEURSHIP

Scholars' works on new ventures creation by alumni can be clustered in two main areas. A first subset of studies focused on the determinants of entrepreneurial entry by alumni (Hsu et al., 2007; Lerner et al., 2013); another group of studies addressed the specific issue of the influence of university on student entrepreneurship (Åstebro et al., 2012; Bergmann et al., 2016). Nevertheless, research on venture creation by alumni still faces several gaps, as it emerges from a deeper analysis of the above-mentioned studies.

According to the first subset of research, the process of entrepreneurial entry is driven by both stable individual traits, i.e. demographic and psychological characteristics, and choices made in a particular situation or changes occurred in the past. Specifically, Hsu et al. (2007) linked entrepreneurial entry to a series of variables related to (1) basic demographic factors – age, ethnicity and gender – (2) training and experience, (3) cognitive factors and (4) financial resources. The results of the study focus especially on demographic traits. Starting from age, it is shown that the lag between graduation and

the first entrepreneurial act is shortening, which, combined with "the declining median time lag to entrepreneurship among those founding firms since the 1980s" point to a declining age trend among first time entrepreneurs. Second comes gender, which still features a certain unbalance; indeed, the growth of women entrepreneurs appears to mirror the number of women graduating from all levels at MIT. The unbalance can be explained by lower female hazards, different opportunity costs and difficulties in accessing financing, if compared to their male counterpart. Finally, the analysis of ethnicity shows a "significant growth in both numbers of non-U.S. citizen MIT entrepreneurial alumni and the rate at which they exceed their U.S. classmates in becoming entrepreneurs". Foreign students who complete their education abroad are usually the most entrepreneurial and financially well-off in their countries, thus facing less resource constraint typical of entrepreneurial entry. Other motivations refer to the fact that labour market might be not as open to immigrants, who become entrepreneurs as a response to the difficulties faced in finding an employment (blocked mobility theory). Finally, foreign graduates who would like to remain in the U.S. after graduation might start a new business to receive a non-immigrant visa.

A different analysis of entrepreneurial entry is provided by Lerner et al. (2013), who explored the impact of personal relationships in the university environment among business-school alumni. Starting from the idea that entrepreneurs learn about their abilities through running their businesses (Jovanovic, 1982), the authors examined how the learning process, leading to entrepreneurial entry, is influenced by ties among students. Specifically, they suggested that close ties between MBA students in the same section may accelerate the learning process, through several possible channels. First, students with entrepreneurial backgrounds may provide direct counsel to their peers and help identifying which business ideas are worth pursuing (selection of business ideas), or which students are able to run a business successfully (selection of individuals with business skills). Second, the mere presence of entrepreneurial peers and their reports about their experiences may help other students to realize the challenges involved in starting a company. That is, even without direct advice, "pre-MBA entrepreneurs may inject realism into other students and discourage all but the best

potential entrepreneurs from pursuing their ventures. Third, the presence of entrepreneurial peers may not affect individual decisions directly, but encourage students to take more elective entrepreneurship classes, which in turn lead to better decisions" (Lerner et al., 2013, p.2413). Interestingly, the empirical results of the study demonstrate that social interactions among students do affect the individual decision to embrace the entrepreneurial career, both due to counselling provided by colleagues and thanks to the help in realizing the challenges of starting a new venture, which lead to weed out potential ventures that are likely to fail. However, the analysis is limited to peers' effect, while the impact on entrepreneurial entry of 'vertical' relationships, such as those between students and their professors or other academics, has not been explored, thus leaving a gap to be filled.

The studies that focused on how institutions can enhance the rate of new business creation by means of developing a favourable environment, have shown that universities should help students in acquiring the assets needed to start a business, in terms of both personal competences and contacts with collaborators, financiers, and university researchers (Åstebro et al., 2012). Through the illustration of three empirical cases, Åstebro et al. (2012) underlined the importance of teaching entrepreneurship, as a vehicle to shape students' decision to start a business. Students attending entrepreneurship courses get better calibrated on the challenges of starting up businesses after taking entrepreneurship courses; more precisely, the pillars of an effective influence seem to be an industry-oriented program design and an extensive ecosystem that can foster entrepreneurial activities beyond graduation. "Worth mentioning is the high importance attributed to relationships created with collaborators, financiers, and university researchers" (p.647). Even in this study, hence, the reference to relationships within the university context, is limited to interactions among students, i.e. peers, (Halmstad and MIT cases) or between students and academic inventors (Chalmers), without specific references to ties between students and their professors.

Under the same belief that entrepreneurship, specifically academic, is strongly context dependent (Bercovitz & Feldman, 2008; Wennberg, Wiklund & Wright, 2011), Bergmann

et al. (2016) explored the imprint of educational and regional contexts on new ventures creation. The study highlights how the sole influence of universities can only facilitate the emergence of entrepreneurial intentions among students. The transition from new venture to operating firm needs the support of a wider environment, represented by industrial ties at regional level. This argument comes from the distinction between the roles of human and social capital in entrepreneurial entry. While the first can foster the decision to start a business, by improving individual opportunity recognition, the second appears to be a crucial ingredient to support the transition from nascent to established business, as certain critical resources and capabilities can only be obtained from the surrounding environment. Interestingly, this study draws attention towards the importance of the academic environment in shaping the nascent phase of entrepreneurship among alumni, underlying the positive impact of entrepreneurship education on students' intentions to start a venture.

Bringing together the main results of the analyses conducted so far, it emerges that student entrepreneurship should be evaluated on a multi-dimensional perspective. Personal traits, indeed, are not enough to explain entrepreneurial entry, while the strong context dependency of entrepreneurship suggests that other variables, e.g. personal interactions and institutional environments, play a determinant role. However, several gaps are still evident. First, the analysis of personal interaction is limited to relationships among peers, while relationships with superiors are quite unexplored. Secondly, although aware of the importance that universities play in fostering student entrepreneurship, researchers have been quite general with respect to the influence of the specific academic context on entrepreneurial entry by graduates.

2.2 THEORETICAL LENSES

Most studies on entrepreneurial entry refer to intention models and the social learning theory to give a theoretical framework to their results. Ajzen's theory of planned behaviour (TPB), Shapero's model of the entrepreneurial event (SEE) and Krueger's entrepreneurial intention model (EIM) represent the most significant frameworks for

our research: the first one is a general intention model, while the others are specifically tailored to explain entrepreneurship. The following paragraphs are aimed at resuming the key points of such frameworks and underlying the main keywords and fundamental definitions needed to better understand each model.

Prior studies on entrepreneurial entry have shown that intention models are particularly suitable to understand the dynamics that govern entry behaviours. Intentions have been conceptualized as being a function of beliefs that provide a link between beliefs and subsequent behaviour (Fishbein and Ajzen, 1975). That is, people form attitudes toward performing a given behaviour based on beliefs that performing the behaviour will result in certain consequences, as well as normative beliefs about the behaviour. Behavioural intentions result from attitudes and become the immediate determinant of behaviour. Bird (1988, 1992) defines intention as a state of mind that focuses a person's attention, experience, and behaviour toward a specific object or method of behaving; he further suggests that entrepreneurial intention directs critical strategic thinking and decisions and operates as a perceptual screen for viewing relationships, resources, and exchanges. According to this framework, individuals are predisposed to entrepreneurial intentions based upon a combination of both personal and contextual factors. Personal factors include prior experience as an entrepreneur, personality characteristics, and abilities. The contextual factors of entrepreneurship consist of social, political, and economic variables such as displacement, changes in markets, and government deregulation (Bird, 1988). According to the psychological literature in general, intentions represent the best predictors of planned behaviour, particularly when planned behaviours are rare, hard to observe, or involves unpredictable time lags. The opportunity identification behind new businesses creation is a process that involves considerable planning and takes quite a long time to develop, especially due to the high uncertainty of all the variables involved; moreover, career choices cannot be considered as simple responses to stimuli, as they involve some cognitive processing, which clearly characterises them as intentionally planned behaviours. Therefore, being entrepreneurial entry a career choice based on opportunity identification, we can transfer the key principles of intentions models to the specific field of entrepreneurship.

The Theory of Planned Behaviour (Ajzen, 1991) claims that individual intentions predict behaviours, while intentions are determined by three distinct variables: attitude towards the behaviour, subjective norms, and perceived behavioural control (Figure1). Attitude towards the behaviour "refers to the degree to which a person has a favourable or unfavourable evaluation or appraisal of the behaviour in question". Subjective norm "refers to the perceived social pressure to perform or not to perform the behaviour". Perceived behavioural control "refers to the perceived ease or difficulty of performing the behaviour and it is assumed to reflect experience as well as anticipated impediments and obstacles". In general, attitude and social norms predict one's desirability to perform a behaviour, while the perception of behavioural control reflects the perceived feasibility of performing the behaviour. Therefore, the more favourable towards the behaviour the attitude and subjective norms, and the greater the perceived control over the behaviour, the stronger the intention to perform the behaviour under scrutiny. The relative importance of attitude, subjective norm, and perceived behavioural control in the prediction of intention is expected to vary across behaviours and situations, as proved by Engle et al. (2010). Overall, the TPB represents an important cognitive process model to understand entrepreneurial intentions.

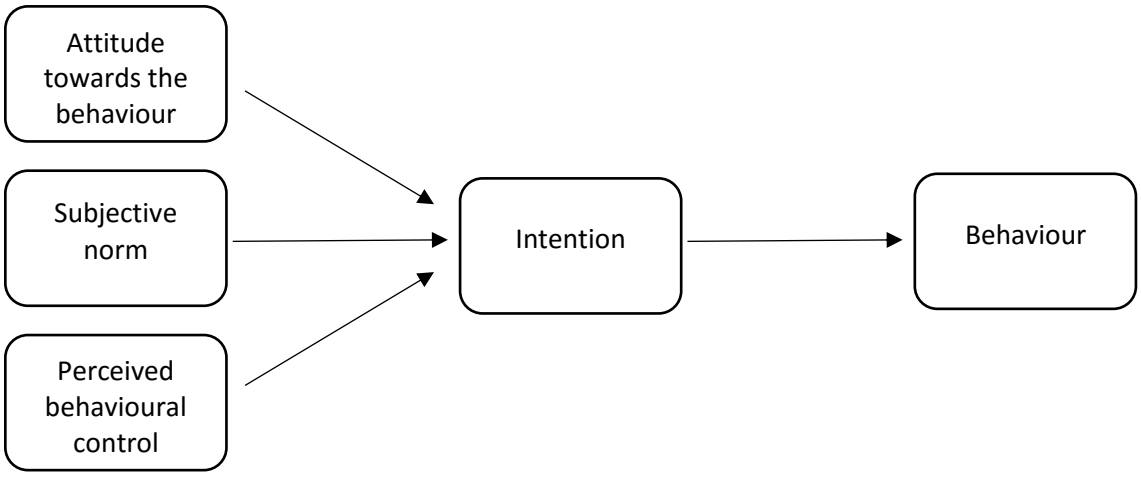

Figure 1 - Ajzen's Theory of Planned Behaviour

The distinction between perceived desirability and perceived feasibility (Krueger, 1993) brings to surface the concept of self-efficacy, which is closely related to the concept of behavioural control (Bandura, 1977a, 1982), as Ajzen points out (1982). Self-efficacy represents the perception of self-ability to execute an intended behaviour, thus being close to perceived behavioural control (Boyd et al., 1994), and proposed as an important explanatory variable in determining both the strength of entrepreneurial intentions and the likelihood that those intentions will result in entrepreneurial actions. Self-efficacy is gradually acquired by virtue of complex cognitive, social, linguistic, and/or physical skills that are obtained through experience. Individuals develop and strengthen beliefs about their efficacy in four ways: mastery experiences, modelling, social persuasion and judgments of their own physiological states (Bandura, 1982). Additionally, the individual's assessment of available resources and constraints, either personal or situational, influence the formation of self-efficacy (Ajzen, 1987). Notably, perceptions of feasibility drive career-related choices, including entrepreneurial entry; hence, it seems reasonable to speak of entrepreneurial self-efficacy (ESE), referred to as one's beliefs regarding the ability to carry out tasks related to starting and running a new venture, such as marketing activities, innovation tasks, managerial activities, financial control, and risk taking (Chen et al., 1998). Interestingly, entrepreneurial self-efficacy has been positively associated with the intention to create new ventures and with individuals specifically interested in entrepreneurship (Chen et al., 1998; Krueger, 1993). Additionally, self-efficacy moderates the relationship between the raise of entrepreneurial intentions and the likelihood of entrepreneurial entry; that is, entrepreneurial intentions will not always result in new venture creation, while individuals will only become entrepreneurs when self-efficacy is high, in relation to the perceived requirements of a specific opportunity (Boyd et al., 1994).

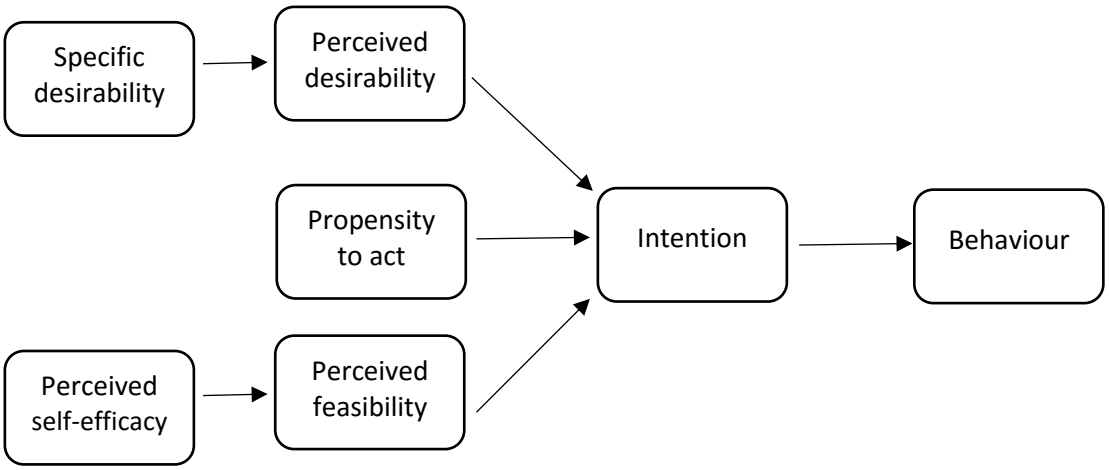

Figure 2 - Shapero's Model of Entrepreneurial Event

Also Shapero's Model of Entrepreneurial Event (1982) is based on the idea that intentions determine individual behaviours and are affected by some antecedents. Precisely, it claims that desirability, feasibility and propensity to act are the most crucial factors influencing entrepreneurial intentions (Figure2). Shapero started from the idea that inertia guides human behaviour and entrepreneurial entry is a consequence of an event leading to some displacement effect (e.g. job loss). Clearly, the sole force of displacement is not enough to determine the choice of a behaviour, which is dependent upon the propensity to act of the individual and the credibility of the behaviour itself, stemming from both its desirability and feasibility. Specifically, the model considers perceived desirability (that is the attitude in the TPB) as a predictor stemming from individuals' expectations of outcome (specific desirability) that result from the behaviour, i.e. starting a business, whereas perceived feasibility (perceived behavioural control in the TPB) works as a predictor representing individual perceived capability to successfully perform the focal behaviour (perceived self-efficacy). Finally, propensity to act is crucial, as it reflects the volitional aspect of intentions ("I will do it").

Always starting from the assumption that starting a business is an intentional behaviour and that intentions are the best predictors for any planned behaviours, Krueger's model (1993) suggests that the process of venture foundation is the result of the dynamic interaction between the individual and the environment (Figure3). The model assumes

that entrepreneurial intentions can be predicted by perceived desirability and perceived feasibility, which in turn have social norms and perceived self-efficacy as antecedents (Krueger and Brazeal, 1994). This hierarchy clarifies how the social context affects intentions by means of perceptions. The social norm dimension, indeed, reflects the perceived normative beliefs of "significant others", weighted by the individual willingness to comply with such beliefs. These "significant others" form the so-called reference group, a standard to which individuals measure their behaviours and attitudes and which defines social norms. In the specific case of entrepreneurs, the reference group could encompass family members, friends, colleagues and business partners (Carsrud et al., 2007), that is either people one looks up to or people one is familiar with. Overall, the TPB and the models of Shapero (SEE) and Krueger (EIM) appear useful for understanding the process that leads to shape intentions and, ultimately, new ventures creation. Precisely, the exogenous factors that act upon the antecedents of intentions can be explored considering observational learning, which plays a crucial role in the individuals' personality development and, hence, in the formation of desirability and feasibility perceptions that, in turn, shape intentions and, eventually, behaviours.

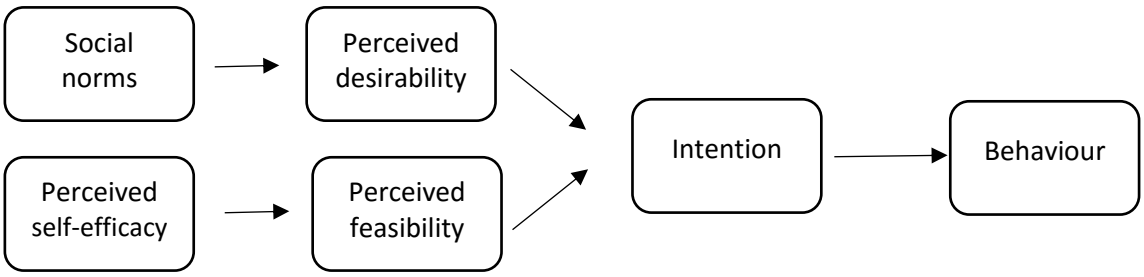

Figure 3 – Krueger's model

Observational learning can be better understood considering the social learning theory (SLT) developed by Bandura (1977), which is based on the concept that individuals are "neither driven by inner forces nor buffeted helplessly by environmental influences. Rather, psychological functioning is best understood in terms of a continuous reciprocal interaction between behaviour and its controlling conditions." More specifically, new

“patterns of behaviour can be either acquired through direct experience or by observing the behaviour of others”. Precisely, the observation of a “model” leads the individual to form an idea on how to act to produce a new pattern of behaviours, through an identification process that involves the adoption of behaviours, values, beliefs and attitudes observed from someone else (i.e. the “model”), without going through tedious trial and error. This concept can be easily understood considering a clarifying example provided by Bandura: the child example. In society, children are surrounded by many influential models and pay attention to some of these, thus encoding their behaviour. Eventually, they may imitate (i.e. copy) what they have observed, according to some distinctive dynamics. First, the child is more likely to imitate those people perceived as similar to herself. Secondly, people around the child will either reinforce or punish the imitation, hence the child is likely to continue performing only a reinforced behaviour. Finally, the child will evaluate what happens to other people when deciding whether to copy someone’s actions or not, thus replicating only behaviours that are likely to be rewarded.

Far from being an automatic imitation of some stimulus-response associations, the observational learning cannot be considered without mediation of some mental factors. Bandura (1977) claims that attention, retention, reproduction and motivation are the four mediational processes that occur from observation of a model to identification with the same (McLeod, 2016; Bandura, 1977). As far as the attentional process is concerned, Bandura claims that observational learning can only take place by paying attention to the essential behaviours of the model, as “the people with whom one regularly associates delimit the types of behaviours that one will repeatedly observe and hence learn more thoroughly” (1977, p.6). going on, a person must have memory of the observed model, to perceive its influence, therefore “a second major function involved in observational learning concerns long-term retention of activities that have been modelled at one time or another (Bandura, 1977, p.7). The following component of modelling pertains to symbolic representations that lead to behavioural reproduction. Finally, for the learning to turn into performance, positive incentives should be provided, i.e. reinforcement of the modelled behaviour (Bandura, 1977). By these considerations,

the SLT provides a comprehensive explanation of human learning and behaviour through social relationships. Additionally, it suggests that the effects of modelling can be strengthen by perceived similarity with the observed model, as the identification process is likely to be stronger, and when the modelled behaviour produces obvious consequences or results.

2.3 THE IMPACT OF RELATIONSHIPS ON ENTREPRENEURIAL ENTRY

Consistently with the above-mentioned theories, entrepreneurial entry is likely to be shaped by social dynamics and relationships developed by individuals in different contexts. According to entrepreneurship-oriented literature, family, schools, work environment and networks represent the core sources of influential factors that affect the individual decision to start a business. Each context will have a certain impact on either human or social capital of individuals (or even on both), where by the first we refer to individual knowledge and competences, while the second deals with the width of one's network of valuable contacts. As suggested by Davidsson et al. (2003), education, experience and practical learning, taking place on the job, mainly contribute to enrich individual human capital. On the other hand, contacts provided by extended family, community-based, or organizational relationships are expected to supplement the effects of education and experience, by enhancing the individual's social capital. Considering existing studies and their gaps, it seems suitable to study relationships considering the role model mechanism, on one hand, and the effects of competences and resources, on the other.

2.3.1. Role models

A role model is a common reference to individuals who set examples to be emulated by others and who may stimulate or inspire other individuals to make certain (career) decisions and achieve certain goals (Shapiro et al., 1978). According to Gibson (2004,

p.136), “the term ‘role model’ draws on two prominent theoretical constructs: the concept of *role* and the tendency of individuals to identify with other people occupying important social roles; and the concept of *modelling* as the psychological matching of cognitive skills and patterns of behaviour between a person and an observing individual”. The first concept emphasizes the notion that individuals are attracted to people whom they perceive some similarity to, in terms of their attitudes, behaviours, goals, or the desirability of their status position, and are motivated to enhance that similarity through observation and emulation (Erikson, 1950; Foote, 1951; Kagan, 1958; Kohlberg, 1963). The second concept, derived from social learning or modelling theories, suggests that individuals attend to models because they can be helpful in learning new tasks, skills, and norms (Bandura, 1977b). Role identification theories, then, place relatively more emphasis on the motivational and self-definitional aspects of role models, while modelling theories emphasize the learning aspects. Consistently, Gibson (2004, p. 136) defines “a role model as a cognitive construction based on the attributes of people in social roles an individual perceives to be similar to him or herself to some extent and desires to increase perceived similarity by emulating those attributes”. The author distinguishes between “close” and “distant” role models, where the first are selected from people who directly and frequently interact with the individual, while the interaction with the latter is not direct. Close role models provide the fine-grained details of how to perform a job and how to execute a professional style, and provided verbal and nonverbal feedback on an individual’s performance. “Individuals may also vary to the degree that they attend to role models who are more advanced than they are in experience or in hierarchical position, and those who are at peer or lower levels. Variation on this dimension tends to relate to the types of skills or attributes individuals are interested in emulating, and their own location in the status hierarchy” (Gibson, 2004, p.148).

Role models are often employed to explain career choices and, more specifically, the entrepreneurial entry. Notably, the OECD (2009) and the European Commission (2003) identified the presence of entrepreneurial role models as amongst the most important drivers of entrepreneurship. Indeed, the presence of entrepreneurial role models affects

the cognitive representation of economic agents and strongly influences the behaviours of the latter towards the different decisions to be taken along the entrepreneurial process (Krueger, 1993). Precisely, entrepreneurs provide examples of the skills and capabilities, as well as the most suitable behaviours, needed to start a business, thus reducing the uncertainty and ambiguity that prospective entrepreneurs usually fear. In addition, role models provide living evidence that certain goals are achievable, thus acting on individual self-efficacy. Exposure to entrepreneurs provides a person not only with familiarity, but with an experienced network that can provide advice, insight, and encouragement. Overall, access to role models should help individuals to overcome fear of failure, lack of experience, and diverse practical hurdles that affect start-ups, i.e. developing market and supply contacts, planning facilities, working with government and regulators, finding partners and employees, or securing financing. These considerations lead to assume that access to role models should positively impact on entrepreneurial intentions.

The dynamics of the role model effect can be summarised in: (i) inspiration and motivation, by creating awareness, (ii) self-efficacy enhancement, by increasing self-confidence with respect to certain goals' achievement, (iii) learning by example, by providing guidelines, (iv) learning by support, by providing advice. Consistently with the SLT, learning by example seems to be the dominant effect (Bosma et al., 2012), the others being additional perceived functions of modelling. In other words, role models serve three interrelated functions: to provide learning, to provide motivation and inspiration and to help individuals define their self-concept (Gibson, 2004). Indeed, "the attributes sought in a role model tend to be of two general types: role expectations and self-concept definitions. Role expectations are beliefs about what an incumbent should or should not do as part of an organizational role (Katz & Kahn, 1978). Role models can efficiently convey to individuals the performance standards, skills, and norms explicit in roles, as well as more implicit matters of style (Ibarra, 1999; Kemper, 1968). A critical aspect, however, is that role models do not merely convey role expectations; they often also represent some aspects of what the individual would like to ''be''—that is, they help the individual to define some aspects of their identity" (Gibson, 2004, p.7). Role models,

indeed, affect self-efficacy through a social comparison process (Wood & Bandura, 1989), i.e. people form judgments of their own capabilities by comparing themselves to others. Through observational learning, an individual estimates the relevant skills and behaviour used by a role model in performing a task, approximates the extent to which those skills are similar to his or her own, and infers the amount of effort versus skill that would be required to reach the same results (Gist & Mitchell, 1992).

Recalling on the child example proposed by Bandura (1977), children are naturally exposed to their parents' behaviours, which significantly contributes to the development of the offspring attitudes. Parental models are, beyond a doubt, the most frequently mentioned and analysed role models. Families represent the environment in which it is easier to observe role model effects, as they are the first place where individuals are exposed to the influence of models – the parents – and where the strongest and most direct ties – family bonds – are built. Focusing on entrepreneurial role models, several studies proved that parental role models have a significant impact on offspring intentions and career choices. Early exposure to parental role models in a family business affects the children's attitude towards becoming self-employed themselves (Dyer et al. 1994; Carr and Sequeira, 2007) and growing up in a family with self-employed members may lead to a general pro-business attitude of the children (Dunn and Holtz-Eakin, 2000). In other words, children of entrepreneurs tend to perceive business ownership and self-employment as more valuable than working for someone else (Dyer et al., 1994). Parental role models can be linked to the TPB to analyse their effects on the three antecedents of intentions. The observation of entrepreneurial role models shapes individual attitudes towards diverse career pathways: by creating an environment strongly influencing the personal characteristics of their children, self-employed parents can make entrepreneurship a desirable option in their offspring's eyes (Matthews et al., 1995; Shapero et al., 1982), thus enhancing her attitude towards entrepreneurial entry. As the offspring becomes part of the parental business network, she also perceives a stronger pressure to start a venture, due to role model's imprint on social norms. In particular, the extent to which individuals perceive that attachment figures ("models") would approve or disapprove a specific

behaviour, defines the pressure to perform or not the behaviour under scrutiny. Finally, parental role models have a positive impact on perceived behavioural control, as the offspring feels more prepared to start up a business, considering the skills and behaving codes acquired through observational learning. More precisely, Bosma et al. (2012) proved that exposure to parental role models only positively influences the subjective norm, whereas it has no significant effect on either attitude or perceived behavioural control about starting a business, unless individuals perceive parental role model exposure as positive.

Provided that role models leave an effective imprint if they come from the direct relationships rather than from 'icons' (Bosma et al., 2012), and acknowledged that parents represent the most influential models, there are some gaps with respect to other ties that can provide models to shape individual career choices. Boyd et al. (1994) suggest that entrepreneurial role models strengthen the intentions of creating a new business, especially when such models come from several close relatives. Different types of relationship, such as those with colleagues or friends, may provide role models as well, fulfilling a different function. As suggested by Bosma et al. (2012): "when role models are selected from the entrepreneur's network, they may be 'strong ties' such as friends or family members or 'weak ties' such as acquaintances, distant relatives or (former) colleagues and superiors. The first provide access to new information and knowledge that may help entrepreneurs to explore new horizons and eventually expand the business, and the second may be more useful in providing mental and practical support (mentoring)". Boyd et al. (1994) suggest that the influence of observational learning, through modelling, on the development of self-efficacy beliefs may extend to mentor relationships, in which the individual has the opportunity to work under the guidance and direction of a successful entrepreneur. In particular, many of the functions of the mentor relationship, such as sponsorship, coaching, access to challenging work assignments, and access to important informal social networks through which information is exchanged, may increase entrepreneurial self-efficacy.

We mentioned that role models are not circumscribed to the family boundaries, but can be represented by other influential people such as mentors and teachers. As it comes to

role models coming from the world of education, we find few heterogeneous insights. Zapkau et al. (2014) suggest that the integration of role models in entrepreneurship education and training programs may have a positive effect on attitude towards starting a business, if trainees perceive the exposure as positive; while learning by doing gives individuals a greater confidence regarding starting their own business. Consistently, they suggest to join entrepreneurship education and training programs with complementary theoretical and active elements to enable entrepreneurship trainee to learn relevant skills for starting a business. Interestingly, in a comparative study between the determinants of student entrepreneurial intentions in US and Mexico (Van Auken et al., 2006), teachers are considered as a possible source of modelling, although the dynamics that determine the influence between teachers and students are not explored. If we consider the theme of role models provided by teachers to their students as antecedents of choices made by the latter, we only find references to choices made by minority students, e.g. the choice of college majors by female students or students belonging to ethnic groups (Rask et al., 2002). Other studies refer to the specific class of medical students (Wright et al., 1997; Byszewski et al., 2012; Basco et al., 2001; Roeske et al., 1977) and further references can be found in a study that explore the role model effect in teaching education (Lunenberg et al., 2007).

2.3.2. Competences and resources

Relationships influence entrepreneurial entry also by transferring some valuable resources that may be used in the business. Personal relationships indeed enhance one's opportunities, by providing competences, social contacts and (possibly) financial resources.

Once again, family is the key starting point to observe the effect of relationships. By virtue of experience, self-employed parents can transfer to their children crucial skills leading to improve their chances to become successful entrepreneurs, not only with respect to the patterns of behaviours to put in place when starting a new venture, but also some specific competences pertinent to the occupational field in which the parent

can be an expert. Not less importantly, entrepreneurial parents may also be abler and more willing to transfer financial wealth to their offspring, thereby relaxing capital market constraints (Dunn et al., 1996). In short, family credit markets may substitute for formal access to funds, thus helping the offspring to overcome the financial barriers, one of the biggest obstacles for prospective entrepreneurs. Dunn et al. (1996) proved that intergenerational transmission plays a crucial role in the transition to self-employment, in terms of both human and financial capital. Additionally, offspring can benefit from accessing the social network of their parents, which provides potentially valuable contacts to overcome competences gaps.

Also the context of education has a crucial influence on individual skills. Fayolle et al. (2006, p.511) suggest that "there are significant differences between students who have taken entrepreneurship courses and those who have not". Many studies examined the link between entrepreneurial education and the entrepreneurial career choice, considering different dimensions of analysis. Noel et al. (2001) suggest that entrepreneurship-oriented education has a positive impact on individual entrepreneurial intentions and self-efficacy, thus leading to higher rates of entrepreneurial entry. Dickson et al. (2008) suggested a positive link between entrepreneurship education and both the choice to become an entrepreneur and subsequent entrepreneurial success. Stokes et al. (2010) contend that early findings have shown that participation in enterprise programmes can positively influence people's enterprise potential and attitudes to entrepreneurship. Bandura (1986) conducted an empirical study to test the link between entrepreneurial education and entrepreneurial self-efficacy. The study generally concluded that entrepreneurial education positively affects individuals' perceptions of their ability to start new businesses. Fayolle et al. (2006) found that the entrepreneurial education programme they tested had a strong measurable impact on the entrepreneurial intention of the attending students. In other words, courses aimed at qualifying students for an entrepreneurial career proved to have a positive effect on new venture creation, by enhancing entrepreneurial intentions and self-efficacy as well as opportunity recognition. Lee, et al. (2005) suggest that education is one of the vital factors

distinguishing entrepreneurs from non-entrepreneurs. Arenius & Minniti (2005) suggest that individuals with higher formal education are more likely to pursue entrepreneurial opportunities, a statement that is supported by Turker et al. (2009) idea that an adequate education may foster entrepreneurial intentions. Focusing on students, Pruett et. al. (2009) established that one of the main barriers for entrepreneurial intention among students is the lack of management, business, accountancy and administration knowledge, and suggest that such gaps can be filled through an entrepreneurship-oriented education program. As a final remark, we report that the Global Entrepreneurship Monitor (GEM, 2001) indicated that people with limited education are less likely to participate in entrepreneurial initiatives. Additionally, Kim et al. (2006) suggest that formal education may work as a credential, providing access to certain social networks (e.g. alumni networks) or serve as a signal of good quality for nascent entrepreneurs in the eyes of resources providers (e.g. venture capitalists). Therefore, universities also represent an important source of contacts and networking opportunities, even by virtue of the endless possibilities of building ties with colleagues, professors and other academics, but also with players from outside the educational sphere, thanks to the interactions between universities and firms or research centres and governmental institutions.

Previous research shows that also prior work experience is an important component of human capital for potential entrepreneurs (Kim et al., 2006). Small and newly founded firms provide a work environment ideally suited for sharing, experiencing, and learning the skills beneficial for starting a business (Zapkau et al., 2015). Individuals' prior exposure to self-employment also provide decision-relevant information, which are valuable in the cognitive decision-making process for further decisions between paid employment and self-employment (Katz, 1992). Additionally, it is even possible that former colleagues approach individuals with business opportunities because they perceive the individual competent enough to exploit these opportunities by virtue of their skills, acquired in the course of their past work experience (MacMillan, 1986); in other words, former colleagues represent an important source of social contacts and valuable competences. Additionally, work experience allows prospective entrepreneurs

to gain experience and to obtain necessary skills relevant for starting their own business. Despite acquiring general business human capital, work experience provides potential entrepreneurs with the opportunity to obtain job- or industry-specific business human capital, which allows to identify potential customers and competitors. Moreover, prospective entrepreneurs gain access to social networks for market information, access to capital, hiring employees, establishing reputations and developing supplier and customer relationships (Kim et al., 2006).

2.4 MODERATING EFFECTS OF SPECIFIC VARIABLES

The studies conducted so far suggest that the role model effects on entrepreneurial entry are likely to be moderated by a series of variables that could be clustered in three wider groups: personality traits of the individual[3], other characteristics of the individual and characteristics of the relationship between the individual and the model. The following paragraphs deepen the analysis of the variables included in these three groups and their moderating effect.

2.4.1 Personality traits of the individual

''Entrepreneurship research cannot develop a consistent theory about entrepreneurship if it does not take personality variables into account as well'' (Rauch et al., 2007, p. 29). Several studies that exploit this idea focus on personality traits of the individuals to explain their choices; in particular, some studies proved that certain personality traits moderate the role model effect, due to their influence on information processing and learning (Ajzen, 1978; Bagozzi et al., 1992). It appears, indeed, that personality and role models complement each other and jointly influence self-employment decisions (Chlosta et al., 2012). Broadly speaking, personality can be defined as a set of relatively enduring patterns of thoughts, feelings, and actions that can be quantitatively assessed and show some degree of cross-situational consistency

[3] The individual considered here is the woman (man) who is evaluating entrepreneurial entry. The characteristics of the role model are not considered.

(Pervin and John, 1999). “Personality determines, partly, how individuals sense (Holland 1985), interpret (Rauch and Frese 2000), and act on (Hunt and Adams 1998; Caprana and Cervone 2000) information and stimuli they receive from their environment and thus their social learning processes” (Chlosta et al., 2012, p.124).

Some personality traits are strictly related to gender. As suggested by social role theory, men happen to have a personality that can be described as assertive, independent, dominating, and task and goal-oriented, while women are affiliative, expressive, submissive and nurturing, by nature. Moreover, it is not uncommon that women show much lower levels of confidence in their business abilities than men, thus perceiving the idea of starting up a new business even more difficult, with drawbacks on female entrepreneurial rates. As a matter of fact, although the number and share of women entrepreneurs significantly increased over the last decades, the world of entrepreneurship still features masculine traits, being dominated by male stereotypes (Blanchflower, 2004; Langowitz & Minniti, 2007; Marlow, 2002). Therefore, it seems reasonable to assume that, under the influence of stereotypes and social dynamics, perception of behavioural control and self-efficacy are more influential for female intentions to start a new business, rather than male (Karimi et al., 2013). Notably, women who conform to gender stereotypes are less likely to undertake self-employment as a career path (Greene et al., 2013), which strengthen the idea that social dynamics are highly influential on women. Indeed, social norms exert a stronger influence on women’s intentions, while male willingness to start a business is mainly affected by their strong attitude towards entrepreneurship.

Interestingly, the same personality traits might strengthen the effect of role models on women. Men’s roles have been characterized by “agentic” attributes, such as being independent, masterful, goal oriented, and instrumental, which make them more likely to rely on their own beliefs when developing entrepreneurial intentions. Conversely, women’s roles are characterized by “communal” attributes, such as being helpful, nurturing, friendly, and unselfish, which make them more willing to listen to advice coming from other people, thus increasing their chances of benefitting from the role model effect. “Since men will likely gravitate toward career choices with agentic

attributes regardless, they are less likely to be affected by the existence of role models in forming the intention to choose entrepreneurship as a career. Women, on the other hand, are less likely to choose male-typical careers in the absence of specific triggers or encouragement mechanisms. To the extent that role models provide encouragement or access to resources that do not exist otherwise, we propose that their effect on enhancing the intention to start a business will be stronger for women" (BarNir et al., 2011, p.275). Moreover, women tend to have better relational abilities and to be more sensitive to decoding interpersonal and behavioural cues than men, both of which are important in learning and internalizing lessons from role models. Since men are more likely to choose a career upon agentic motivations, their intentions to pick self-employment as a career are less likely to be affected by the existence of role models. Conversely, women are quite unlikely to choose male-typical careers in the absence of specific triggers or encouragement mechanisms as they are more likely to perceive the lack of role models as a barrier for career progression. Hence, to the extent that role models encourage and provide access to resources that do not exist otherwise, the effect on the intention to start a business will, hence, be stronger for women (BarNir et al., 2011).

Another characteristic that has been described as moderator of the effect of role models is the individual openness[4], i.e. the tendency to be creative, innovative, untraditional (Zhao and Seibert 2006), and free from conformity and security; or the willingness to change the status quo and experiment with new and different ideas (Roccas et al. 2002). "It appears that the effect of social learning varies between high- and low-openness individuals, because openness influences the kind of information and environmental stimuli to which individuals respond" (Chlosta et al., 2010, p.125). Open individuals have broad interests, are imaginative, and enjoy the aesthetics of their environment (Zhao and Seibert 2006). They are responsive to new ideas and incorporate information and stimuli outside their daily experiences and established patterns of thoughts into their behaviours and actions. In contrast, individuals that exhibit low openness are

[4] One of the personality dimensions identified by the Big Five (Costa & McCrae, 1992).

conventional and comfortable with well-established methods and topics (Singh and DeNoble 2003); they favour the status quo. Focusing on entrepreneurial families, more open offspring may be more willing to embrace different careers than their parents, due to their higher creativity and tendency to experiment with behaviours internalized through social learning from outside the family context (Stavrou and Swiercz 1998). Hence, it is reasonable to assume that individuals who feature high openness will perceive a lower influence from parental role models, being more attracted by career opportunities they are unfamiliar with. Therefore, the more open the individual, the more likely she/he is to learn from others outside familiar contexts (Chlosta et al., 2010). Conversely, low-openness individuals are less attracted by external stimuli and tend to rely on what they are familiar with, such as behaviours they can observe from their parents. Thus, there is a higher probability that they choose a similar career to their parents; in other words, low-openness individuals are more likely to become entrepreneurs, if their parents are, but they are less likely to be influenced by other role models (Chlosta S. et al., 2010).

2.4.2 Other characteristics of the individual

Besides personality traits, human capital as well might shape the entrepreneurial entry process. Individual human capital, defined as the individual's knowledge and competencies, developed through prior work and life experience (Bosma et al., 2012), showed a moderating effect on role models' influence on entrepreneurial intentions. In particular, it is possible to observe two opposite effects. On the one hand, individuals with higher human capital levels are likely to be more prone to benefit from role models, by virtue of their higher absorptive capacity. The notion of absorptive capacity was introduced by Cohen and Levinthal (1990) as the "ability to recognize the value of new information, assimilate it, and apply it to commercial ends". Qian et al. (2013) recognize new knowledge as a source of entrepreneurial opportunities and human capital as the major source of entrepreneurial absorptive capacity. The entrepreneurial absorptive capacity refers to the combination of scientific and business skills needed by perspective entrepreneur to effectively pursuit the knowledge exploitation, but also to the openness

and creativity of the local surrounding (Audretsch and Belitski 2013). The positive effect of higher absorptive capacity can be observed in light of the ability to value, interpret and apply external knowledge, absorbed from role models. On the other hand, however, individual human capital may substitute the need for role models, by virtue of the strengthening effect of past experience on self-efficacy and perceived feasibility. In other words, the higher the human capital, the less likely the individual to look for inspiration from others, due to reliance on personal knowledge and experience during opportunity evaluation and decision making. The analysis can be deepened according to the distinction between general and specific human capital. General human capital is developed through formal education, which mainly stimulates codified knowledge, easily documented, transferable and reproducible; conversely, specific human capital relies on context-specific knowledge, which is usually tacit, not easily documented and experience-based. Consistently with such a distinction and with the definition of absorptive capacity, it seems reasonable to assume that the latter is more strongly associated with general human capital obtained through formal education (Bosma et al., 2011). In contrast, tacit knowledge can best be transmitted via face-to-face interactions and frequent contacts (Davidsson and Honig, 2003), which makes role models a substitute for specific knowledge developed through experiences. For the purpose of this study, specific human capital will refer to entrepreneurship-specific human capital, narrowing the scope to the field of entrepreneurship (consistently with the references in Bosma et al., 2012).

Overall, prospective entrepreneurs with higher levels of education, leading to greater absorptive capacity are expected to benefit from role model effects, which they consider as crucial sources of inspiration, when they rely on general human capital; conversely, entrepreneurs that developed a context-specific knowledge due to their experience, will not rely on role models (Bosma et al., 2012).

2.4.3 Characteristics of the relationship

Looking at the moderating effects of relationship characteristics, scholars highlighted the role of proximity, i.e. the degree of closeness between the individual and the model, and the social acceptance of entrepreneurship, i.e. the extent to which entrepreneurship is recognized as worthy. The concept of proximity finds application in different fields, but in general it refers to similarities and shared understanding; hence, it relies on homogeneity regarding at least one characteristic (Mattes, 2012). Learning theories associate proximity with the idea that knowledge is more likely to flow between individuals who are located more closely together (Jaffe et al., 1993; Zucker et al., 1998). However, geographical proximity (i.e. co-location of the involved actors) is only one dimension to look at; organisational, institutional, social and cognitive aspects play an equally important role (Boschma, 2005). For sure, geographical proximity carries strong relational elements and it may be regarded as a means of creating trust, i.e. as a mechanism fostering other types of proximity (Mattes, 2012). This idea is supported by the assumption that individuals may easily learn from those with whom they frequently interact, due to a localized effect in which the ability to take up a new activity is defined by spatial and social proximity (Wright et al., 1987). Social proximity comes about as a result of shared personality characteristics, personal interaction and a sense of familiarity between individual actors (Mattes, 2012), which encourages actors to engage in communication (Boschma, 2005). Interaction may come from: direct relationships (e.g., family, former work colleagues or school mates), indirect relationships (e.g., graduates of the same university, common friends), reputation (e.g., status of particular universities or firms in the home country), or cultural cues (e.g., inferences based on knowledge about caste or culture-specific personality characteristics).

Looking at the role model effect, Bosma et al. (2012) suggest that a prospective entrepreneur is unlikely to view herself embracing the same behaviours and following the same path of the observed model, unless she perceives a certain similarity with the latter. On the other hand, according to the idea of observational learning, raised by the social learning theory, the role model should not simply be observable, but also formative; therefore, role models are expected to have positions, skills and experience

from which the entrepreneur can learn. This implies that, proximity with role models can be found with respect to such features as gender, sector and nationality, while a certain distance to the model should exists as to factors that imply hierarchy, ranking or achievement. Empirical evidence, indeed, suggests that individuals and their role models tend to be similar in terms of gender and race (Ruef et al., 2003), in line with the idea that role models may exert a stronger impact on potential entrepreneurs when they show a higher degree of resemblance (Slack, 2005). At the same time, a role model often has a higher hierarchical position (Shapiro et al., 1978) and, to be imitated, should be socially effective or successful (Bandura et al., 1963).

Greene et al. (2013) explored the role of gender proximity by examining how daughter's entrepreneurial activities are shaped by their mothers' occupational roles and stereotypical assumptions. Their work proves that if a mother was self-employed when her daughter was born, the likelihood of the daughter herself becoming self-employed was greater. Interestingly, having a mother who is an entrepreneur or who has managerial experience proved to be important for the formation of entrepreneurial intentions among women, but not among men. This evidence supports the idea that role models work through the identification with ideal examples that are perceived as closer with respect to individual characteristics (Bosma et al., 2012). Effectively, same-gender influence has been explored by several scholars who proved that children imitate same-sex models more than opposite-sex models, mainly because they recognize that they share a larger set of common attributes with the parent of the same gender (Hetherington, 1965; Slaby and Frey, 1975¸ Bonke and Esping-Andersen, 2009).

By assuming a broader perspective, it is possible to spot another dimension that filters the effect of role models. Whether the demonstration effect leaves an imprint or not, frequently depends on the social acceptance of entrepreneurship (Wyrwich et al., 2015). Accordingly, Kibler et al. (2014) developed the concept of regional social legitimacy, which is understood as a common perception – either positive or negative – of entrepreneurship. Similarly, Westlund and Bolton (2003) developed the concept of local social capital, which can either facilitate or inhibit entrepreneurial activities. Similar to what happens inside the smaller environment represented by the family, when self-

employment is positively perceived by society, individuals are more prone to learn from entrepreneurs; consequently, entrepreneurial role models are more effective on individuals' intentions to start a business in social environments featuring a higher acceptance of entrepreneurship. Such a mechanism has been observed in the academic environment as well, when exploring the phenomenon of academic spin-offs or academic startups creation. Perceived role models of university spin-off creation leave a positive imprint on research scientists' intentions to found a company themselves (Prodan and Drnovsek, 2010), proving that a pro-entrepreneurship institutional culture fosters individual willingness to engage in self-employment. Indeed, the presence of entrepreneurs among academics signals that entrepreneurship is accepted as a legitimate activity within the university.

The institutional environment also plays a role in the formation of individual fear of failure. Individual perception of entrepreneurship is an important determinant for entrepreneurial entry and institutions can shape the interaction between role models and such perceptions, among which fear of failure assumes importance due to its strong negative relationship with entrepreneurial entry (Wyrwich et al., 2015). The formation of fear of failure is defined by Wyrwich et al. (2015, p.469) as "a context-specific process that is affected by social interactions with entrepreneurs in the local environment and can negatively affect entrepreneurial propensity. Furthermore, these processes depend on the social legitimation of entrepreneurship in terms of the general local favourability of entrepreneurship as a career option (Etzioni, 1987). Thus, fear of failure has an institutional dimension to the extent that entrepreneurship in terms of starting a business is less accepted as a career option, and (failed) entrepreneurs face social stigmatization in less entrepreneurship-approving institutional environments". Interestingly, the study suggests that, in entrepreneurship education, having contacts with entrepreneurs should reduce information ambiguity with respect to entrepreneurship and foster interest in non-entrepreneurs, provided that the institutional context is pro-entrepreneurship. Indeed, the results show that that "entrepreneurial role models do not positively affect individual entrepreneurial

perceptions if individuals were exposed to an anti-entrepreneurial environment for most time of their life" (Wyrwich et al., 2015, p.469).

CHAPTER 3: HYPOTHESES

The present chapter introduces the hypotheses formulated to cover the gaps highlighted in the analysis of the extant studies on student entrepreneurship. Precisely, the focus is on the impact that relationships with others, different than peers, have on students' entrepreneurial intentions. We use the Theory of Planned Behaviour (TPB) and Social Learning Theory (SLT; see Chapter 2) to define the general scope of the analysis, while the studies conducted on role model effects lead to analyse the impact of the relationships with the thesis supervisors on students' entrepreneurial entry. In general, we exploit the idea that exposure to other entrepreneurs can strengthen entrepreneurial self-efficacy that, in turn, acts on intentions and possibly determines entrepreneurial entry. As mentioned, the theme of role models that students can observe in the university environment still have some gaps, especially if we consider entrepreneurial role models as determinants of students' entrepreneurial entry. This analysis, therefore, aims to enrich the understanding of the role of personal relationships in students' entrepreneurial entry, that so far has the gaps highlighted in the previous chapter.

Already existing studies on role models developed in the context of education (see 2.3.1), support our idea that observing a certain behaviour or certain characteristics pertaining to teachers have an impact on students' choices. Additionally, literature on parental entrepreneurial role models and offspring's career choices, support the idea that individual with entrepreneurial role models are more entrepreneurship-oriented. Therefore, it seems reasonable to exploit the role modelling mechanism to explain career choices of students and, precisely, entrepreneurial role models, observed by students in the university environment, as antecedents of their entrepreneurial entry.

To fill the gap pertaining to the type of relationships analysed, the thesis supervisor represents the most suitable candidate to become a role model for the supervised student. Students possibly have a deeper relationship with their thesis supervisors, compared to other professors met during the academic studies, due to the frequent and direct interactions required for the development of a master thesis. Consistently, the two belong to the same environment, leading to a certain degree of similarity between the individual and the model, which determines the modelling dynamic; in addition, the supervisor fulfils a position that the student perceives as superior and may aspire to, leading to the role identification mechanism. By virtue of the modelling dynamic and the role identification, i.e. the two theoretical constructs behind the role model effect (see section 2.3.1), the thesis supervisor seems likely to become a role model for the supervised student.

We expect that students are more likely to become entrepreneurs when their thesis supervisors have entrepreneurial experience for two reasons. First, a supervisor with entrepreneurial experience, being a role model for her/his supervised students, can provide these latter with an example of the skills and competences needed to be an entrepreneur and of the best behaviours to perform to face the entrepreneurial regulations in force and the obstacles that characterize the process of business creation. Learning by example is, indeed, the dominant effect of role model's influence, as the SLT suggests. Second, a supervisor with entrepreneurial experience is a source of entrepreneur-specific knowledge that can increase the self-efficacy of her/his supervised students. Several studies proved that the enrichment of individual human capital is positively associated with greater self-efficacy and, consequently, with a more effective transition from entrepreneurial intentions to entrepreneurial entry. Reasonably, the frequent interactions with a thesis supervisor with entrepreneurial experience lead to entrepreneurship-specific knowledge transfer, which helps the supervised student to develop a stronger entrepreneurial self-efficacy and, therefore, a stronger perceived behavioural control. Based on these considerations, if a thesis supervisor is an entrepreneur, supervised students will be more likely to choose the entrepreneurial career. This argument is synthesized in the following hypothesis:

H1: University students are more likely to become entrepreneurs if their thesis supervisors have entrepreneurial experience.

As highlighted in the previous chapter, the identification of a role model is based on the prerequisite that a certain degree of similarity should link the individual to the model. Without such similarity it is difficult for the individual to think she can do anything the role model can, as the perceived feasibility of an action is greater if an individual compares herself with a more similar other, leading to increased entrepreneurial self-efficacy. Indeed, Bandura (1977) suggested that the process of identification, which enables to learn from an observable example, is likely to be more effective if the observer looks at a model that she perceives as closer. Consistently, it seems reasonable to assume that the closer the student perceives the thesis supervisor, the stronger will be the positive effect exerted by the latter on the entrepreneurial entry of the first (Ruef et al., 2003; Greene et al., 2013) by virtue of increased self-efficacy. More in depth, some studies (Ruef et al. 2003; Hernandez, 1995; Maccoby and Jacklin, 1974) highlighted that individuals and their role models tend to be similar in terms of individual characteristics where differences do not imply any hierarchy, ranking or achievement, such as gender and race (Bosma et al., 2012). "Evidence of gender homophily has been found in various contexts, such as large organizations (Kalleberg et al., 1996), networks (Ibarra, 1997) and voluntary organizations (McPherson and Smith-Lovin, 1987). In addition, ethnic homophily has been identified in the work place (Reskin, 1999)" (Bosma et al., 2012, p.7). Interestingly, many researchers tried to understand whether underrepresented students benefit from instructors with similar characteristics; for example, several studies of primary and secondary education have found that that African-American students who have African-American instructors have higher test scores (Ronald et al., 1995). "Many scholars interpret these findings as evidence of that same-group instructors act as role models, perhaps because they serve as examples to students or can better empathize with their particular needs" (Bettinger et al., 2004). In line with these results, it seems reasonable to assume that:

H2a, b, c: The effect of the thesis supervisors' entrepreneurial experience on students' entrepreneurial entry is more positive when supervisors and students have a) the same gender, b) more similar geographical origin.

Another moderator of the relationship between the thesis supervisor's entrepreneurial experience and the likelihood of supervised students' entrepreneurial entry is the closeness between the scope of activity of the former and the area of expertise of the latter. As Cohen and Levinthal (1990, p.131) have argued, "the ability to assimilate information is a function of the richness of the pre-existing knowledge structure: learning is cumulative, and learning performance is greater when the object of learning is related to what is already known". This suggests that, in order to better exploit the knowledge provided by the thesis supervisor role model, the student should be familiar, to some extent, with the research field in which the model is involved. Therefore, the positive influence of entrepreneurial experience of the role model on the student's entrepreneurial entry is likely to be stronger if there is some homogeneity between the core subject of the student's *curriculum studiorum* and the field of research activity of the model. That is to say:

H3: The effect of the thesis supervisors' entrepreneurial experience on students' entrepreneurial entry is more positive when the field of the thesis supervisor's activity and of the student's curriculum studiorum are similar.

The second prerequisite for observing the role model effects is a certain hierarchical distance with the model, leading to desire the achievement of the position observed. A higher status of the model is likely to exert a stronger influence on the intentions of the observer, in light of the greater benefits that can be obtained from the relationship. It seems reasonable, indeed, to assume that a professor with higher academic status is more likely to possess greater competences and skills, which can be transferred to the supervised student. In addition, a role model with a more influential social position

possibly leads to access valuable networks and partners. Therefore, a professor that fulfils an influential role in the academic environment and enjoys a higher reputation is perceived as a more powerful role model by the supervised student, thus leading to the reinforcement of the above-mentioned influence over entrepreneurial entry (*H1*). Specifically, the influence of a higher academic status of the thesis supervisor role model on student entrepreneurial entry can be explained in light of both the greater desirability of the observed position, leading to enhance individual attitude towards entrepreneurship, and the greater perceived feasibility of the tasks required by the entry process, leading to increase one's behavioural control. In other words:

H4: The effect of the thesis supervisors' entrepreneurial experience on students' entrepreneurial entry is more positive when the academic status of the thesis supervisor is higher.

Several studies highlighted how some personal traits of the individual moderate the effect of role modelling on entrepreneurial intentions. As emerged from several studies on social roles, "agentic" personalities are more likely to rely on their own perceived capabilities, while "communal" personalities are less self-confident and, therefore, more likely to benefit from the role model effect. Such a distinction is usually coincident with gender distinction: men are associated with agentic traits, while women are more likely to show a communal nature. Based on the results of previous studies (BarNir et al., 2011), the role model effect should, hence, be greater for women. It seems reasonable to assume that the role model effect exerted by a thesis supervisor with entrepreneurial experience, on the student's entrepreneurial entry will be stronger for female students than for males. In other words:

H5: The positive effect between the model entrepreneurial activity and the student entrepreneurial entry is greater for female students.

CHAPTER 4: METHODOLOGY

The following paragraphs aim to describe the process of dataset construction, discuss a series of characteristics of the sample and illustrate the variables and the econometric model used to test the hypothesis formulated in the previous chapter.

4.1 THE DATASET

For studying the impact of the relationship between the student and the thesis supervisor on students' entrepreneurial entry, we merged unique data on individuals graduated at Politecnico di Milano (PoliMi) and data on their master thesis supervisors.

Our dataset includes the population of PoliMi alumni who graduated between July 2005, when the first students obtained a *Laurea Magistrale* degree in the new university system[5], and December 2009. This dataset was developed at mid-2014 by combining data drawn from two secondary sources.

The first source was a database developed and managed by PoliMi academic office. This database stores demographic data and any information concerning the university curriculum of the individuals who have ever been enrolled in any degree program at PoliMi. Within this database, we identified the 13,745 alumni who obtained a Laurea Magistrale Degree between July 2005 and December 2009. For each alumnus, we extracted the following information: individual social security number, gender, date and county of birth, name of the Laurea Magistrale program where the Degree was obtained and year of enrolment in this program, list of courses completed and Educational Sector

[5] In Italy, the university system was reformed in the 1999/2000 academic year, to comply with the Bologna process directives. The old system consisted in a unique course, from four to six years, depending on the degree program, leading to a Master of Science degree called *Laurea*. Conversely, the new university system includes two degree levels: a three-year Bachelor degree, called *Laurea di Primo Livello*, and a two-year course of specialization, leading to the *Laurea Magistrale* degree.

Code(s)[6] associated to each course, final degree score and date of graduation, list of any other degrees obtained at PoliMi and corresponding years of enrolment in these degree programs, participation in study abroad programs. By examining the data on the 13,745 alumni, we noted that 194 alumni had peculiar university curricula: either they had obtained two different Laurea Magistrale degrees at PoliMi or they had obtained a Laurea Magistrale degree after obtaining a Laurea degree in the old university system. For the sake of comparability, we decided to focus on the population of the alumni who obtained only one Laurea Magistrale degree after attending a Bachelor degree program. This population included 13,551 individuals.

The second source of information was the Italian Business Register,[7] that was used to gather information on the companies founded by the 13,551 PoliMi alumni in Italy till December 2013. Starting from the individual social security numbers of the 13,551 alumni, we retrieved the following information: the VAT codes and NACE[8] codes of activity of all the Italian companies where PoliMi alumni have ever been listed as shareholders, the year of incorporation of each company and the year(s) when each alumnus acquired shares in the company (companies) where s/he has ever been a shareholder.

We defined as "PoliMi student entrepreneurs" the alumni who founded a company (i.e., became shareholders of the company in the year of incorporation) few years after graduation (see the following for details). As we are interested in the creation of firms

[6] Any courses offered in Italian universities are associated to one or more Educational Sector Codes (in Italian, "Settori Scientifico Disciplinari"). In Italy, the Educational Sector Codes are used to classify university disciplines. They have been introduced by Law no. 341 of November 19, 1990. The current Educational Sector Codes are 367 (for the complete list, see: http://attiministeriali.miur.it/anno-2015/ottobre/dm-30102015.aspx). They have been determined by the Ministerial Decree no. 855 of October 30, 2015.

[7] The Italian Business Register is the public register created by the Italian Chambers of Commerce to gather information (incorporation, amendments, cessation of trading) for all companies with any legal status and within any sector of economic activity, with headquarters or local branches within the country.

[8] NACE (Nomenclature statistique des Activités économique dans la Communauté Européenne) code, i.e. the statistical classification of economic activities in the European Community; NACE is a four-digit classification providing the framework for collecting and presenting a large range of statistical data according to the economic activity in the fields of economic statistics (e.g. production, employment and national accounts) and in other statistical domains developed within the European Statistical System (ESS).

that sell products or services, we did not consider as PoliMi student entrepreneurs those who founded only companies with NACE codes 7010 (Activities of Head Offices) or 6420 (Activities of Holding Companies). These codes indeed identify companies that do not sell products or services themselves, as their purpose is to own shares of and to control several different companies forming a group. Moreover, as we want to investigate the impact of the relationship with the thesis supervisor on students' entrepreneurial entry, we exclude from our sample all PoliMi alumni who founded a startup while they were studying (i.e., before being able to start interacting with their master thesis supervisors).

Starting from data on PoliMi alumni, we collected information about their master thesis supervisors. The total number of thesis supervisors was high: 1121. Hence, to cope with time constraints, in this first work on the topic, we limited this data collection activity to the 589 academics who supervised at least 10 students. For these 589 academic, we collected the following data: gender, academic status as captured by the role within PoliMi (i.e., full professor, associate professor, etc.), department the academic is affiliated with, and entrepreneurial activity of the professor. Data concerning gender, academic status and department were collected using the PoliMi website area dedicated to academics, where these data are directly provided. It is worth noting here that the PoliMi website provides information on PoliMi academics only since the academic year 2012/2013. As all the alumni in the population graduated before the academic year 2012/2013, a (small) group of alumni were supervised by academic that were not working any more at PoliMi in the academic year 2012/2013, therefore information is missing for these thesis supervisors. Conversely, information on academics' entrepreneurial activity was collected by downloading academics' *curricula.* As many curricula are not available on PoliMi website or are too synthetic, to collect missing data and to triangulate the information downloaded from PoliMi website, we browsed other sources. In particular, we looked for the LinkedIn profile of each thesis supervisor and, in case of missing profiles, we browsed the Internet in general, thus performing a triangulation of data. By doing so, on the one side we cross-validated the data collected thus increasing the credibility of our research; on the other side, we could perform a more in-depth analysis of the phenomenon under scrutiny. Overall, we have

complete information for 549 thesis supervisors as 29 *curricula* are missing and 11 profiles could not be found in the Internet. These 549 academics supervised 7,462 out of the PoliMi alumni included in our dataset. In addition, we collected data that might be used to build an alternative measure of academic status. The PoliMi website provides information the hierarchical ranking structure among scholars in the university, but academic status in the broader research realm can be captured by the citation index. For this purpose, we gathered information from Web of Science, an online subscription-based scientific citation indexing service that provides a comprehensive citation search. We were able to download the list of publications pertaining to each thesis supervisor, together with a series of additional information, among which we were mainly interested in the citation index (parameter NR, Web of Science). As to avoid misinterpretation of results, we had to exclude data referred to those authors who are not professors at Politecnico di Milano but have the same name of one of the thesis supervisors in our dataset. Therefore, we had to check the Author Address (parameter C1, Web of Science) to cope with homonymy; the Author Address, indeed, contains information about the university and the scientific department to which the professor belongs, thus allowing us to exclude academics that do not belong to Politecnico di Milano. The pieces of information that we could download from the platform do not include the parameter of interest, therefore, in the following, we only use the data on the role of the thesis supervisor within university. It is worth noting that, given the objectives of the present study, this information probably is a better proxy of academic status. Indeed, we are trying to understand the impact on students of the relationship with the thesis supervisor. Students will consider a thesis supervisor more, or less, influential considering her/his academic position rather than considering the citation indexing, that they may not be aware of.

With respect to the entrepreneurial activity of the thesis supervisors, we used two alternative definitions. First, we followed Bygrave and Hofer (1991) who define the entrepreneur as “someone who perceives an opportunity and creates an organization to pursue it”, and we focused on new venture creation as the pillar of entrepreneurship. Hence, we classified as entrepreneurs all those thesis supervisors who were involved in

the foundation of a firm. Then, we extended the idea of organization, by including also entities developed without the intent of profiting financially and, thus, obtaining a wider definition of the entrepreneurial behaviour of thesis supervisors. Indeed, after a visual inspection of the curricula of sample thesis supervisors, we noticed that several academics founded accelerators, associations, innovation observatories, periodicals and blogs, PhD schools, research centres and laboratories. We do think that the creation of such organizations should be considered as an entrepreneurial behaviour as well. Since we are observing the role model effect exerted by thesis supervisors on their students, our interest is focused on the observation and imitation of entrepreneurial behaviours in the entry phase, not on the type of organization founded to exploit the perceived opportunities. To build the variables that should capture thesis supervisors' entrepreneurial behaviours, we relied on the information contained in the thesis supervisor's *curriculum* uploaded on PoliMi website. Whenever no company foundation was mentioned in the curriculum, we assumed that the focal academic had no entrepreneurial experience. Subsequently, we compared the curricula uploaded on PoliMi website with the thesis supervisors' LinkedIn profiles, and we noticed that some thesis supervisors had entrepreneurial experiences not mentioned in the curriculum provided from the academic website.

From the analysis of the *curricula*, we also acknowledged that some of the thesis supervisors under scrutiny are not only involved in the academic activity, but have work experiences in the private sector as well. These experiences are likely to provide the academics with contacts that may help the students they supervised to enter entrepreneurship. As mentioned, according to the stream of literature on intergenerational transmission of entrepreneurship, children of entrepreneurial parents are more likely to become entrepreneurs (Blau & Duncan, 1967; Western, 1994, Steinmetz & Wright, 1989). One of the explanation for this phenomenon is the transmission of business contacts and the inclusion of the son in the social network of the parent. We can fairly assume to observe the same transmission mechanism between a student and her thesis supervisor, provided that the latter developed a network of business contacts during her work experiences.

4.2 THE SAMPLE

As we mentioned above, our sample is composed of the 7,462 PoliMi alumni for which complete data on the thesis supervisors were collected. We used a chi square (χ^2) statistic to investigate whether the sample is representative of the initial population. In particular, we checked the distribution of some categorical variables, i.e. gender, type of degree program, as captured by the school[9] to which the alumnus' degree program pertains, and geographic origin[10]. The tests reveal that our sample is not representative of the population ($\chi^2(1) = 0.000^{***}$; $\chi^2(2) = 0.000^{***}$; $\chi^2(3) = 0.000^{***}$, respectively).

Out of the 7,462 individuals in the sample, 207, i.e., 2.77%, founded at least one company during the first five years after graduation. In the following, we compare the distributions across a series of interesting dimensions for student entrepreneurs and non-entrepreneurs (Table1). Both student entrepreneurs and the others are predominantly men, who were born in the North of Italy, especially in Lombardy (61.83% for student entrepreneurs, 71.09% for the others), belong to the middle contribution fee and attended the school of Industrial & Information Engineering. If we compare the two groups, we notice that the percentage of women is even lower for student entrepreneurs, which is consistent with general statistics on entrepreneurial rates. As for geographic origin, we have a slightly higher portion of students from Centre and South of Italy among entrepreneurs, while the percentage of foreigners is less than half of the percentage of foreigners among other students. The two groups, in turn, do not have significant differences in terms of distribution of types of degree program attended by students.

[9] The schools we considered are Architecture, Design, Highway, Environmental & Territorial Engineering, Building Engineering & Architecture and Industrial & Information Engineering.

[10] Milan, the rest of Lombardy, the rest of North-West of Italy, North-East of Italy, the Centre and South of Italy and abroad.

	Student entrepreneurs (N=207)		Other students (N=7255)		Difference between student entrepreneurs and the others
Gender					
M	182	87.92%	5693	78.47%	0.000***
F	25	12.08%	1562	21.53%	
Geographical origin					
Milan	43	20.77%	1888	26.02%	0.214***
Rest of Lombardy	85	41.06%	3270	45.07%	
Rest of North-West	11	5.31%	271	3.74%	
North-East	20	9.66%	498	6.86%	
Centre and South	43	20.77%	920	12.68%	
Abroad	5	2.42%	408	5.62%	
University fee					
low	12	5.80%	776	10.70%	0.030***
medium	139	67.15%	5268	72.61%	
high	56	27.05%	1211	16.69%	
School					
Architecture	2	0.97%	34	0.47%	5.662
Design	0	0	12	0.17%	
Highway, Environmental & Territorial Engineering	10	4.83%	381	5.25%	
Building Engineering & Architecture	16	7.73%	485	6.69%	
Industrial & Information Engineering	179	86.47%	6343	87.43%	

Level of significance: *p<0.1; **p<0.05; ***p<0.01

Table 1 - description of the sample

All together these 207 individuals founded 206 companies (hereafter, PoliMi student startups). Let us now focus on these companies. PoliMi student startups operate in 84 different 2-digit NACE sectors (see Appendix A for details), which have mainly to do with Professional, Scientific and Technical activities (43%) such as management consultancy, technical testing and analysis, scientific R&D, advertising and market research. Other sizeable classes (53.41% overall) are Information and Communication activities, Construction, Manufacturing and Wholesale & Retail Trade, Repair of motor vehicles and motorcycles. This is consistent with the information about the type of school from

which student entrepreneurs of our sample graduated, i.e. Industrial & Information Engineering for the most. To sum up, PoliMi student startups mainly deal with services industries (150, i.e. 73% of total student startups), while smaller portions pertains to manufacturing industries (27, i.e. 13% of total student startups) and other industries (29, i.e. 14% of total student startups). Among the latter, Construction is the dominant sector (96%), with only 1 case of Agriculture Industry.

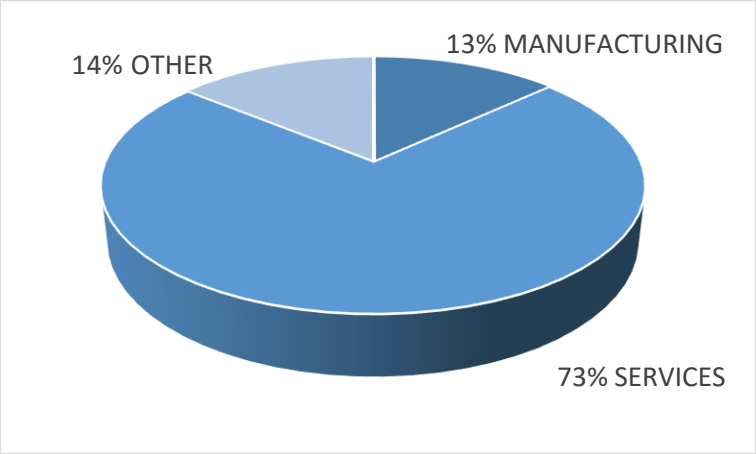

Figure 4 - PoliMi student startups by industry

We analysed more in depth the distribution of firms in the manufacturing and in the services industries, following the Pavitt[11] (1984) taxonomy and the Miozzo and Soete[12] (2001) taxonomy. We can observe from the graphs[13] how the dominant sectors are the most knowledge intensive ones, for both the manufacturing and the services industries, i.e. science based industries (33%) for the first and knowledge intensive based services

[11] Pavitt (1984) proposes a taxonomy that defines four industry categories with common characteristics in terms of sources, nature, and directions of innovation: science based (SB), supplier dominated (SD), scale intensive (SI), and specialized supplier (SS) industries.

[12] Miozzo and Soete (2001) extended the Pavitt taxonomy by including four different groups of service industries: knowledge intensive business services (KIBS),1 supplier dominated services (SDS), physical networks services (PNS), and information networks services (INS).

[13] Percentages are referred to the total of student startups belonging to manufacturing industries (27) and services industries (150) respectively.

for the second (48%). The SB industry category includes electronics (inclusive of telecommunication equipment), computers, and pharmaceutical industries. The KIBS category includes software, R&D services, engineering, and consultancy firms. Both heavily rely on R&D activities and on the scientific advances achieved by universities (see, e.g. Castellacci 2008); hence, it is not surprising that most of startups founded by students who attended a university of applied science and engineering belong to these sectors.

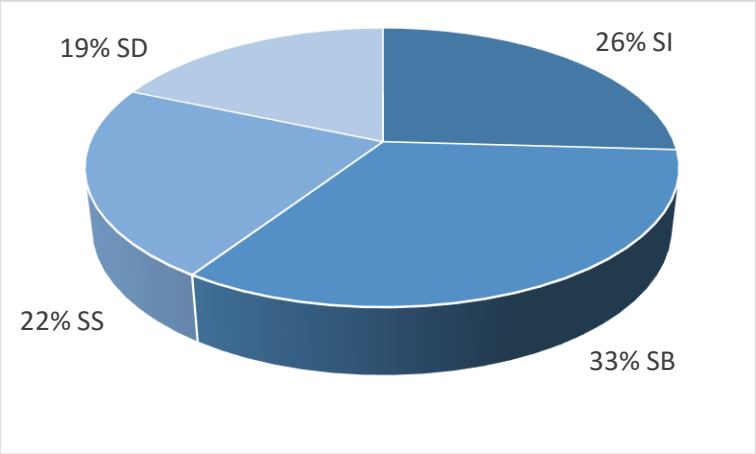

Figure 5 - Distribution of PoliMi student startups in the manufacturing industry

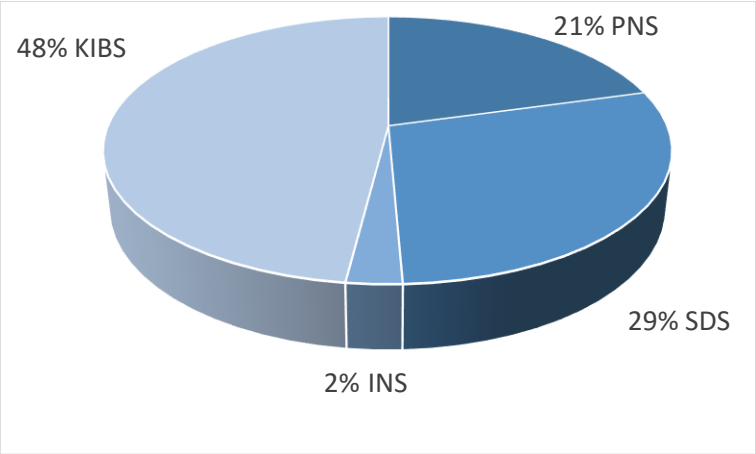

Figure 6 - Distribution of PoliMi student startups in the services industry

The first years of the timeframe under scrutiny feature lower levels of startup foundation by PoliMi students, while years 2009, 2010 and 2011 feature the highest numbers of student startups. This can be interpreted as a response to the economic decline observed from 2007; in other words, the lower employment rates led people, students in the specific, to seek for alternative jobs, e.g. self-employment (opportunity entrepreneurship). Most PoliMi student startups were founded after 3 or 5 years from graduation, which is consistent with the fact that entrepreneurial entry takes some times to occur.

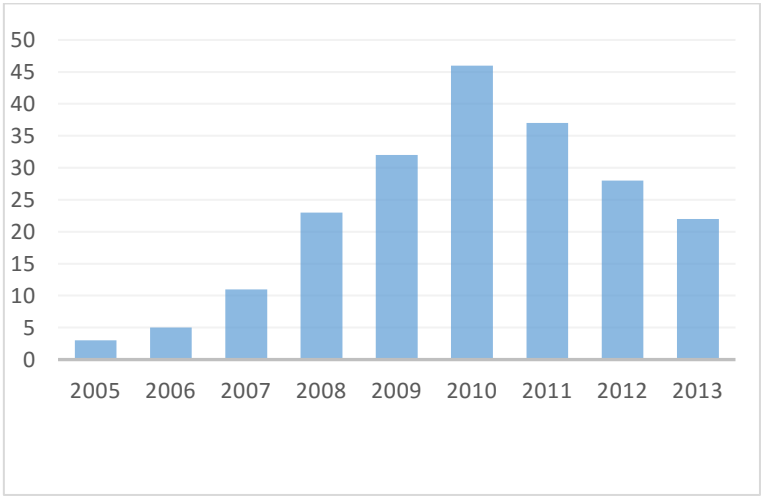

Figure 7 - PoliMi student startups by year of foundation

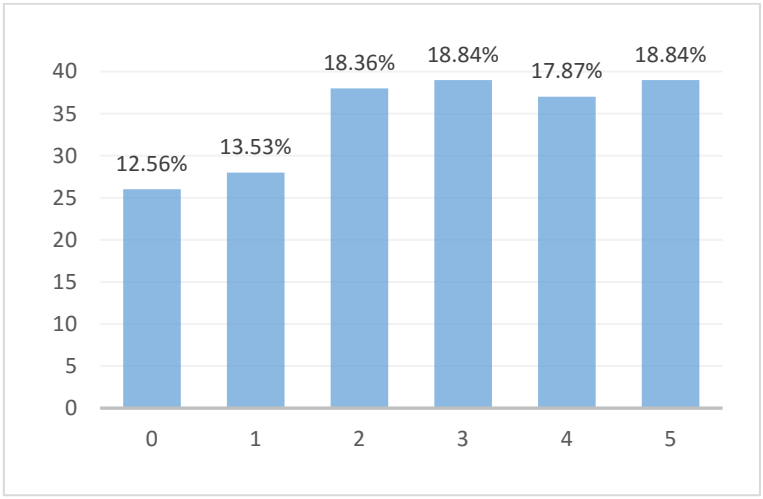

Figure 8 - Years between graduation and entrepreneurial entry

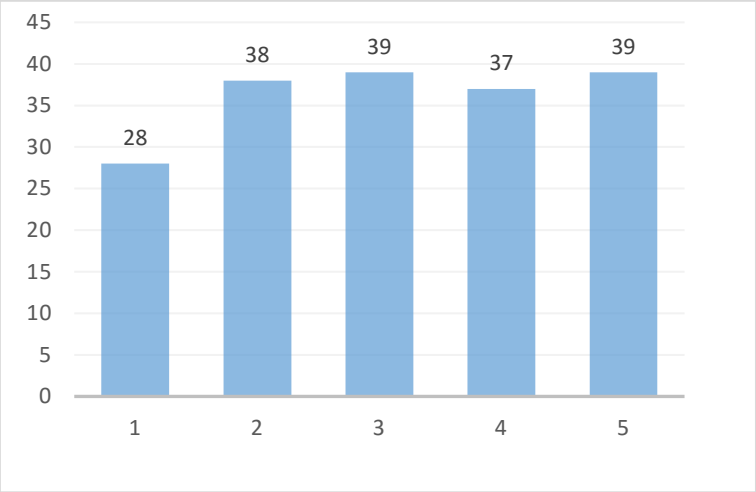

Figure 9 - Years between graduation and entrepreneurial entry

4.3 THE ECONOMETRIC MODEL

In the followings, we introduce the econometric model and describe the main features of its variables.

4.3.1 The dependent variables and specification of the econometric model

Since we aim to test the impact on the students' entrepreneurial entry of the relationship with their thesis supervisor, we created a dummy variable to expresses the student entrepreneurial entry, our dependent variable. As for the definition of the thesis supervisor's entrepreneurial activity, we do not have a univocal definition of student entrepreneur. Broadly speaking, we defined "student entrepreneurs" as students who founded a startup few years after graduation. To be compliant with this definition, we excluded all the students who founded a startup before graduation. If this is the case, indeed, the observed entrepreneurial role model, if any, is likely to be represented by parents rather than the thesis supervisor or, more likely, the student has been included in the family entrepreneurial activity. Therefore, we excluded students who appear

among the founders of entrepreneurial ventures before the year of graduation, as to observe the influence of their thesis supervisor only. Additionally, if we considered too long an interval between graduation and entrepreneurial entry, the results of our observation could account both for the influence of other role models, e.g. colleagues or seniors, and for other determinants of entrepreneurial entry, e.g. work experience in a small or newly founded firm. Therefore, we created three definitions of student entrepreneurs according to the number of years that separate entrepreneurial entry from graduation. In the specific, we looked at 5 years, 3 years and 1 year from graduation, as to observe, if any, the changes in the impact exerted by the thesis supervisor on the student's entrepreneurial entry. We created three dependent dummy variables that assume the value 1 if the student founded a venture after n years from graduation (n= 5, 3, 1), 0 otherwise and we called such variables D_STUDENT_FOUNDER_5, D_STUDENT_FOUNDER_3, D_STUDENT_FOUNDER_1.

We considered the binary response models and survival models, to cope with the binary nature of our dependent variables. Binary response models aim to explain the values of a binary dependant variable, i.e. a variable that can only assume the value 1 or 0 (dummy variable), considering a series of explicative variables. Such models have been developed to analyse individual choices, as, in the economic reality, the individual frequently has to choose between two options; therefore, the individual dimension assumes more importance than the temporal dimension in which the choices are taken. Among binary response models we find linear regression models and non-linear ones, logit and probit models. Logit models have a logistic distribution of errors, while probit models have a normal distribution or errors, but the two are really similar to each other and the choice between them only depends on practical issues. Survival models are statistical models for analysing the expected duration of time until one or more events happen. They have three main characteristics: (1) the dependent variable or response is the waiting time until the occurrence of a well-defined event, (2) observations are censored, in the sense that for some units the event of interest has not occurred at the time the data are analysed, and (3) there are predictors or explanatory variables whose effect on the waiting time we wish to assess or control. By using a survival model, we obtain one

observation for each individual for each year of the analysed period, thus considering also the time lag between the year of graduation and the year of venture creation.

We decided to use a probit model to test the hypothesis developed in Chapter 3, as a survival analysis would be inconsistent with our choice to observe entrepreneurial entry after 1 year from graduation, a too short timeframe to suite survival analysis. The model will have the following formulation:

$$p_i = P(y_i = 1) = \Phi(x_i'\beta) = \int_{-\infty}^{x_i'\beta/\sigma} \frac{1}{2\pi} e^{-\frac{z^2}{2}} dz$$

Where y_i is the dependant dummy variable, x_i is a vector of *k* independent variables, β is a k-dimensional vector of unknown parameters, p_i is the probability that the i^{th} individual makes the choice and $\Phi(x_i'\beta)$ expresses the normal distribution. The equation refers to the i^{th} individual, with i = 1, 2, …, N. The independent variables (x_i) express the individual features, while the unknown parameters (β) determine the impact of such variables on the individual choices.

4.3.2 The independent variables

The key independent variable is a dummy equal to 1 if the thesis supervisor is an entrepreneur and, thus, can be a role model for supervised students, 0 otherwise. Our dataset allowed us to build two alternative dummies to capture the role model effect: D_SUPERVISOR_ENTREPRENEUR_BROAD and D_SUPERVISOR_ENTREPRENEUR_STRICT. The former refers to the wider definition of entrepreneur (see section 4.1) and equals one if the thesis supervisor has ever created a company or any other type of organization, while the latter refers to the definition by Bygrave and Hofer (1991) and equals one if the thesis supervisor has ever founded a company. Of course, as the broad definition has been developed to embrace a wider portion of academics who showed an attitude towards the creation of organizations, D_SUPERVISOR_ENTREPRENEUR_BROAD also includes those academics who pertain to

the strict definition of entrepreneurship. In line with H1, we expect that the coefficients of both variables are positive.

To test the remaining hypotheses, we included a series of variables and their interactive terms with the independent variable. These additional variables are: D_SAME_GENDER, SAME_SSD, D_STATUS, D_FULL, D_WOMAN, D_PRIOR_SHAREHOLDER. D_SAME_GENDER was built to test H2a. It is another binary variable, which equals 1 if the student and her/his supervisor had the same gender, 0 otherwise. The dummy SAME_SSD, created to test H3, captures proximity in terms of disciplinary area; it equals 1 if the Educational Sector Code[14] of the thesis supervisor is the same associated to the largest number of courses completed by the alumnus is her/his university curriculum. H4 aims to test whether the academic status of the thesis supervisor moderates the role model effect; as expressed in 4.1, we measured the status in terms of academic role of the thesis supervisor. D_STATUS equals 1 if the thesis supervisor is a full or an associate professor, 0 otherwise. As a check of robustness D_STATUS was replaced by a dummy equalling one for full professors only. Finally, to test H5, we inserted D_WOMAN that equals 1 for female alumnae. We also considered the interaction between the key dependent variable and D_PRIOR_SHAREHOLDER, that, as we describe below, is a proxy for exposure to entrepreneurial experience through household experience. If a student has other entrepreneurial role models, i.e. self-employed parents, the impact of the relationship with the thesis supervisor might change. In particular, we might expect either a reinforcement effect or a substitution effect. On the one hand, being familiar with entrepreneurship might reinforce the role model effects exerted by the thesis supervisor. On the other hand, however, the parental role model might satisfy the need for a role model and, consequently, the thesis supervisor will not be perceived as such. We could not find sufficient theoretical frameworks or studies to support the

[14] In Italy, the Educational Sector Codes (in Italian, "Settori Scientifico Disciplinari") are used to classify university disciplines. They have been introduced by Law no. 341 of November 19, 1990. The current Educational Sector Codes are 367 (for the complete list, see: http://attiministeriali.miur.it/anno-2015/ottobre/dm-30102015.aspx). They have been determined by the Ministerial Decree no. 855 of October 30, 2015. Any academics in Italian universities are associated to one Educational Sector Code. Similarly, any courses offered in Italian universities are associated to one or more Educational Sector Codes.

development of a consistent hypothesis, therefore we simply add the control to the model.

As mentioned, some of the thesis supervisors developed business contacts that can provide an alternative explanation of the positive impact of D_SUPERVISOR_ENTREPRENEUR_STRICT on student's entrepreneurial entry. For sure thesis supervisors who are involved (or have been) in entrepreneurial activities have contacts in the private sector that can be leveraged to facilitate the foundation of student startups. Therefore, contacts of the thesis supervisor may exert a positive effect on the probability that a student becomes an entrepreneur. If this is the case, we would observe the same consequences of having entrepreneurial role models, i.e. the student will be more likely to found a startup not under the influence of the entrepreneurial role model represented by the thesis supervisor, but due to the contacts provided by the latter. To rule out this alternative explanation, we created two dummy variables that proxy the development of business contacts through prior work experiences in the private sector: D_CONTACTS_STRICT and D_CONTACTS_BROAD. D_CONTACTS_STRICT equals 1 for the thesis supervisors who work(ed) as managers or belong(ed) the board of directors of one or more ventures. By definition, thesis supervisor involved in entrepreneurial activities belong to this group. D_CONTACTS_BROAD, in turn, equals 1 for the academics who provide consultancy services or lead research projects funded by firms.

The estimates also include a series of control variables. Although we are not directly interested in the impact of these controls on the dependent variables, the controls are correlated to the explicative variables and, therefore, must be included as part of the error measure; otherwise the latter might erroneously result being non-correlated to the dependent variable[15]. We included in the estimates 2 dummies: D_HIGH_INCOME, and D_PRIOR_SHAREHOLDER. D_HIGH_INCOME equals 1 for the alumni who were

[15] In observational studies, such the one we are performing, it is difficult to infer causality, as it is not possible to manipulate one variable to see the direct effect on the other; this means that multiple explanations might be consistent with a positive correlation between two variables. If we want to study the partial effect of an explicative variable, the error (accounting for both accidental and unobserved events) must be unrelated to the dependent variable.

assigned the highest contribution level and 0 otherwise, and thus capture students in a very favourable economic condition. It was inserted because prior studies (see e.g. the theory of liquidity constraints by Evans and Jovanovic, 1989) have shown that personal financial resources are positively associated to a higher propensity of starting a new venture. Another stylized fact in the entrepreneurial entry literature is the intergenerational transmission of entrepreneurial behaviour. According to the stream of literature on parental entrepreneurial role modelling, sons of self-employed fathers are three times more likely to be 'occupational followers' in self-employment than the average worker (Laband and Lentz, 1983); they also enter self-employment at an earlier age and spend a greater fraction of their work-time engaged in it (Dunn and Holtz-Eakin, 2000). In particular, it has been shown that the simplest means by which parents can facilitate their children's entrepreneurial entry is by involving these latter in their on-going ventures (Sørensen, 2007). D_PRIOR_SHAREHOLDER is a proxy for exposure to entrepreneurial experience through household or personal experience and it equals 1 for the alumni who had acquired shares in a company before enrolling in the Laurea Magistrale degree program at POLIMI and 0 for the remaining alumni. We included in the estimates two additional controls: AGE_GRADUATION and LN_DISTANCE_BIRTHPLACE. The former variable specifies the age of the student at graduation and it was inserted because several studies have suggested that age may play a role in the decision to start a new venture (see, e.g., Levesque and Minniti, 2006). LN_DISTANCE_BIRTHPLACE is a continuous variable measuring the natural logarithm[16] of the distance in 100 kilometres of the county of origin from Milan[17] (Winsor zed at 1st and 99th percentiles to correct for outliers). We assume that this measure indicates whether a student moved to attend university, suggesting a propensity towards risk.

Independent variables, moderating variables and control variables are summarized in Table2, as to observe their mean values, standard deviations, minimum and maximum,

[16] The natural logarithm is a more robust measure of the distribution of values, i.e. it is less sensitive to perturbations in the tails of the distribution.

[17] For not Italy-born alumni LN_DISTANCE_BIRTHPLACE was computed as the logarithm of the distance between Milan and the capital of the native country.

observed in the sample. Table3, in turn, shows how these variables are correlated. Consistently with the variables' definition, D_SUPERVISOR_ENTREPRENEUR_STRICT features high levels of positive correlation with D_SUPERVISOR_ENTREPRENEUR_BROAD and D_CONTACTS_STRICT, which is also positively correlated with the broad definition of entrepreneur. D_WOMAN, in turn, is negatively correlated with D_SAME_GENDER. In general, we do not have problems of correlation among variables. An additional check has been performed by means of calculation of the centred or non-centred variance inflation factors (VIFs) for the independent variables specified in the model. Since the results are below threshold values, i.e. all VIFs below 10 and mean VIF below 5 (1.09 in the specific), we can further remark that we do not have problems of collinearity.

Variables (N=7462)	Mean	Std. Dev.	Min	Max
D_SUPERVISOR_ENTREPRENEUR_STRICT	0.142	0.349	0	1
D_SUPERVISOR_ENTREPRENEUR_BROAD	0.241	0.428	0	1
D_SAME_GENDER	0.727	0.445	0	1
SAME_SSD	0.588	0.492	0	1
D_STATUS	0.901	0.298	0	1
D_FULL	0.552	0.497	0	1
D_WOMAN	0.213	0.409	0	1
D_PRIOR_SHAREHOLDER	0.019	0.137	0	1
D_CONTACTS_ STRICT	0.279	0.449	0	1
D_CONTACTS_ BROAD	0.638	0.480	0	1
LN_DISTANCE_ BIRTHPLACE	3.238	2.508	0	6.968
D_HIGH_INCOME	0.169	0.375	0	1
AGE_GRADUATION	24.978	1.545	22	54

Table 2 - Variables of the econometric model: independent variables, moderating variables, independent variables for robustness check, control variables

Table 3 - Correlation coefficients.

	D_SUP_ENT_STRICT	D_SUP_ENT_BROAD	D_SAME_GENDER	SAME_SSD	D_STATUS	D_FULL	D_WOMAN	D_PRIOR_SHAREHOLDER	D_CONTACTS_STRICT	D_CONTACT_BROAD	LN_DISTANCE_BIRTHPLACE	D_HIGH_INCOME	AGE_GRADUATION
D_SUP_ENT_STRICT	1												
D_SUP_ENT_BROAD	0.7208***	1											
D_SAME_GENDER	0.1099***	0.0716***	1										
SAME_SSD	0.1345***	0.1075***	0.0303***	1									
D_STATUS	0.1087***	0.1089***	-0.0051	0.0945***	1								
D_FULL	0.2132***	0.1874***	0.0583***	0.0922***	0.3673***	1							
D_WOMAN	-0.0599***	-0.0173	-0.6419***	-0.0336***	0.0305***	0.0134	1						
D_PRIOR_SHAREHOLDER	-0.0144	0.0018	-0.0072	0.0149	-0.0065	-0.0086	-0.0149	1					
D_CONTACTS_STRICT	0.6517***	0.5448***	0.0675***	0.0412***	0.1013***	0.2041***	-0.0256**	-0.0038	1				
D_CONTACT_BROAD	0.3057***	0.2866***	0.0362***	0.0714***	0.1763***	0.1495***	-0.0056	0.0027	0.4691***	1			
LN_DISTANCE_BIRTHPLACE	-0.0260**	-0.0100	-0.0262**	-0.0082	0.0062	-0.0224*	0.0379***	0.0145	-0.0162	0.0247**	1		
D_HIGH_INCOME	-0.0158	0.0096	-0.0267**	-0.0357***	0.0061	-0.0173	0.0293**	0.0964***	-0.0108	0.0157	0.0681***	1	
AGE_GRADUATION	-0.0030	-0.0026	0.0219*	-0.0538***	-0.0576***	-0.0741***	-0.0734***	0.0185	0.0109	-0.0318***	0.0876***	0.0198*	1

Level of significance: *p<0.1; **p<0.05; ***p<0.01

CHAPTER 5: RESULTS

The result of the hypotheses testing is discussed in the following paragraphs. We first describe the basic statistics to have a broader idea of the dynamics under scrutiny. Then, we focus on the regression analysis to observe the role model effects in a more structured framework. Finally, we consider possible alternative explanations of the observed phenomenon to assess the robustness of results.

5.1 DESCRIPTIVE STATISTICS

To analyse the impact of the relationship between a student and her thesis supervisor on the entrepreneurial entry of the first, in Table 4 we provide some descriptive evidence on the distribution of the dependent and the key explanatory variables. As to the dependent variable, we consider three alternatives: D_STUDENT_FOUNDER_5, D_STUDENT_FOUNDER_3, and D_STUDENT_FOUNDER_1 (for a description see section 4.3.1). As to the explanatory variable, we consider both the strict and the broad definition of entrepreneurship (i.e., both D_SUPERVISOR_ENTREPRENEUR_STRICT and D_SUPERVISOR_ENTREPRENEUR_BROAD). Table 4 reveals that, as we already highlighted in section 4.2, student entrepreneurship is a rare phenomenon, occurring in only 2.8%, 1.7% and 0.7% of cases of our sample respectively after 5, 3 and 1 years from graduation. The entrepreneurial activity of academics is quite rare as well: only about 14% of sample students have entrepreneurial supervisors if we consider the strict definition, about 24% if we consider the broad one. Overall, in most cases both the thesis supervisor and the supervised student in our sample are not involved in entrepreneurial activities.

		D_STUDENT_FOUNDER_5		D_STUDENT_FOUNDER_3		D_STUDENT_FOUNDER_1	
		0	**1**	**0**	**1**	**0**	**1**
D_SUPERVISOR_ENTREPRENEUR_STRICT	**0**	6236 (83.6%)	169 (2.3%)	6302 (84.5%)	103 (1.4%)	6363 (85.3%)	42 (0.6%)
	1	1019 (13.7%)	**38 (0.5%)**	1029 (13.8%)	**28 (0.4%)**	1045 (14.1%)	**12 (0.1%)**
D_SUPERVISOR_ENTREPRENEUR_BROAD	**0**	5512 (73.9%)	151 (2.0%)	5572 (74.7%)	91 (1.2%)	5627 (75.4%)	36 (0.5%)
	1	1743 (23.3%)	**56 (0.8%)**	1759 (23.6%)	**40 (0.5%)**	1781 (23.9%)	**18 (0.2%)**

The percentages in parenthesis refer to the 7462 students of the sample.

Table 4 - Combined frequencies of student entrepreneurs and supervisor entrepreneurs.

Starting from Table 4, we tested whether students who had a supervisor entrepreneurs more often became entrepreneurs themselves. To do so, we performed a χ^2 statistic test for independence on D_STUDENT_FOUNDER_T (T = 1, 3, 5) for both the strict and the broad definitions of D_SUPERVISOR_ENTREPRENEUR. The results, reported in Table 5, show that, when we consider the strict definition of supervisor entrepreneur, there is a significant correlation between the entrepreneurial activity of the supervisor and the student entrepreneurial entry. This relationship is stronger when we focus on students' entrepreneurial entry by the third year after graduation. Conversely, if we focus on the broad definition, there is only a weak correlation when we consider firm creation by the third year after graduation and no evidence when considering firm creation by the fifth or the first years. This evidence is in line with *H1* (i.e. *university students are more likely to become entrepreneurs if their thesis supervisors have entrepreneurial experience).* We do think that the correlation is stronger when considering D_STUDENT_FOUNDER_3 rather than D_STUDENT_FOUNDER_1 because firm creation often takes time, hence the effect of the thesis supervisor as an entrepreneurial role model for the supervised student may not fully manifest by the first year after the student's graduation. Instead, different arguments may explain why the correlation is stronger for D_STUDENT_FOUNDER_3 rather than for D_STUDENT_FOUNDER_5. On the one hand, students rarely maintain contacts with their thesis supervisors after graduation, hence

the effect of the activity of the thesis supervisor is likely to have a weaker influence on student's entrepreneurial intentions the longer the timeframe between graduation and entrepreneurial entry. On the other hand, 5 years after graduation the overlapping of other forces (maybe associated to the work environment where the alumnus works) may partially hide the effect of the thesis supervisor's entrepreneurial experience. For instance, the student may develop other influential relationships, that may eventually substitute the influence of the thesis supervisor.

	D_SUPERVISOR_ENTREPRENEUR_STRICT	**D_SUPERVISOR_ENTREPRENEUR_BROAD**
D_STUDENT_FOUNDER_5	0.010*****	0.165
D_STUDENT_FOUNDER_3	0.000 ******	0.011 *****
D_STUDENT_FOUNDER_1	0.012 *****	0.020

For an α level of 0.05 and 1 degree of freedom, the control value for the χ^2 test is 0.004; values above such threshold lead to reject the H_0 of independency. N=7462. Level of significance: *****p<0.1; ******p<0.05; *******p<0.01

Table 5 - χ2 statistic test for independence.

In line with the above-discussed findings, in the following, we focus on D_STUDENT_FOUNDER_3 and D_SUPERVISOR_ENTREPRENEUR_STRICT. In Table 6.1, we tried to capture the impact of the moderators described in 4.3.2 on the occurrences of student entrepreneurial entry and supervisor entrepreneurial experiences. In line with the hypothesis presented in Chapter 3, the number of student entrepreneurs is higher when the moderating variable equals 1. Results on occurrences considering D_SAME_GENDER shows that gender proximity, i.e. D_SAME_GENDER=1, increases the chance to observe student entrepreneurial entry when the thesis supervisor is an entrepreneur herself (0.5% versus 0.1% when they have different gender). This result is in line with *H2a* (i.e. the effect of the thesis supervisors' entrepreneurial experience on students' entrepreneurial entry is more positive when supervisors and students have the same gender). Also proximity in terms of area of expertise, i.e. SAME_SSD=1,

increases the percentage of student entrepreneurs in conjunction with a supervisor entrepreneur (0.5% versus 0.3%), which is in line with *H3* (i.e. the effect of the thesis supervisors' entrepreneurial experience on students' entrepreneurial entry is more positive when the field of the thesis supervisor's activity and of the student's curriculum studiorum are similar).

Both measures of the thesis supervisor's status highlight an increase of occurrences of student entrepreneurs with supervisor entrepreneurs when the latter has a high status, i.e. when the control variable equals 1 (0.4% versus 0.1% for D_STATUS and 0.6% versus 0.1% for D_FULL). This confirms *H4*, i.e. the effect of the thesis supervisors' entrepreneurial experience on students' entrepreneurial entry is more positive when the academic status of the thesis supervisor is higher. Results on D_WOMAN, conversely, do not support *H5* (i.e. the positive effect between the model entrepreneurial activity and the student entrepreneurial entry is greater for female students), indeed when the supervised student is a woman (D_WOMAN=1) we have student entrepreneurs with supervisor entrepreneurs in only 0.2% of cases, which is lower than 0.4% observed when the control variable equals 0. Such result is in line with statistics on female entrepreneurship, which is significantly lower than male one. Finally, the additional control, D_PRIOR_SHAREHOLDER, determines the highest increase of occurrences of the observed phenomenon (1.4% of student entrepreneurs with supervisor entrepreneurs when the control equals 1, 0.4% otherwise), thus supporting our idea that entrepreneurial role models possibly observed in families where parents are self-employed interact with other entrepreneurial role models that the student is exposed to, i.e. supervisor entrepreneurial role models. In Appendix B (Tables 11 - 15), we present the same figures when considering D_STUDENT_FOUNDER_5, D_STUDENT_FOUNDER_1 and D_SUPERVISOR_ENTREPRENEUR_BROAD to have a more complete representation of the whole phenomenon. We can observe the same trends after 5 years from graduation, while after 1 year the change of D_WOMAN from 0 to 1 does not determine any change in occurrences and the change of D_PRIOR_SHAREHOLDER determines a decrease of student entrepreneurs with

supervisor entrepreneurs (strict definition). However, it is worth acknowledging that these results are based on small numbers (Table 6).

			D_STUDENT_ENTREPRENEUR_3	
			0	**1**
D_SAME_GENDER=0	D_SUPERVISOR_ENTREPRENEUR_ STRICT	0	1841 (90.4%)	34 (1.7%)
		1	158 (7.8%)	**3 (0.1%)**
D_SAME_GENDER=1	**D_SUPERVISOR_ENTREPRENEUR_ STRICT**	**0**	4461 (82.2%)	69 (1.3%)
		1	871 (16.1%)	**25 (0.5%)**
SAME_SSD=0	D_SUPERVISOR_ENTREPRENEUR_ STRICT	0	2776 (90.3%)	34 (1.1%)
		1	255 (8.3%)	**8 (0.3%)**
SAME_SSD=1	**D_SUPERVISOR_ENTREPRENEUR_ STRICT**	**0**	3526 (80.3%)	69 (1.6%)
		1	774 (17.6%)	**20 (0.5%)**
D_STATUS=0	D_SUPERVISOR_ENTREPRENEUR_ STRICT	0	704 (95.5%)	13 (1.8%)
		1	19 (2.6%)	**1 (0.1%)**
D_STATUS=1	**D_SUPERVISOR_ENTREPRENEUR_ STRICT**	**0**	5598 (83.2%)	90 (1.3%)
		1	1010 (15.0%)	**27 (0.4%)**
D_FULL=0	D_SUPERVISOR_ENTREPRENEUR_ STRICT	0	3100 (92.7%)	47 (1.4%)
		1	194 (5.8%)	**4 (0.1%)**
D_FULL=1	**D_SUPERVISOR_ENTREPRENEUR_ STRICT**	**0**	3202 (77.8%)	56 (1.4%)
		1	835 (20.3%)	**24 (0.6%)**
D_WOMAN=0	D_SUPERVISOR_ENTREPRENEUR_ STRICT	0	4891 (83.3%)	88 (1.5%)
		1	871 (14.8%)	**25 (0.4%)**
D_WOMAN=1	**D_SUPERVISOR_ENTREPRENEUR_ STRICT**	**0**	1411 (88.9%)	15 (0.9%)
		1	158 (10.0%)	**3 (0.2%)**
D_PRIOR_SHAREHOLDER=0	D_SUPERVISOR_ENTREPRENEUR_ STRICT	0	6184 (84.5%)	94 (1.3%)
		1	1016 (13.9%)	**26 (0.4%)**
D_PRIOR_SHAREHOLDER=1	**D_SUPERVISOR_ENTREPRENEUR_ STRICT**	**0**	118 (83.1%)	9 (6.3%)
		1	13 (9.2%)	**2 (1.4%)**

The percentages in parenthesis refer to the total of 7462 students of the sample. Level of significance: *p<0.1; **p<0.05; ***p<0.01.

Table 6 - Occurrences of student entrepreneurs and supervisor entrepreneurs under the effects of moderators

5.2 REGRESSION ANALYSIS

To test our hypotheses, we run a probit regression. The results of the estimates for the three alternative dependent variables are reported in Table 7. For each dependent variable, we estimated three models: the first one includes only the controls (model1), in the second one D_SUPERVISOR_ENTREPRENEUR_STRICT is added (model2), while in the third one D_SUPERVISOR_ENTREPRENEUR_STRICT is replaced by D_SUPERVISOR_ENTREPRENEUR_BROAD (model3). From model1 we can make some observations on the impact and statistical significance of the control variables. Overall, the level of significance is quite unvaried from the scenario with T=5 and T=3, while T=1 features lower level of significance, consistently with the observation that the timeframe may be too short to observe entrepreneurial entry. D_SAME_GENDER, D_PRIOR_SHAREHOLDER, D_HIGH_INCOME and LN_DISTANCE_BIRTHPLACE have highly significant positive coefficients, consistently with the observations made on the choice of such variables as controls (see 4.3.2). As far as the thesis supervisor's status is concerned, D_STATUS is not significant, while, if we look at full professors only, we find a reasonable statistical significance. D_WOMAN, in turn, has a negative coefficient with high statistical significance, consistent with the observations on female entrepreneurship. Finally, the age at graduation is not significant. The results are quite unvaried in model2 and model3.

The analysis of marginal effects (Tables 16 – 18, Appendix B) leads to make a further step in the regression analysis considering the effect of the independent variables and of each control variable on the dependent variables. From the results of both the estimates and the marginal effects, we can confirm our observations on *H1*, i.e. there is statistically significant evidence (especially after three years from graduation) that the thesis supervisor's entrepreneurial activity (strict definition) has a positive impact on the supervised student's entrepreneurial entry. Indeed, if we look at results in Table7, we notice that the independent variable has statistically significant coefficients in model2 (strict definition) but not in model3 (broad definition) and that the scenario with T=3 has the highest levels of significance.

Furthermore, D_SUPERVISOR_ENTREPRENEUR_STRICT has a statistically significant marginal effect of 0.9 percentage points on the decision of the supervised student to become entrepreneur after 3 years from graduation. Conversely, results are not significant considering the broad definition and the other time frames (i.e. T=5, T=1). Therefore, in the following, we focus on models that use D_STUDENT_FOUNDER_3 as the dependent variable (the estimates with dependent variables D_STUDENT_FOUNDER_5 and D_STUDENT_FOUNDER_1 are presented in Appendix B for comparative purposes).

An inspection of the marginal effects of control variables leads to notice that some of the features pertaining to the student have a stronger impact on the entrepreneurial entry of the student in comparison to the entrepreneurial role model provided by the thesis supervisor. In the specific, D_HIGH_INCOME and D_PRIOR_SHAREHOLDER have a marginal effect of, respectively, 1.5 and 4 percentage points. Clearly, economic wealth represents a strong enabling factor for venture creation; therefore, students who belong to families with higher incomes will face a smoother entrepreneurial entry thanks to the financial support received from their parents. Even more significant is the impact of belonging to an entrepreneurial family, which brings entrepreneurial-specific knowledge and contacts, besides economic wealth. The strong marginal effect of D_PRIOR_SHAREHOLDER is well explained considering our assumption to use such variable as a proxy of belonging to an entrepreneurial family and being involved in the family business. LN_DISTANCE_BIRTH have a positive significant marginal effect of 0.2%; this result is not surprising if we assume that risk-averse individuals are less likely to leave their hometown to attend university and, therefore, LN_DISTANCE_BIRTH can be used as a proxy for risk-taking individuals, which are usually considered more prone to become entrepreneurs. D_WOMAN has a statistically significant negative marginal effect on the student's entrepreneurial entry (-1.0%), consistently with findings on female entrepreneurship. Gender proximity has a significant negative marginal effect (-1.0%), which is not in line with our expectations ($H2_a$). In turn, proximity in terms of area of expertise has a reasonably significant positive coefficient, which is in line with *H3*. The remaining control variables are not statistically significant.

	D_STUDENT_FOUNDER_5			D_STUDENT_FOUNDER_3			D_STUDENT_FOUNDER_1		
Model 1	-			-			-		
Model 2	0.138 (0.084) *			0.201 (0.095) **			0.217 (0.128) *		
Model 3			0.064 (0 .071)			0.115 (0.081)			0.167 (0.107)
D_SAME_ GENDER	-0.265 (0.085) ***	-0.285 (0 .087) ***	-0.276 (0.086) ***	-0.216 (0.102) **	-0.246 (0 .105) **	-0.235 (0 .105) **	-0.173 (0.128)	-0.206 (0 .132)	-0.204 (0.131)
SAME_SSD	0.093 (0.064)	0.083 (0 .064)	0 .089 (0 .064)	0.157 (0.076) **	0.142 (0.077)	0 .150 (0 .077) *	0.089 (0.101)	0 .071 (0.103)	0.076 (0 .102)
D_STATUS	-0.079 (0.111)	-0.084 (0 .111)	-0.083 (0 .111)	-0.132 (0.129)	-0.139 (0 .130)	-0.141 (0 .129)	-0.026 (0.182)	-0.035 (0 .183)	-0.040 (0 .183)
D_FULL	0.129 (0.068) *	0 .109 (0 .069)	0 .120 (0 .069) *	0.159 (0.081) *	0 .129 (0 .082)	0.142 (0 .081) *	0.091 (0.105)	0.056 (0 .106)	0 .066 (0 .106)
D_WOMAN	-0.484 (0.107) ***	-0.492 (0.109) ***	-0.492 (0 .109) ***	-0.361 (0.126) ***	-0.374 (0.129) ***	-0.375 (0.130) ***	-0.236 (0.147)	-0.252 (0.150) *	-0.257 (0.152) *
D_PRIOR_ SHAREHOLDER	0.653 (0.145) ***	0.657 (0.145) ***	0 .652 (0.145) ***	0.635 (0.161) ***	0.641 (0.162) ***	0.633 (0.161) ***	0.497 (0.224) **	0.508 (0.225) **	0.491 (0.223) **
LN_DISTANCE_ BIRTH	0.025 (0.012) **	0.026 (0.012) **	0.025 (0.012) **	0.031 (0.014) **	0.032 (0.014) **	0.031 (0.014) **	0.004 (0.019)	0.005 (0.019)	0.004 (0.019)
D_HIGH_ INCOME	0 .239 (0.073) ***	0.239 (0.073) ***	0.238 (0.073) ***	0.242 (0.085) ***	0.240 (0.086) ***	0.238 (0.085) ***	0.214 (0.116) *	0.217 (0.116) *	0.215 (0.116) *
AGE_ GRADUATION	0.005 (0.020	0.005 (0.020)	0.005 (0.020)	0.030 (0.018)	0.030 (0.018)	0.029 (0.018)	0.018 (0.022)	0.017 (0.022)	0.018 (0.022)
cons	-1.997 (0.539) ***	-1.982 (0 .542) ***	-1.984 (0 .536) ***	-2.900 (0.488) ***	-2.879 (0 .492) ***	-2.878 (0 .483) ***	-2.891 (0.599) ***	-2.859 (0 .606) ***	-2.870 (0 .599) ***
Log pseudo likelihood	- 914.439	- 913.144	- 914.044	- 634.718	-632.610	-633.755	- 313.798	-312.480	-312.705
Pseudo R^2	0.033	0.035	0.034	0.037	0.040	0.039	0.019	0.023	0.022

The percentages in parenthesis refer to the total of 7462 students of the sample. Standard errors in parenthesis. Level of significance: *p<0.1; **p<0.05; ***p<0.01.

Table 7 - Probit regression model, interaction between the dependent and the independent variables

Subsequently, we tested the hypothesised effects of moderators on the relationship between the explicative and the dependent variable (i.e. *H2* to *H5*). Table 8 displays the results of such estimates for model2 with D_STUDENT_ENTREPRENEUR_3 as dependent variable (Tables 19 - 23 in Appendix B display results for the other scenarios). D_SUPERVISOR_ENTREPRENEUR_STRICT#D_SAME_GENDER is aimed at testing whether gender proximity increases the role model effect ($H2_a$); D_SUPERVISOR_ENTREPRENEUR_STRICT#SAME_SSD tests whether the role model effect is stronger when the student and the thesis supervisor have the same area of expertise (*H3*), D_SUPERVISOR_ENTREPRENEUR_STRICT#D_STATUS (and #D_FULL) tests the moderating effect of the thesis supervisor's status (*H4*), D_SUPERVISOR_ENTREPRENEUR_STRICT#D_WOMAN tests the moderating effect of the student's gender (*H5*) and D_SUPERVISOR_ENTREPRENEUR_STRICT#D_PRIOR_SHAREHOLDER is related to the control included to test if belonging to entrepreneurial families moderates the role model effect (4.3.2). In line with the descriptive statistics reported in 5.1, we do not find statistically significant evidence to support our hypotheses *H2* to *H5*.

D_SUPERVISOR_ENTREPRENEUR_STRICT	0.166 (0.262)	0.386 (0.174) **	0.307 (0.450)	0.124 (0.219)	0.206 (0.102)	0.195 (0.097) **
D_SUPERVISOR_ENTREPRENEUR_STRICT # D_SAME_GENDER	**0 .040 (0 .279)**					
D_SUPERVISOR_ENTREPRENEUR_STRICT # SAME_SSD		**-0.251 (0.203)**				
D_SUPERVISOR_ENTREPRENEUR_STRICT # D_STATUS			**-0.110 (0.459)**			
D_SUPERVISOR_ENTREPRENEUR_STRICT # D_FULL				**0.093 (0.241)**		
D_SUPERVISOR_ENTREPRENEUR_STRICT # D_WOMAN					**-0.040 (0.279)**	
D_SUPERVISOR_ENTREPRENEUR_STRICT # D_PRIOR_SHAREHOLDER						**0.115 (0.449)**
D_SAME_GENDER	-0.248 (0.106) **	-0.246 (0.106) **	-0.246 (0.105) **	-0.244 (0.105) **	-0.247 (0.106) **	-0.246 (0.105) **
SAME_SSD	0.142 (0 .078) *	0.182 (0.084) **	0.142 (0 .077) *	0.141 (0.077) *	0.142 (0 .077) **	0.142 (0 .077) *
D_STATUS	-0.140 (0.130)	-0.139 (0.130)	-0.135 (0.133)	-0.136 (0.130)	-0.140 (0.130)	-0.138 (0.130)
D_FULL	0 .129 (0 .082)	0.129 (0.082)	0 .130 (0 .082)	0.118 (0.088)	0 .129 (0 .085)	0 .129 (0 .082)
D_WOMAN	-0.369 (0 .133) ***	-0.371 (0.129) ***	-0.374 (0 .129) ***	-0.373 (0.129) ***	-0.369 (0.133) ***	-0.374 (0.129) ***
D_PRIOR_SHAREHOLDER	0.641 (0.162) ***	0.635 (0.162) ***	0.639 (0.161) ***	0.644 (0.162) ***	0.641 (0.162) ***	0.652 (0.177) ***
LN_DISTANCE_BIRTHPLACE	0 .032 (0 .014) **	0.032 (0.014) **	0.032 (0.014) **	0.032 (0.014) **	0.032 (0.014) **	0.032 (0.014) **
D_HIGH_INCOME	0.240 (0 .085) ***	0.240 (0.085) ***	0.240 (0.085) ***	0.239 (0.085) ***	0.240 (0.086) ***	0.239 (0.085) ***
AGE_GRADUATION	0.030 (0.018)	0.030 (0.018)	0.030 (0.018)	0.030 (0.018)	0.030 (0.018)	0.030 (0.018)
_cons	-2.880 (0.492) ***	-2.915 (0.496) ***	-2.883 (0.493) ***	-2.885 (0.493) ***	-2.880 (0.492) ***	-2.882 (0.492) ***
Log pseudolikelihood	-632.599	-631.869	-632.590	-632.537	-632.599	-632.578
Pseudo R^2	0.040	0.041	0.040	0.040	0.040	0.040

T=3 years, strict definition of supervisor entrepreneur. The percentages in parenthesis refer to the total of 7462 students of the sample. Standard errors in parenthesis. Level of significance: *p<0.1; **p<0.05; ***p<0.01.

Table 8 - Effects of moderating variables

5.3 ALTERNATIVE EXPLANATIONS

Considering that the positive influence of D_SUPERVISOR_ENTREPRENEUR_STRICT may be caused by other effects than the role model effect, in this paragraph we test for alternative explanations. In the specific, Table 9 shows the results of the probit models using D_STUDENT_FOUNDER_3 as dependent variable and D_CONTACTS_STRICT or D_CONTACTS_BROAD as explicative variable. D_CONTACTS_STRICT has a positive and significant coefficient, while the coefficient of D_CONTACTS_BROAD is not statistically significant. Since there is a positive relation between the students' entrepreneurial entry and the contacts of the thesis supervisors (strict definition), we checked the magnitude of this effect. The marginal effect of D_CONTACTS_STRICT (Table 24, Appendix B) is of 0.7 percentage points, which is lower than the marginal effect of D_SUPERVISOR_ENTREPRENEUR_STRICT (0.9 percentage points). This means that the role model effect is stronger than the impact of contacts developed by the thesis supervisors through working in the private sector and, therefore, we can reject the alternative explanation and support with more evidence the observations on *H1*.

	D_STUDENT_FOUNDER_3	
D_CONTACTS_STRICT	0.169 (0.077) **	
D_CONTACTS_BROAD		0.083 (0.076)
D_SAME_GENDER	-0.242 (0.106) **	-0.229 (0.104) **
SAME_SSD	0.155 (0.077) *	0.154 (0.076) **
D_STATUS	-0.141 (0.130)	-0.153 (0.132)
D_FULL	0.128 (0.081)	0.150 (0.081) *
D_WOMAN	-0.378 (0.130) ***	-0.373 (0.128) ***
D_PRIOR_SHAREHOLDER	0.635 (0.161) ***	0.634 (0.161) ***
LN_DISTANCE_BIRTH	0.032 (0.014) **	0.031 (0.014) ***
D_HIGH_INCOME	0.245 (0.085) **	0.331 (0.086) **
AGE_GRADUATION	0.030 (0.018) *	0.031 (0.018) *
_cons	-2.913 (0.491) ***	-2.948 (0.486) ***
Log pseudolikelihood	-632.432	-634.165
Pseudo R^2	0.041	0.038

N=7462. Standard errors in parentheses. Level of significance: *p<0.1; **p<0.05; ***p<0.01

Table 9 - Probit regression model for robustness check

CHAPTER 6: CONCLUSIONS

This study examined the impact of the thesis supervisor's entrepreneurial activity on students' entrepreneurial entry. First, we analysed the extant studies on student entrepreneurship and we spotted some gaps related to the impact that relationships and, more generally, the university climate can have on student entrepreneurial entry. So far, the analyses of relationships developed in the university context is limited to the so-called peer-effect originated by interactions with fellows, thus leaving unexplored the field of relationships built with professors and/or other academics. Studies on the university environment and its entrepreneurial orientation, in turn, are quite generic with regards to their impact on startup creation by alumni. In a second moment, we examined the studies on entrepreneurial entry and the formation of entrepreneurial intentions to identify the most frequently used models that determine entrepreneurial intentions. Drawing on this knowledge, we chose to analyse the above-mentioned relationship using the Social Learning Theory and the Theory of Planned Behaviour. We assumed that a thesis supervisor with an entrepreneurial background represents a role model for the supervised student and, thus, can shape the entrepreneurial intentions and entrepreneurial entry of the latter. We also identified a series of individual- and relationship-specific factors that, possibly, moderate such relationship. Hence, we developed a series of hypotheses that were tested through the estimates of econometric models. The database used to test the hypotheses was developed by collecting data from multiple sources: the PoliMi Academic Office, the Italian Business Register, the PoliMi website, LinkedIn and the Internet in general. The results of our analyses indicate that when the thesis supervisor has entrepreneurial experience, supervised students are more likely to become entrepreneurs in the years immediately following graduation. Conversely, we found no empirical support for our hypotheses on

the factors that moderate the above impact. Overall, the findings of our study are interesting to both practitioners and scholars. Therefore, the following paragraphs discuss the main contributions to entrepreneurship research and implications for policy makers. In the following, we discuss also the limitations of our work and derive avenues for future research.

6.1 CONTRIBUTIONS TO ENTREPRENEURSHIP RESEARCH

Our findings contribute to the streams of literature on student entrepreneurship and on role models in entrepreneurship. As we mentioned above, research conducted so far on student entrepreneurship and its determinants has under-investigated the role of personal relationships as determinants of firm creation by university students and recent graduates. Our study represents a first attempt to fill such gap, considering the impact of the relationship that students establish in the university context with superiors (i.e., their professors) and the role model effect of their thesis supervisors. Consistently with the contextual approach towards entrepreneurship, this research work confirms that entrepreneurial entry is not simply dependent on the characteristics of the individual's personality, but is subject to more complex mechanisms, e.g. role modelling. In regards to this issue, the results of our estimates indicate that the entrepreneurial role models provided by students' parents are not the only ones influencing young prospective entrepreneurs. Indeed, also the thesis supervisors' entrepreneurial activity can stimulate supervised students to create new ventures in the years immediately after graduation. Additionally, we provide new insights on the role model framework. The extant literature has shown that this mechanism either works as an antecedent of entrepreneurial career choices in other contexts than the educational one, e.g. family, or, in the educational context, it may explain other choices such as major or specialization choices (2.3.1). Therefore, we add to theory by analysing entrepreneurial role models in the education environment. Our research also contributes to the stream

of literature on entrepreneurial environment[19], in specific the university entrepreneurial environment. The availability of entrepreneurial role models is one of the characteristics that defines the university environment and this research work provides evidence of the impact that such models, represented by thesis supervisors, have on student entrepreneurship. Therefore, the present work represents a step forward in the understanding of the influence that the academic context has on entrepreneurial entry by graduates.

6.2 IMPLICATIONS

Besides enriching the extant literature, our research provides some insights for practitioners. As proved by the diffusion of entrepreneurship-oriented university programs, entrepreneurship education is becoming an important source of entrepreneurship-specific human capital, alternative to antecedent self-employment experiences. As Åstebro et al. (2012) have shown, student entrepreneurial rates outnumber academic entrepreneurial rates and, as we have shown, the second affects the first. Therefore, university managers, who are willing to stimulate student entrepreneurship, could consider to create an environment that favours academic entrepreneurship, in the first place. In this way, despite concentrating efforts on a smaller-scale phenomenon, they could observe positive results on a much larger scale. A pro-entrepreneurship environment would, indeed, favour academic entrepreneurship and, hence, increase the probability that academics become entrepreneurial role models for their students. Additionally, it could affect students' perceived desirability of a career as an entrepreneur and increase their propensity to observe entrepreneurial role models. Although this consideration is not directly ascribable to the results of the present research, it seems consistent with the theoretical premises of the model and the insights provided by studies on the interaction between institutional environments

[19] "First, it refers to the overall economic, sociocultural, and political factors that influence people's willingness and ability to undertake entrepreneurial activities. Second, it refers to the availability of assistance and support services that facilitate the start-up process" (Gnyawali et al., 1994, p.44)

and the formation of entrepreneurial intentions (see 2.4.3). Specifically, Wyrwich et al. (2015) suggest that entrepreneurial role models are more effective on individuals' intentions to start a business in social environments featuring a higher acceptance of entrepreneurship.

6.3 LIMITATIONS AND FUTURE RESEARCH DEVELOPMENT

Our research is affected by two subsets of limitations, which provide insights for future research developments. A first subset of limitations depends on the scope of our analysis, while others can be ascribed to missing data. The scope of the analysis is determined by the domain of the dataset, which is limited to students who (a) graduated from Politecnico di Milano between July 2005 and December 2009 and (b) have a thesis supervisor who supervised at least 10 students[20]. Because of these characteristics of the dataset and the fact that we are observing a rare phenomenon (see 5.1), we have a small number of student entrepreneurs supervised by academics with entrepreneurial experience. If we enlarged our sample by including more students, we may obtain more significant results in the estimates. To do so, the timeframe under scrutiny could be extended to alumni who graduated up to 2013[21] and/or we could collect information on the academics who supervised less than 10 students. Moreover, we focus on alumni of Politecnico di Milano, which is a technical university, and so the generalizability of our findings to other universities is questionable. Thus, it would be interesting to test whether our results still hold if students from different universities, besides technical ones, were considered. It seems, indeed, reasonable to assume that different universities provide a different entrepreneurial climate, featuring higher or lower social acceptance of entrepreneurship, which is a strong antecedent of entrepreneurial intentions and behaviours, by means of social norms (see 2.4.3). Therefore, the analysis of different universities would lead to compare the impact that different orientations

[20] Due to time constraints in the data collection phase

[21] Considering that the best estimates are obtained if we look at venture creation after 3 years and under the assumption that we can have information on firms created up to 2016, we can extend the sample to students who graduated up to 2013.

towards entrepreneurship have on the relationship between students and their thesis supervisor, thus moderating the role model effect.

Furthermore, missing information prevented us from testing some hypotheses. As we mentioned in Chapter 1, several studies proved that entrepreneurship education exerts a positive influence on students' entrepreneurial entry e.g. by increasing students' entrepreneurial self-efficacy (Bandura, 1986; Boyd & Vozikis, 1994). Interestingly, a study conducted in South Africa analysed the relationship between entrepreneurial education, role models and entrepreneurial intentions and proved that, besides showing a greater attitude towards entrepreneurship, students who attend entrepreneurship courses are also more likely to benefit from the influence of entrepreneurial role models in comparison with non-entrepreneurship students (Muofhe et al., 2011), although nothing specific is said about the underlying dynamics that determine such effect. In addition to the hypothesis described in Chapter 3, it would be interesting to test whether and how entrepreneurship education moderates the impact of the thesis supervisor's entrepreneurial activity on the entrepreneurial entry of the supervised student. Future research should expand the analysis of moderators and check, among others, the impact of entrepreneurial education on the role model effect leading to students' entrepreneurial entry. This would require to collect additional information on the students' *curricula studiorum*, to check for entrepreneurship-oriented courses.

The analysis of moderators left another issue open to future researches. From the literature review, we acknowledged that some personality traits can affect the decision to become an entrepreneur; the Big Five trait inventory lead to define the impact of five dichotomic dimensions of personality, among which openness seems to be the most interesting one (see 2.4.1). In general, more open individuals tend to be attracted by career opportunities they are unfamiliar with, therefore, in entrepreneurial families, more open individuals seem more prone to seek for career opportunities that differ from the one chosen by their parents and to learn from others that do not belong to the family environment (Chlosta et al., 2010). If we extend these considerations to the relationship between students and their thesis supervisors, more open students should be more willing to learn from non-family members, e.g. the thesis supervisors, and to

consider them as role models. Consistently with the results of the studies conducted so far and with the hypothesis described in Chapter 3, it seems reasonable to assume that the positive effect of the thesis supervisor's entrepreneurial experience is likely to be stronger on entrepreneurial intentions of more open students. In their study, Chlosta et al. (2010) exploited the Big Five trait inventory to measure the individual's openness with respect to parental role models. Testing whether openness moderates the role modelling dynamics under scrutiny, would of course require to collect primary data on sample students.

Further limitations are concerned with the need for additional checks for robustness. Specifically, we were not able to verify whether the relationship between students' entrepreneurial entry and their thesis supervisors' entrepreneurial experience is a consequence of the fact that the thesis supervisors are involved in the entrepreneurial venture founded by the supervised student. If this were the case, it would not be correct to speak about role models effect, as the motivations leading to the student's entrepreneurial entry would be other than observational learning and identification with the thesis supervisor. The documents needed to verify the participation of the thesis supervisor in the student's startup were not available to us; therefore, we could not perform this additional check of robustness, thus suggesting another possible avenue for future research.

Finally, the reliability of our estimates may be limited by the problem of self-selection, i.e. students may select themselves in the group of student entrepreneurs, regardless of the role model effect. If this was the case, we would have a biased sample and our results would no longer hold. To cope with this problem, we should evaluate the relationship between the thesis supervisor and the supervised student based on the student's curriculum studiorum, which can be done considering as independent variable the probability that the student chooses a thesis supervisor with an entrepreneurial background. Due to time constraints, we could not perform such additional check, thus we suggest to future researchers to perform it to increase the reliability of our considerations.

APPENDIX

Appendix A

EUROPEAN INDUSTRIAL ACTIVITY CLASSIFICATION	Freq.	Percent
Growing of vegetables and melons, roots and tubers	1	0.49
Operation of dairies and cheese making	1	0.49
Manufacture of wearing apparel, except fur apparel	1	0.49
Manufacture of other technical and industrial textiles	2	0.97
Manufacture of other chemical products n.e.c.	1	0.49
Manufacture of glass and glass products	1	0.49
Manufacture of other plastic products	1	0.49
Manufacture of other non-metallic mineral products n.e.c.	1	0.49
Manufacture of metal structures and parts of structures	1	0.49
Machining	1	0.49
Manufacture of electronic components and boards	1	0.49
Manufacture of electronic components	4	1.94
Manufacture of communication equipment	4	1.94
Manufacture of wiring devices	1	0.49
Manufacture of ovens, furnaces and furnace burners	1	0.49
Manufacture of machinery for metallurgy	1	0.49
Manufacture of machinery for food, beverage and tobacco processing	1	0.49
Manufacture of furniture	1	0.49
Manufacture of other special-purpose machinery n.e.c.	1	0.49
Other manufacturing n.e.c.	1	0.49
Repair of machinery	1	0.49
Electricity power generation, transmission and distribution	1	0.49
Production of electricity	11	5.34
Remediation activities and other waste management services	1	0.49
Development of building projects	1	0.49
Construction of residential and non-residential buildings	15	7.28
Construction of other civil engineering projects n.e.c.	1	0.49

Electrical installation	6	2.91
Plumbing, heat and air-conditioning installation	1	0.49
Other construction installation	1	0.49
Other building completion and finishing	3	1.46
Sale of cars and light motor vehicles	1	0.49
Agents involved in the sale of machinery, industrial equipment, ships and aircraft	2	0.97
Agents involved in the sale of food, beverages and tobacco	1	0.49
Agents specialised in the sale of other particular products	1	0.49
Wholesale of clothing and footwear	1	0.49
Wholesale of electrical household appliances	1	0.49
Wholesale of furniture, carpets and lighting equipment	1	0.49
Wholesale of other household goods	1	0.49
Wholesale of computers, computer peripheral equipment and software	1	0.49
Wholesale of electronic and telecommunications equipment and parts	1	0.49
Wholesale of other machinery, equipment and supplies	1	0.49
Wholesale of other machinery, equipment and supplies	1	0.49
Wholesale of wood, construction materials and sanitary equipment	1	0.49
Non-specialised wholesale trade	1	0.49
Other retail sale of food in specialised stores	1	0.49
Retail sale of sporting equipment in specialised stores	1	0.49
Retail sale of clothing in specialised stores	1	0.49
Retail sale of watches and jewellery in specialised stores	1	0.49
Retail sale via mail order houses or via internet	5	2.43
Freight transport by road	1	0.49
Other postal and courier activities	1	0.49
Other postal and courier activities	1	0.49
Restaurants and mobile food service activities	4	1.94
Beverage serving activities	1	0.49
Software publishing	2	0.97
Computer programming activities	10	4.85
Computer consultancy activities	11	5.34
Other information technology and computer service activities	4	1.94
Data processing, hosting and related activities	1	0.49
Web portals	3	1.46
Other financial service activities, except insurance and pension funding n.e.c.	1	0.49
Risk and damage evaluation	1	0.49

Buying and selling of own real estate	10	4.85
Renting and operating of own or leased real estate	4	1.94
Business and other management consultancy activities	11	5.34
Architectural and engineering activities and related technical consultancy	2	0.97
Engineering activities and related technical consultancy	14	6.80
Technical testing and analysis	4	1.94
Other research and experimental development on natural sciences and engineering	3	1.46
Advertising agencies	1	0.49
Specialised design activities	1	0.49
Other professional, scientific and technical activities n.e.c.	7	3.40
Combined facilities support activities	1	0.49
Cleaning activities	1	0.49
Other building and industrial cleaning activities	1	0.49
Combined office administrative service activities	1	0.49
Organisation of conventions and trade shows	1	0.49
Other business support service activities n.e.c.	1	0.49
Other education n.e.c.	2	0.97
Other human health activities	1	0.49
Fitness facilities	1	0.49
Other sports activities	3	1.46
Other amusement and recreation activities	2	0.97
Total	**206**	**100.00**

Table 10 - Appendix A, EUROPEAN INDUSTRIAL ACTIVITY CLASSIFICATION

Appendix B

			D_STUDENT_ENTREPRENEUR_3	
			0	1
D_SAME_GENDER=0	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	1617 (79.4%)	30 (1.5%)
		1	382 (18.8%)	7 (0.3%)
D_SAME_GENDER=1	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	3955 (72.9%)	61 (1.2%)
		1	1377 (25.4%)	33 (0.6%)
SAME_SSD=0	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	2472 (80.4%)	29 (0.9%)
		1	559 (18.2%)	13 (0.4%)
SAME_SSD=1	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	3100 (70.6%)	62 (1.4%)
		1	1200 (27.3%)	27 (0.6%)
D_STATUS=0	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	650 (88.2%)	13 (1.8%)
		1	73 (9.9%)	1 (0.1%)
D_STATUS=1	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	4922 (73.2%)	78 (1.2%)
		1	1686 (25.1%)	39 (0.6%)
D_FULL=0	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	2793 (83.5%)	43 (1.3%)
		1	501 (15.0%)	8 (0.2%)
D_FULL=1	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	2779 (67.5%)	48 (1.2%)
		1	1258 (30.6%)	32 (0.8%)
D_WOMAN=0	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	4358 (74.2%)	78 (1.3%)
		1	1404 (23.9%)	35 (0.6%)
D_WOMAN=1	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	1214 (76.5%)	13 (0.8%)
		1	355 (22.4%)	5 (0.3%)
D_PRIOR_SHAREHOLDER=0	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	5472 (74.8%)	84 (1.1%)
		1	1728 (23.6%)	36 (0.5%)
D_PRIOR_SHAREHOLDER=1	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	100 (70.4%)	7 (4.9%)
		1	31 (21.8%)	4 (2.8%)

The percentages in parenthesis refer to the total of 7462 students of the sample. Level of significance: *p<0.1; **p<0.05; ***p<0.01.

Table 11 - Occurrences of student entrepreneurs and supervisor entrepreneurs (broad definition) under the effects of moderators

			D_STUDENT_ENTREPRENEUR_5	
			0	1
D_SAME_GENDER=0	D_SUPERVISOR_ENTREPRENEUR_STRICT	0	1820 (98.4%)	55 (2.7%)
		1	158 (7.8%)	3 (0.1%)
D_SAME_GENDER=1	D_SUPERVISOR_ENTREPRENEUR_STRICT	0	4416 (81.4%)	114 (2.1%)
		1	861 (15.9%)	35 (0.6%)
SAME_SSD=0	D_SUPERVISOR_ENTREPRENEUR_STRICT	0	2747 (89.4%)	63 (2.1%)
		1	252 (8.2%)	11 (0.4%)
SAME_SSD=1	D_SUPERVISOR_ENTREPRENEUR_STRICT	0	3489 (79.5%)	106 (2.4%)
		1	767 (17.5%)	27 (0.6%)
D_STATUS=0	D_SUPERVISOR_ENTREPRENEUR_STRICT	0	697 (94.6%)	20 (2.7%)
		1	19 (2.6%)	1 (0.1%)
D_STATUS=1	D_SUPERVISOR_ENTREPRENEUR_STRICT	0	5539 (82.4%)	149 (2.2%)
		1	1000 (14.9%)	37 (0.6%)
D_FULL=0	D_SUPERVISOR_ENTREPRENEUR_STRICT	0	3068 (91.7%)	79 (2.4%)
		1	193 (5.8%)	5 (0.1%)
D_FULL=1	D_SUPERVISOR_ENTREPRENEUR_STRICT	0	3168 (76.9%)	90 (2.2%)
		1	826 (20.1%)	33 (0.8%)
D_WOMAN=0	D_SUPERVISOR_ENTREPRENEUR_STRICT	0	4832 (82.2%)	147 (2.5%)
		1	861 (14.7%)	35 (0.6%)
D_WOMAN=1	D_SUPERVISOR_ENTREPRENEUR_STRICT	0	1404 (88.5%)	22 (1.4%)
		1	158 (10.0%)	3 (0.2%)
D_PRIOR_SHAREHOLDER=0	D_SUPERVISOR_ENTREPRENEUR_STRICT	0	6123 (83.6%)	155 (2.1%)
		1	1006 (13.7%)	36 (0.5%)
D_PRIOR_SHAREHOLDER=1	D_SUPERVISOR_ENTREPRENEUR_STRICT	0	113 (79.6%)	14 (9.9%)
		1	13 (9.2%)	2 (1.4%)

The percentages in parenthesis refer to the total of 7462 students of the sample. Level of significance: *p<0.1; **p<0.05; ***p<0.01.

Table 12 - Occurrences of student entrepreneurs and supervisor entrepreneurs (strict definition) under the effects of moderators

			D_STUDENT_ENTREPRENEUR_5	
			0	1
D_SAME_GENDER=0	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	1598 (78.5%)	49 (2.4%)
		1	380 (18.7%)	9 (0.4%)
D_SAME_GENDER=1	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	3914 (72.1%)	102 (1.9%)
		1	1363 (25.1%)	47 (0.9%)
SAME_SSD=0	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	2448 (79.7%)	53 (1.7%)
		1	551 (17.9%)	21 (0.7%)
SAME_SSD=1	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	3064 (69.8%)	98 (2.2%)
		1	1192 (27.2%)	35 (0.8%)
D_STATUS=0	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	643 (87.2%)	20 (2.7%)
		1	73 (9.9%)	1 (0.1%)
D_STATUS=1	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	4869 (72.4%)	131 (1.9%)
		1	1670 (24.8%)	55 (0.8%)
D_FULL=0	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	2763 (82.6%)	73 (2.2%)
		1	498 (14.9%)	11 (0.3%)
D_FULL=1	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	2749 (66.8%)	78 (1.9%)
		1	1245 (30.2%)	45 (1.1%)
D_WOMAN=0	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	4303 (73.2%)	133 (2.3%)
		1	1390 (23.7%)	49 (0.8%)
D_WOMAN=1	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	1209 (76.2%)	18 (1.1%)
		1	353 (22.2%)	7 (0.4%)
D_PRIOR_SHAREHOLDER=0	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	5416 (74.0%)	140 (1.9%)
		1	1713 (23.4%)	51 (0.7%)
D_PRIOR_SHAREHOLDER=1	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	96 (67.6%)	11 (7.7%)
		1	30 (21.1%)	5 (3.5%)

The percentages in parenthesis refer to the total of 7462 students of the sample. Level of significance: *p<0.1; **p<0.05; ***p<0.01.

Table 13 - Occurrences of student entrepreneurs and supervisor entrepreneurs (broad definition) under the effects of moderators

			D_STUDENT_ENTREPRENEUR_1	
			0	1
D_SAME_GENDER=0	D_SUPERVISOR_ENTREPRENEUR_STRICT	0	1862 (91.5%)	13 (0.6%)
		1	158 (7.8%)	3 (0.1%)
D_SAME_GENDER=1	D_SUPERVISOR_ENTREPRENEUR_STRICT	0	4501 (83.0)	29 (0.5%)
		1	887 (16.3%)	9 (0.2%)
SAME_SSD=0	D_SUPERVISOR_ENTREPRENEUR_STRICT	0	2794 (90.9%)	16 (0.5%)
		1	260 (8.5%)	3 (0.1%)
SAME_SSD=1	D_SUPERVISOR_ENTREPRENEUR_STRICT	0	3569 (81.3%)	26 (0.6%)
		1	785 (17.9%)	9 (0.2%)
D_STATUS=0	D_SUPERVISOR_ENTREPRENEUR_STRICT	0	712 (96.6%)	5 (0.7%)
		1	20 (2.7%)	0 (0.0%)
D_STATUS=1	D_SUPERVISOR_ENTREPRENEUR_STRICT	0	5651 (84.0%)	37 (0.6%)
		1	1025 (15.2%)	12 (0.2%)
D_FULL=0	D_SUPERVISOR_ENTREPRENEUR_STRICT	0	3126 (93.5%)	21 (0.6%)
		1	197 (5.9%)	1 (0.0%)
D_FULL=1	D_SUPERVISOR_ENTREPRENEUR_STRICT	0	3237 (78.6%)	21 (0.5%)
		1	848 (20.6%)	11 (0.3%)
D_WOMAN=0	D_SUPERVISOR_ENTREPRENEUR_STRICT	0	4943 (84.1%)	36 (0.6%)
		1	887 (15.1%)	9 (0.2%)
D_WOMAN=1	D_SUPERVISOR_ENTREPRENEUR_STRICT	0	1420 (89.5%)	6 (0.4%)
		1	158 (10.0%)	3 (0.2%)
D_PRIOR_SHAREHOLDER=0	D_SUPERVISOR_ENTREPRENEUR_STRICT	0	6240 (85.2%)	38 (0.5%)
		1	1030 (14.1%)	12 (0.2%)
D_PRIOR_SHAREHOLDER=1	D_SUPERVISOR_ENTREPRENEUR_STRICT	0	123 (86.6%)	4 (2.8%)
		1	15 (10.6%)	0 (0.0%)

The percentages in parenthesis refer to the total of 7462 students of the sample. Level of significance: *p<0.1; **p<0.05; ***p<0.01.

Table 14 - Occurrences of student entrepreneurs and supervisor entrepreneurs (strict definition) under the effects of moderators

			D_STUDENT_ENTREPRENEUR_1	
			0	1
D_SAME_GENDER=0	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	1634 (80.3%)	13(0.6%)
		1	386 (19.0%)	3 (0.1%)
D_SAME_GENDER=1	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	3993 (73.6%)	23 (0.4%)
		1	1395 (25.7%)	15 (0.3%)
SAME_SSD=0	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	2487 (80.9%)	14 (0.5%)
		1	567 (18.5%)	5 (0.2%)
SAME_SSD=1	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	3140 (71.5%)	22 (0.5%)
		1	1214 (27.7%)	13 (0.3%)
D_STATUS=0	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	658 (89.3%)	5 (0.7%)
		1	74 (10.0%)	0 (0.0%)
D_STATUS=1	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	4969 (73.9%)	31 (0.5%)
		1	1707 (25.4%)	18 (0.3%)
D_FULL=0	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	2818 (84.2%)	18 (0.5%)
		1	505 (15.1%)	4 (0.1%)
D_FULL=1	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	2809 (68.2%)	18 (0.4%)
		1	1276 (31.0%)	14 (0.3%)
D_WOMAN=0	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	4406 (75.0%)	30 (0.5%)
		1	1424 (24.2%)	15 (0.3%)
D_WOMAN=1	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	1221 (76.9%)	6 (0.4%)
		1	357 (22.5%)	3 (0.2%)
D_PRIOR_SHAREHOLDER=0	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	5522 (75.4%)	34 (0.5%)
		1	1748 (23.9%)	16 (0.2%)
D_PRIOR_SHAREHOLDER=1	D_SUPERVISOR_ENTREPRENEUR_BROAD	0	105 (73.9%)	2 (1.4%)
		1	33 (23.2%)	2 (1.4%)

The percentages in parenthesis refer to the total of 7462 students of the sample. Level of significance: *p<0.1; **p<0.05; ***p<0.01.

Table 15 - Occurrences of student entrepreneurs and supervisor entrepreneurs (broad definition) under the effects of moderators

	dx/dy			
D_SUPERVISOR_ENTREPRENEUR_STRICT	**0.009**	*		
	(0.005)			
D_SUPERVISOR_ENTREPRENEUR_BROAD			0.005	
			(0.003)	
D_SAME_GENDER	-0.010	**	-0.010	**
	(0.005)		(0.005)	
SAME_SSD	0.004	*	0.005	**
	(0.002)		(0.002)	
D_STATUS	-0.006		-0.006	
	(0.006)		(0.006)	
D_FULL	0.004		0.005	*
	(0.003)		(0.003)	
D_WOMAN	-0.011	**	-0.011	***
	(0.003)		(0.003)	
D_PRIOR_SHAREHOLDER	0.047	**	0.046	**
	(0.019)		(0.019)	
LN_DISTANCE_BIRTH	0.001	**	0.001	**
	(0.000)		(0.000)	
D_HIGH_INCOME	0.011	**	0.011	**
	(0.005)		(0.004)	
AGE_GRADUATION	0.001		0.001	
	(0.000)		(0.001)	

T=3year**.** N=7462. dy/dx is for discrete change of dummy variable from 0 to 1. Standard errors in parenthesis. Level of significance: *p<0.1; **p<0.05; ***p<0.01.

Table 16 - Marginal effects of explicative variables

	dx/dy			
D_SUPERVISOR_ENTREPRENEUR_STRICT	0.008 (0.006)			
D_SUPERVISOR_ENTREPRENEUR_BROAD			0.004 (0.004)	
D_SAME_GENDER	-0.018 (0.006)	***	-0.018 (0.006)	***
SAME_SSD	0.003 (0.003)		0.004 (0.003)	
D_STATUS	-0.004 (0.007)		-0.004 (0.007)	
D_FULL	0.006 (0.004)		0.006 (0.004)	*
D_WOMAN	-0.021 (0.004)	***	-0.021 (0.004)	***
D_PRIOR_SHAREHOLDER	0.064 (0.023)	***	0.064 (0.023)	***
LN_DISTANCE_BIRTH	0.002 (0.001)	***	0.002 (0.001)	***
D_HIGH_INCOME	0.021 (0.006)	***	0.021 (0.006)	***
AGE_GRADUATION	0.001 (0.001)		0.001 (0.001)	

T=5year. N=7462. dy/dx is for discrete change of dummy variable from 0 to 1. Standard errors in parenthesis. Level of significance: *p<0.1; **p<0.05; ***p<0.01.

Table 17 - Marginal effects of explicative variables

	dx/dy	
D_SUPERVISOR_ENTREPRENEUR_STRICT	0.005 (0.003)	
D_SUPERVISOR_ENTREPRENEUR_BROAD		0.004 (0.002)
D_SAME_GENDER	-0.004 (0.003)	-0.004 (0.003)
SAME_SSD	0.001 (0.003)	0.001 (0.001)
D_STATUS	-0.001 0.004)	-0.001 (0.004)
D_FULL	0.001 (0.001)	0.001 (0.001)
D_WOMAN	-0.001 (0.002)	-0.004 * (0.002)
D_PRIOR_SHAREHOLDER	0.015 (0.012)	0.014 (0.011)
LN_DISTANCE_BIRTH	0.000 (0.000)	0.000 (0.00)
D_HIGH_INCOME	0.007 * (0.004)	0.007 ** (0.004)
AGE_GRADUATION	0.000 (0.000)	0.000 (0.000)

T=1year. N=7462. dy/dx is for discrete change of dummy variable from 0 to 1. Standard errors in parenthesis. Level of significance: *p<0.1; **p<0.05; ***p<0.01.

Table 18 - Marginal effects of explicative variables

D_SUPERVISOR_ENTREPRENEUR_BROAD	0.103 (0.187)	0.251 (0.139) *	-0.245 (0.384)	-0.001 (0.156)	0.132 (0.088)	0.102 (0.083)
D_SUPERVISOR_ENTREPRENEUR_BROAD # D_SAME_GENDER	0 .015 (0 .206)					
D_SUPERVISOR_ENTREPRENEUR_BROAD # STESSO_SSD		-0.198 (0.168)				
D_SUPERVISOR_ENTREPRENEUR_BROAD # D_STATUS			0.376 (0.391)			
D_SUPERVISOR_ENTREPRENEUR_BROAD # D_FULL				0.161 (0.181)		
D_SUPERVISOR_ENTREPRENEUR_BROAD # D_WOMAN					-0.105 (0.224)	
D_SUPERVISOR_ENTREPRENEUR_BROAD # D_PRIOR_SHAREHOLDER						0.226 (0.348)
D_SAME_GENDER	-0.237 (0.207) **	-0.234 (0.105) **	-0.233 (0.105) **	-0.232 (0.107) **	-0.242 (0.106) **	-0.236 (0.105) **
SAME_SSD	0.150 (0 .077) *	0.205 (0.090) **	0.149 (0 .077) *	0.149 (0.077) *	0.149 (0 .077) *	0.150 (0 .077) *
D_STATUS	-0.140 (0.129)	-0.144 (0.130)	-0.175 (0.135)	-0.131 (0.129)	-0.140 (0.129)	-0.140 (0.129)
D_FULL	0 .142 (0 .081) *	0.143 (0.081) *	0 .139 (0 .081) *	0.105 (0.093)	0 .142 (0 .081) *	0 .144 (0 .081) *
D_WOMAN	-0.372 (0 .137) ***	-0.376 (0.130) ***	-0.375 (0 .129) ***	-0.372 (0.130) ***	-0.350 (0.137) **	-0.375 (0.129) ***
D_PRIOR_SHAREHOLDER	0.633 (0.161) ***	0.631 (0.161) ***	0.640 (0.160) ***	0.642 (0.161) ***	0.633 (0.161) ***	0.567 (0.197) ***
LN_DISTANCE_BIRTHPLACE	0 .031 (0 .014) **	0.031 (0.014) **	0.031 (0.014) **	0.032 (0.014) **	0.031 (0.014) **	0.031 (0.014) **
D_HIGH_INCOME	0.238 (0 .084) ***	0.237 (0.085) ***	0.240 (0.085) ***	0.236 (0.085) ***	0.237 (0.084) ***	0.237 (0.085) ***
AGE_GRADUATION	0.029 (0.017) *	0.028 (0.017)	0.029 (0.018)	0.029 (0.018)	0.030 (0.018) *	0.030 (0.018) *
_cons	-2.879 (0.482) ***	-2.886 (0 .478) ***	-2.842 (0.484) ***	-2.875 (0.483) ***	-2.890 (0.484) ***	-2.887 (0.482) ***
Log pseudolikelihood	-633.752	-633.084	-633.352	-633.374	-633.647	-633.547
Pseudo R^2	0.039	0.040	0.039	0.039	0.040	0.039

T=3 years, broad definition of supervisor entrepreneur N=7462. Standard errors in parenthesis. Level of significance: *p<0.1; **p<0.05; ***p<0.01.

Table 19 - Effects of moderating variables

D_SUPERVISOR_ENTREPRENEUR_STRICT	0.025 (0.255)	0.280 (0.152) *	0.114 (0.444)	0.027 (0.199)	0.153 (0.089) *	0.141 (0.085) *
D_SUPERVISOR_ENTREPRENEUR_STRICT # D_SAME_GENDER	0 .127 (0 .269)					
D_SUPERVISOR_ENTREPRENEUR_STRICT # STESSO_SSD		-0.196 (0.179)				
D_SUPERVISOR_ENTREPRENEUR_STRICT # D_STATUS			0.024 (0.451)			
D_SUPERVISOR_ENTREPRENEUR_STRICT # D_FULL				0.135 (0.218)		
D_SUPERVISOR_ENTREPRENEUR_STRICT # D_WOMAN					-0.127 (0.269)	
D_SUPERVISOR_ENTREPRENEUR_STRICT # D_PRIOR_SHAREHOLDER						0.090 (0.439)
D_SAME_GENDER	-0.289 (0.087) ***	-0.285 (0.086) ***	-0.285 (0.086) ***	-0.283 (0.087) ***	-0.289 (0.087) ***	-0.285 (0.086) ***
SAME_SSD	0.084 (0 .064)	0.111 (0.069)	0.083 (0 .064)	0.082 (0.064)	0.084 (0.064)	0.083 (0 .064)
D_STATUS	-0.084 (0.111)	-0.084 (0.111)	-0.085 (0.113)	-0.079 (0.111)	-0.084 (0.111)	-0.084 (0.111)
D_FULL	0 .109 (0 .069)	0.110 (0.069)	0 .109 (0 .069)	0.095 (0.073)	0 .109 (0 .069)	0 .109 (0 .069)
D_WOMAN	-0.478 (0 .112) ***	-0.490 (0.109) ***	-0.492 (0 .109) ***	-0.490 (0.109) ***	-0.478 (0.111) ***	-0.492 (0.110) ***
D_PRIOR_SHAREHOLDER	0.656 (0.145) ***	0.653 (0.146) ***	0.657 (0.147) ***	0.660 (0.145) ***	0.656 (0.145) ***	0.668 (0.155) ***
LN_DISTANCE_BIRTHPLACE	0 .025 (0 .012) **	0.026 (0.012) **	0.025 (0.012) **	0.026 (0.012) **	0.026 (0.012) **	0.026 (0.012) **
D_HIGH_INCOME	0.239 (0.073) ***	0.239 (0.073) ***	0.239 (0.073) ***	0.238 (0.073) ***	0.238 (0.073) ***	0.240 (0.073) ***
AGE_GRADUATION	0.005 (0.020)	0.005 (0.020)	0.005 (0.020)	0.005 (0.020)	0.005 (0.020)	0.005 (0.020)
_cons	-1.982 (0.541) ***	-2.004 (0.544) ***	-1.981 (0.542) ***	-1.990 (0.542) ***	-1.982 (0.541) ***	-1.980 (0.542) ***
Log pseudolikelihood	-913.022	-912.554	-913.143	-912.954	-913.022	-913.123
Pseudo R^2	0.035	0.035	0.035	0.035	0.035	0.035

T=5 years, strict definition of supervisor entrepreneur N=7462. Standard errors in parenthesis. Level of significance: *p<0.1; **p<0.05; ***p<0.01.

Table 20 - Effects of moderating variables

D_SUPERVISOR_ENTREPRENEUR_BROAD	0.057 (0.164)	0.244 (0.116) **	-0.437 (0.377)	-0.064 (0.137)	0.067 (0.077)	0.055 (0.072)
D_SUPERVISOR_ENTREPRENEUR_BROAD # D_SAME_GENDER	0 .007 (0 .181)					
D_SUPERVISOR_ENTREPRENEUR_BROAD # STESSO_SSD		-0.275 (0.143)				
D_SUPERVISOR_ENTREPRENEUR_BROAD # D_STATUS			0.519 (0.383)			
D_SUPERVISOR_ENTREPRENEUR_BROAD # D_FULL				0.177 (0.159)		
D_SUPERVISOR_ENTREPRENEUR_BROAD # D_WOMAN					-0.022 (0.196)	
D_SUPERVISOR_ENTREPRENEUR_BROAD # D_PRIOR_SHAREHOLDER						0.164 (0.322)
D_SAME_GENDER	-0.277 (0.088) ***	-0.276 (0.086) ***	-0.273 (0.086) ***	-0.273 (0.086) ***	-0.277 (0.087) ***	-0.276 (0.086) ***
SAME_SSD	0.089 (0.064)	0.158 (0.074) **	0.089 (0 .064)	0.088 (0.064)	0.089 (0.064)	0.090 (0.064)
D_STATUS	-0.083 (0.110)	-0.090 (0.111)	-0.123 (0.114)	-0.074 (0.110)	-0.083 (0.110)	-0.083 (0.111)
D_FULL	0.120 (0.068) *	0.123 (0.068) *	0 .116 (0 .069) *	0.082 (0.077)	0.120 (0 .068) *	0.121 (0 .068) *
D_WOMAN	-0.490 (0 .114) ***	-0.495 (0.109) ***	-0.492 (0 .110) ***	-0.488 (0.109) ***	-0.487 (0.117) ***	-0.492 (0.109) ***
D_PRIOR_SHAREHOLDER	0.651 (0.145) ***	0.648 (0.144) ***	0.659 (0.146) ***	0.659 (0.145) ***	0.651 (0.145) ***	0.607 (0.170) ***
LN_DISTANCE_BIRTHPLACE	0 .025 (0 .012) **	0.025 (0.012) **	0.025 (0.012) **	0.025 (0.012) **	0.025 (0.012) **	0.025 (0.012) **
D_HIGH_INCOME	0.238 (0.073) ***	0.237 (0.073) ***	0.240 (0.073) ***	0.236 (0.073) ***	0.238 (0.073) ***	0.238 (0.073) ***
AGE_GRADUATION	0.005 (0.020)	0.004 (0.020)	0.004 (0.020)	0.005 (0.020)	0.005 (0.020)	0.005 (0.020)
_cons	-1.985 (0.534) ***	-1.992 (0.527) ***	-1.943 (0.536) ***	-1.979 (0.535) ***	-1.986 (0.534) ***	-1.990 (0.535) ***
Log pseudolikelihood	-914.043	-912.256	-913.205	-913.430	-914.037	-913.912
Pseudo R^2	0.034	0.036	0.035	0.034	0.034	0.034

T=5 years, broad definition of supervisor entrepreneur N=7462. Standard errors in parenthesis. Level of significance: *p<0.1; **p<0.05; ***p<0.01.

Table 21 - Effects of moderating variables

D_SUPERVISOR_ENTREPRENEUR_STRICT	0.533 (0.281) *	0.268 (0.244)	0.228 (0.130) *	0.071 (0.197)	0.141 (0.142)	0.242 (0.130) *
D_SUPERVISOR_ENTREPRENEUR_STRICT # D_SAME_GENDER	-0.391 (0.311)					
D_SUPERVISOR_ENTREPRENEUR_STRICT # STESSO_SSD		-0.070 (0.282)				
D_SUPERVISOR_ENTREPRENEUR_STRICT # D_STATUS			-			
D_SUPERVISOR_ENTREPRENEUR_STRICT # D_FULL				0.137 (0.236)		
D_SUPERVISOR_ENTREPRENEUR_STRICT # D_WOMAN					0.391 (0.311)	
D_SUPERVISOR_ENTREPRENEUR_STRICT # D_PRIOR_SHAREHOLDER						-
D_SAME_GENDER	-0.181 (0.135)	-0.205 (0.132)	-0.205 (0.132)	-0.202 (0.132)	-0.182 (0.135)	-0.205 (0.133)
SAME_SSD	0.068 (0.104)	0.082 (0.113)	0.069 (0.104)	0.076 (0.103)	0.069 (0.104)	0.068 (0 .104)
D_STATUS	-0.034 (0.183)	-0.035 (0.183)	-0.054 (0.183)	-0.031 (0.181)	-0.034 (0.183)	-0.039 (0.183)
D_FULL	0.059 (0.106)	0.057 (0.106)	0.054 (0.107)	0.030 (0.124)	0.059 (0.106)	0.056 (0.107)
D_WOMAN	-0.321 (0 .165) *	-0.251 (0.150) *	-0.252 (0.150) *	-0.253 (0.153) *	-0.321 (0.164) *	-0.253 (0.151) *
D_PRIOR_SHAREHOLDER	0.508 (0.225) **	0.506 (0.226) **	0.516 (0.226) **	0.500 (0.221) **	0.501 (0.225) **	0.587 (0.230) **
LN_DISTANCE_BIRTHPLACE	0 .004 (0.019)	0.005 (0.019)	0.005 (0.019)	0.004 (0.019)	0.004 (0.019)	0.005 (0.019)
D_HIGH_INCOME	0.223 (0 .115) *	0.217 (0.116) *	0.218 (0.116) *	0.214 (0.116) *	0.223 (0.115) *	0.223 (0.115) *
AGE_GRADUATION	0.017 (0.022)	0.017 (0.022)	0.018 (0.022)	0.018 (0.022)	0.017 (0.022)	0.017 (0.022)
_cons	-2.855 (0.608) ***	-2.866 (0.612) ***	-2.845 (0.604) ***	-2.870 (0.599) ***	-2.855 (0.608) ***	-2.849 (0.608) ***
Log pseudolikelihood	-311.720	-312.703	-312.188	-312.547	-311.720	-311.693
Pseudo R^2	0.025	0.022	0.024	0.023	0.025	0.025

T=1 year, strict definition of supervisor entrepreneur N=7462. Standard errors in parenthesis. Level of significance: *p<0.1; **p<0.05; ***p<0.01.

Table 22 - Effects of moderating variables

D_SUPERVISOR_ENTREPRENEUR_BROAD	0.081 (0.240)	0.155 (0.190)	0.192 (0.110) *	0.071 (0.197)	0.168 (0.117)	0.145 (0.110)
D_SUPERVISOR_ENTREPRENEUR_BROAD # D_SAME_GENDER	0.109 (0 .268)					
D_SUPERVISOR_ENTREPRENEUR_BROAD # STESSO_SSD		0.017 (0.230)				
D_SUPERVISOR_ENTREPRENEUR_BROAD # D_STATUS			-			
D_SUPERVISOR_ENTREPRENEUR_BROAD # D_FULL				0.137 (0.236)		
D_SUPERVISOR_ENTREPRENEUR_BROAD # D_WOMAN					-0.004 (0.283)	
D_SUPERVISOR_ENTREPRENEUR_BROAD # D_PRIOR_SHAREHOLDER						0.376 (0.466)
D_SAME_GENDER	-0.219 (0.139)	-0.205 (0.131)	-0.200 (0.131)	-0.202 (0.132)	-0.205 (0.133)	-0.205 (0.131)
SAME_SSD	0.076 (0.102)	0.072 (0.120)	0.077 (0.103)	0.076 (0.103)	0.076 (0.102)	0.078 (0 .102)
D_STATUS	-0.039 (0.183)	-0.039 (0.183)	-0.102 (0.186)	-0.031 (0.181)	-0.040 (0.182)	-0.043 (0.182)
D_FULL	0.065 (0.105)	0.066 (0.106)	0.061 (0.107)	0.030 (0.124)	0.066 (0.107)	0.071 (0.105)
D_WOMAN	-0.236 (0 .150)	-0.257 (0.152)	-0.257 (0.152) *	-0.253 (0.153) *	-0.256 (0.165) *	-0.256 (0.151) *
D_PRIOR_SHAREHOLDER	0.490 (0.223) *	0.491 (0.223) **	0.495 (0.223) **	0.500 (0.221) **	0.491 (0.223) **	0.356 (0.297)
LN_DISTANCE_BIRTHPLACE	0.004 (0.019)	0.004 (0.019)	0.003 (0.019)	0.004 (0.019)	0.004 (0.019)	0.004 (0.019)
D_HIGH_INCOME	0.213 (0.116) *	0.215 (0.116) *	0.218 (0.116) *	0.214 (0.116) *	0.215 (0.115) *	0.213 (0.116) *
AGE_GRADUATION	0.018 (0.022)	0.017 (0.022)	0.017 (0.022)	0.018 (0.022)	0.018 (0.022)	0.018 (0.022)
_cons	-2.876 (0.597) ***	-2.870 (0.600) ***	-2.808 (0.601) ***	-2.870 (0.599) ***	-2.870 (0.599) ***	-2.885 (0.599) ***
Log pseudolikelihood	-312.625	-312.703	-311.855	-312.547	-312.705	-312.375
Pseudo R^2	0.023	0.022	0.022	0.023	0.022	0.023

T=1 year, broad definition of supervisor entrepreneur N=7462. Standard errors in parenthesis. Level of significance: *p<0.1; **p<0.05; ***p<0.01.

Table 23 - Effects of moderating variables

	dx/dy	
D_CONTACTS_ STRICT	**0 .007** (0 .003)	**
D_SAME_GENDER	-0.010 (0.005)	**
SAME_SSD	0 .005 (0 .002)	*
D_STATUS	-0.005 (0.006)	
D_FULL	0 .004 (0 .003)	
D_WOMAN	-0.010 (0.003)	***
D_PRIOR_SHAREHOLDER	**0.039** (0.017)	**
LN_DISTANCE_BIRTH	0.002 (0 .001)	***
D_HIGH_INCOME	**0 .015** (0 .005)	***
AGE_GRADUATION	0 .001 (0 .001)	**

T=3years. N=7462. dy/dx is for discrete change of dummy variable from 0 to 1. Standard errors in parenthesis. Level of significance: *p<0.1; **p<0.05; ***p<0.01.

Table 24 - Marginal effects of alternative explicative variable

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