POLITECNICO DI TORINO

Corso di Laurea Magistrale in Management Engineering

Tesi di Laurea Magistrale

Heterogeneity in teams:
an empirical study on early stage start-ups

Relatori:

Emilio Paolucci

Alessandra Colombelli

Daniele Battaglia

Candidata:

Livia Delledonne

Luglio 2019

"Curiosity is Insubordination

in its purest form"

SUMMARY

INTRODUCTION

The human mind needs to work with others, to foster the competences of each individual and nurture the amazement that everyone feels in front of new thoughts. Thoughts are formed through exchanges that take place in dialogue with others. They mature thanks to the possibility of widening one's point of view and therefore they allow one to seize opportunities by seeing in a different way what surrounds us. (Bion, "Attention and Interpretation", 1970)

Coherently with psychoanalysis theory from Bion, who underlines the role of interaction in finding new thoughts and new opportunities, an increasing number of studies looks at the teams in Top Management, instead of looking at the solo entrepreneur that was the myth in the Eighties. (Cooney, 2005, Mayer et al. 1989, Foo, 2011)

The factors determining the success of an entrepreneurial team have been analysed in many studies; particularly from literature it is known that having a diverse team affects the innovativeness of a company (Guo, Pang and Li, 2018), the financial performances (Cui, Zhang, Guo, Hu, Meng, 2018) and the corporate policies and risk (Bernile, Bhagwat, Yonker, 2018).

It has also been investigated which factors can determine the success or unsuccess of start-up entrepreneurs. (Davidsson and Honig, 2000)

This thesis work aims to fit into the context of the study of team heterogeneity, observing the 142 early stage start-ups teams participating in the course "The Start-up Lab".

The presence of the diverse factors that could influence the outcome of the start-ups on the market is investigated and it is questioned if there is a relation among those factors.

Successively, it is shown the relationship among the heterogeneity and the traits of the entire team as well as the traits of the leaders, the scientific factor that each start-up shows in the first stage, and the drop-out rate.

The following work is divided into four chapters.

The first one presents an overview of the previous literature regarding heterogeneity in teams and the hypothesis that this work is presenting.

In the second chapter, the sample from which the data for the analysis are taken is introduced and qualitatively described.

The third chapter discloses the variables used for this work, introducing not only the heterogeneity, but also the traits of the teams and the leader, the scientific approach of these start-ups and the drop-out variable.

The fourth and last one describes thoroughly the analyses done and the results we can observe from this work.

Coherently with what described in the literature, in some cases the heterogeneity factors impact the performance measures of the start-ups, in some other scenarios, there is no relationship between the kind of heterogeneity and the behaviour of the studied teams.

1.LITERATURE REVIEW

1.1 Team or solo entrepreneur

"*It Is Difficult To Clap With One Hand (gu zhang nan ming)*".

This old Chinese say is the introduction to the editorial "What is an entrepreneurial team?", written in 2005, which provides a thorough overview on how the enterprise formation in its first stage is deeply dependent from the team.

"*It is arguable that despite the romantic notion of the entrepreneur as a lone hero, the reality is that successful entrepreneurs either built teams about them or were part of a team throughout. For example, when one considers the success of Apple Computers, the name of Steven Jobs immediately springs to mind. However, while Jobs was the charismatic folk hero and visionary, it was Steve Wozniak who invented the first PC model and Mike Markkula who offered the business expertise and access to venture capital.*" (Cooney, T.M.2005)

This editorial identified three dimensions from the literature analysis on the topic: the idea, the team, and the implementation of the idea.

The focus on the team as the backbone of the enterprise leads to the question: "Is a solo entrepreneur the founder? Or is it a team?" To answer this, he identified as critical the instant in which the idea is born: before or after the composition of a team.

The literature regarding the numerosity of the entrepreneurial team is broad. Many studies are reporting how enterprises founded by teams perform better than the ones founded by solo entrepreneurs (Lechler, 2001, Cooper and Bruno 1977, Mayer et al. 1989) and other studies report this factor as a consolidated starting point (Foo, 2011).

If we look more in general to the founding team, we can define the numerosity as the first factor that can define and differentiate a team.

If this is equal to one, all the possible differences are automatically nullified. Ma Yun, Alibaba's founder, asserts that there is no perfect individual and only a perfect team. Nevertheless, the consideration of both solo entrepreneurs and teams remain fundamental to understand the dynamics of the group.

1.2 Heterogeneity in the teams

What else could define a group? The members themselves, their similarities and their differences, that can compose the winning team.

"*No man is an island, entire of itself; every man is a piece of the continent, a part of the main*;" John Donne

In this work, we are going to focus on the differences among the component of the team: the team diversity.

According to Nkomo and Cox (1996), for instance, diversity is "*a mixture of people with different group identities within the same social system*". Harrison and Sin (2005) goes more in deep, defining diversity in a social unit. "*The collective amount of differences among members within a social unit*".

The team diversity topic has been studied from many different perspectives during last twenty years, focusing on one or more factors of diversity among the components of the team and how these factors can influence the firms to which the team belongs.

Several studies regarding diverse characteristics among team members refer to Top Management Teams. They explore how their composition affects innovation (Bantel and Jackson, 1989), how it affects business model innovation (Guo, Pang and Li, 2018), how different aspects of diversity affect financial performances (Cui, Zhang, Guo, Hu, Meng, 2018) or the effect of board diversity on corporate policies and risk (Bernile, Bhagwat, Yonker, 2018). These studies are mainly spread due to the high economic interest in knowing the consequences of team heterogeneity on high-value companies.

An interesting work from Manconi, Rizzo ad Spalt (2017) addresses the impact the diversity has on investors, finding strong evidence they have downward-biased return expectations on firms with diverse teams. Analysing stocks in the Standard&Poor 1500 in each year, they studied the impact of top management team diversity on stock returns and showed that prominent stock market investors care about the heterogeneity factor in corporate leadership.

Others investigated the idea that "diverse teams produce better results" in the context of production teams (Hamilton, Nickerson and Owan, 2004) and presented as a result that heterogeneity in workers' abilities has a positive impact on productivity, due to mutual learning. On the other side, teams with a significant difference in age are less productive. This study provided a theoretical framework that allowed them to jointly analyse the impacts of both skills' diversity and demographic diversity on productivity as well as explain team member turnover in a production setting.

As said before, there are multiple definitions of diversity. In the same way, it can be clustered in various ways. Many previous analyses refer to demographic characteristics (easier to find out), while others define two or more categories of diversity. Harrison, Price and Bell (1998) distinguish among surface-level diversity, that includes biological characteristics that are typically reflected in physical features as sex, age and race, classically belonging to demographic characteristics, and deep-level diversity that includes differences among members' attitudes, beliefs and values and relation those with group cohesion and successively (Harrison, Price, Gavin, Florey, 2002) with group functioning. Each study anyway considers different factors to analyse diversity. Bernile, Baghwat and Yonke (2018), for example, created an index based on six dimensions, including demographic factors, that are age, gender, ethnicity, educational background, financial expertise, and breadth of board experience.

In recent years the interest in team composition is exponentially increased and the consequence is the spreading of available insights in the start-up sector and academic environment.

University spin-off topic has been thoroughly addressed by Clarysse, Moray (2002) that followed the progress of high-tech university spin-offs from the idea phase to the post-start-up phase, using as main data collection technique the observation of participants.

1.3 Heterogeneity in Start-up teams

Start-up sector, besides the novelty of diversity study, has a high uncertainty in itself, as underlined by Fairly, Miranda (2017), as more than 80% of startup will fail during their first seven years.

For this reason, it is most interesting to investigate if heterogeneity in founding teams of startups has a consequence on them.

Guo, Pang and Li, (2018) studied heterogeneity in the start-ups in China; Kaiser and Müller (2015) in Denmark and Davidsson, Honig (2003) studied the human capital of early-stage start-ups in Sweden.

Guo, Pang and Li (2018) put the focus on the Business Model Innovation and how this is affected by heterogeneity in the top management team in Chinese small and medium enterprises, publicly listed on the China Start-ups Stock Market.

The Business Model Innovation is defined as "*the shift in transaction content, transaction structure and governance between focal firms and stakeholders with the aim of creating and capturing value*". This process is relevant because both technological and market potentials are highly uncertain and in this scenario, the decisions of the top management team are most crucial.

In this work, it is expected that team diversity can influence the decision- making process of business model innovation and it can be related to the performance outcomes.

Team diversity is limited to background characteristics, such as functionality, age or tenure. The diversity is not here considered as a continuous variable but as a dummy variable, existent and relevant above a threshold.

In this work, it is empirically demonstrated that when Top Management Teams diversity is high, there is a positive relationship between novelty-centred business model innovation and team performance.

Kaiser and Müller (2015) focus on the importance of human capital for the success of young teams. They analyse how skills heterogeneity plays in team member's choice of fellow team members. Moreover, they monitor heterogeneity in teams regarding age, education and wages before the start-up both at the time of founding and in their development over time.

Considering the population of Danish start-ups established in 1998, they create a benchmark, as a random assembly of start-up teams among the individuals observed in their data and subsequently compare these random teams' characteristics with the ones of the real teams they are observing.

They find out that the degree of heterogeneity on the three selected characteristics is relevantly lower than the one of the benchmark, indicating that the members of the teams look for individuals that have similar characteristics.

Davidsson and Honig (2000) want to investigate the existence of any difference between the successful entrepreneurs and the ones who fail. They compare a sample of early-stage entrepreneurs and a group of non-entrepreneurs, both taken from the general population of Swedish adults.

In their work, they assert that entrepreneurs have a higher level of education. It may reflect the fact that people with a higher level of education discover more, or that they are more confident and consequently keener on exploiting their opportunities.

Analysing early-stage entrepreneurs for eighteen months, they have the opportunity of seeing the ones succeeding and the failing ones, avoiding the bias there is in many studies that focus only on the successful ones.

1.4 Winners and losers

It is at this point important to underline how the sample used is inclusive of cases of success and failure, it has not been in any way limited according to start-up potential.

Generally, most of the cases of unsuccess are challenging to track, as the effort those potential entrepreneurs made is not reflected in a product and consequently to their failure, their idea is forgotten.

Nassim Nicolas Taleb, in his book *The black swan*, points out how the history is written by winners, by success people, by entrepreneurs that due to manifold factors managed to emerge from the mass and be known, recognized, have an economic return, or even only exist as an enterprise, selling products or services, interacting with other subjects or realities. This concept has not been introduced by Taleb, but it is coherent with historians' point of view, that more and more are trying to rediscover the history seen by the losers' perspective.

The importance of also considering the failures is discussed in (Cope, Clave, Eccles, 2004), also recalling how venture failure is often viewed negatively (Cardon, McGrath, 1999). Davisson and Honig (2000) work, described above, includes all the failures and the abandoning at early stage.

1.5 The characteristics of the entrepreneurs

In literature, we can find studies regarding one unique diversity factor, like the work of Terjesen et al. (2009) that provides an overview of the gender diversity in corporate boards at micro, meso and macro levels. The effect that heterogeneity in gender has on corporate outcomes is studied from over 400 publications and it leads to a clear conclusion:

"*As well as governance outcomes, women directors contribute to important firm-level outcomes, as the play direct roles as leaders, mentors and network members as well as indirect roles as symbols of opportunities for other women and inspire them to achieve and stay with their firm."*

Many other studies defined heterogeneity from more than one point of view, including demographics factors and experiences of the members.

Bantel and Jackson (1989), in their study of top management in the banking sector in the USA, used a questionnaire to define five factors:

- the year of joining the bank;
- the age;
- the functional area of expertise;
- the educational level;
- the major field of studies and the higher studies achieved.

In their study, they paradoxically find both a positive effect on innovative and creative decision-making and higher turnover, that leads to difficulties in keeping the group together.

Ruef, Aldrich and Carter (2003) hypothesized five mechanisms for structuring the founding teams. Two of them are Homophily and Functionality. The first explains group composition in terms of similarities of members' characteristics, speculating over a high homogeneity in the teams. The second is in opposition, and it is based on the importance of diversity among members, especially in terms of achieved characteristics, such as leadership skills and task expertise.

In this thesis work, the heterogeneity of eleven factors has been studied. Those are pertaining to two main categories: demographic factors and experiences.

The factors are gender, age, region, work/study, field of competence, higher studies achieved, experience in start-up sector, working experience,

entrepreneurship experience, managerial experience and experience in business plans.

The first hypothesis is defined:

Hypothesis1a: Most of the teams of such early-stage start-ups are homogeneous on most of the factors.

Hypothesis1b: Most of the teams of such early-stage start-ups are heterogeneous on most of the factors.

1.6 The correlation of the factors

The correlation on the studied factors by Korunka et al. (2003) brought them to define three configurations of start-ups, which reveal a different pattern of personality characteristics.

In their study, based on a sample of 1169 nascent entrepreneurs and new business owners-managers in Austria, they group personality characteristics of the entrepreneurs into:

1. Nascent entrepreneurs against their will;
2. The "Would-Be" nascent entrepreneurs;
3. The networking Nascent Entrepreneurs with Risk Avoidance Pattern.

The same idea that some of the factors are dependent from the others and recurrent if they are all together it is proposed the second Hypothesis of this work, with the aim of investigating how the heterogeneity factors inside a team can be connected and if they could bring to two or more configurations, as in the Korunka et al. (2003) case.

Hypothesis 2: There is a correlation among the studied factors.

1.7 Traits of the team and the leaders

Regarding the traits that define a team, three of them are determinant for the decisions the enterprise is facing: the intuition, the analytic capacity and the confidence of the team.

Hodgkinson and Sadler-Smith (2018) define the intuition and the analytic capacity as two complementary mental processes used to take decisions.

The intuition is an unconscious process, an ability to understand or know something without needing to think about it or use reason to discover it. The analytic capacity is oppositely the capacity to use the data at disposal to deduct something.

Finally, the confidence in the team is a variable necessary at some level to survive the uncertainty of the entrepreneurial environment.

Hypothesis 3a: There is a correlation between the different kind of heterogeneity of the team and the traits of the team.

The literature affirms that in a team the personality of the leader and the way he pursues his goals influence the behaviour of the ones surrounding him. In a start-up the leader is the one pushing the other members of the team (Ensley, Hmieleski, 2015).

More in detail, it is described in literature which are the main psychological traits of a leader that influence how the business is done.

Kerr, Kerr and Xu (2017) provide an overview of the existing literature regarding the personal traits of the entrepreneurs.

As the most important traits that can be analysed looking for characteristics influencing the outcome of the firm, they suggest:

- The Big five (Openness to experience; Conscientiousness; Extraversion; Agreeableness; Neuroticism);
- Self- efficacy and innovativeness;

- Locus of control;
- Need for achievement;

Also, in a separate section, they approach risk attitudes.

Among these, some have been considered as particularly interesting for the purpose of this research.

Self-efficacy, defined as "*belief that he/she can perform tasks and fulfil roles, and is directly related to expectations, goals and motivation*" (Cassar and Friedman, 2009) has been proven to be related to innovativeness (Utsch and Rauch, 2000, Kickul and Gundry, 2002).

"*A person with an internal LOC conceptualizes that their own decisions control their lives, while those with an external LOC believe the true controlling factors are chance, fate, or environmental features that they cannot influence.*"

Different studies have proven that people believing in internal control are keener on engaging in entrepreneurial activities and that the entrepreneurs have higher control even before engaging in this kind of activities (Gartner,1985; Perry,1990 Levine and Rubenstein 2017).

Regarding risk propensity, Khilstromand and Laffont (1979) developed a very popular theory model which predicts that the most risk-averse people will become employees while those with low-risk aversion will become entrepreneurs.

Lazear (2005) used a large sample of over 5,000 graduates to measure risk tolerance as the variation of industry-level earnings among the first job selected and he found how it is positively correlated with the probability of later entering entrepreneurship. Also in Hall and Woodward (2010) it is affirmed that entrepreneurs must have a relatively high-risk tolerance.

Finally, self-regulation is the process through which the person control its own thoughts, emotions and behaviours, to adapt them to external expectations or goal reaching.

To summarize, the five considered factors regarding the leaders of the analysed teams are:

- Locus of control;
- Risktaker;
- Riskaverse;
- Self-efficacy;
- Self-regulation.

Knowing from the literature how those factors can influence a firm's outcome, we inquire if they are related to heterogeneity in teams.

H3b: There is a correlation between the different kind of heterogeneity of the team and the traits of the leader.

1.8 Heterogeneity and scientific approach and drop-outs

The scientific method has not classically been a tool for entrepreneurship. It is born far before, when in the 19th century the need to distinguish between science and non-science arose, maybe even before and it is the method used in science to approach highly uncertain problems. How do scientists set up their job?

They propose a theory, based on the observation of nature or some conjectures. They create some hypotheses regarding the main points of that theory, which they test to verify the truthfulness. Finally, they evaluate the results, with the help of a detailed journal of the activities done.

During last years, from the concept of lean manufacturing and considering the scientific method used by scientists, Eisenmann, Ries and Dillard (2013) proposed the lean start-up idea, in which the highly uncertain process of founding an enterprise is approached as a scientific experiment.

The four steps of the discovery are defined:

1. Formulating a theory over the entrepreneurial idea;
2. Defining falsifiable hypotheses covering all the main point of the theory;
3. Creating tests to evaluate the hypothesis;
4. Evaluating the results of the tests done, to decide to go on or pivot the idea.

This process must be applied several times to approach different aspects of the entrepreneurial idea.

Camuffo et al. (2017) empirically test the different performance effects of a scientific approach to the decision to launch a new business model or product idea compared with an approach based on heuristics and tries to explain this difference. It uses a randomized control trial (RCT) involving 116 Italian start-up founders. The entrepreneurs are randomly assigned to a treatment and a control group, they receive a four-month entrepreneurship training program, and the performance of the two groups are monitored over time.

The results of the study made by Camuffo et al. (2017) positively validate the scientific approach. They empirically prove an increase odd of drop-outs of the teams, due to the increased awareness of the profitability of the idea, and for the same reason, there is an increased number of pivots. Moreover, it results that the teams using the scientific method have higher revenues and that after pivoting the idea, they have higher odds of finding a profitable solution.

The fourth hypothesis of this work investigates the influence that heterogeneity in teams can have over the scientific approach.

Hypothesis 4: There is a correlation among the kind of heterogeneity and the scientific approach.

Finally, we saw how the scientific method can affect the dropping-out of the entrepreneurial teams, and we question if the heterogeneity in the team can influence drop-outs too.

Hypothesis 5: There is a different trend in dropouts according to the different kinds of heterogeneity.

2.SAMPLE DEFINITION AND DATA COLLECTION

The data used in the following analysis describe the participants of the program "The Start-up Lab". This is a course of 7 lessons for early-stage start-ups, organised by EIC (Entrepreneurship and Innovation Center at Turin Polytechnic) and ICRIOS (the Invernizzi Center for Research on Innovation, Organization, Strategy and entrepreneurship). It was held in Turin between October 2018 and January 2019.

The course had the aim of helping the startuppers identifying the idea, focusing on the target customer and developing a winning business model.

2.1 First phase: the marketing campaign

In order to find an adequate number of entrepreneurs fulfilling the requirements of the research, a marketing campaign has been organised, with a target of 130 start-ups. The strategy has been developed both online and offline. First, a dedicated web-page explaining the course structure and the dates of the course has been created; then the opportunity of participating for free has been advertised on social networks like LinkedIn and Facebook, besides with direct emails to accelerators, incubators and co-working throughout the Italian territory. Moreover, all the start-ups that subscribed for the Start-cup competition organised by I3P (the incubator of Turin Polytechnic) were contacted via email.

The contents for the page were created by the Research Assistants involved in the organisation and support of the course and spread over the personal profile of most of them, besides on the official page of EIC. This has been done both on LinkedIn and Facebook, the first being the professional social network par excellence, based and focused on relationships among people as they say in their motto "Relationships matter", the second because of the high level of participation of people and the chance of quickly detecting "want to be" startuppers groups. Instagram and Twitter have been avoided, the first because mostly used to personal

reasons instead of professional, the second because less centred on the community concept and not offering thematic groups easy to target.

The marketing campaign started on the 7th of August and lasted for two months.

The Facebook results have been extracted from the Insights overview, and they are discussed below.

10/09/2018 12:00	Le candidature per The Startup Lab continuano! Il programma gratuito			2.5K	169 62
28/08/2018 12:03	Le candidature per The Startup Lab continuano! Fino al 14 settembre c'è			7.6K	358 98
17/08/2018 14:12	Entrepreneurship and Innovation Center at Politecnico di Torino shared			84	5 6
16/08/2018 13:34	Hai un'idea? Vuoi che la tua idea diventi reale? Vuoi lanciare una start			13.7K	715 273
15/06/2017 10:16	EIC e Fondazione Agnelli http://www.lastampa.it/2017/06/15/cul			188	9 8

Figure2.1-1: Facebook reached people

The first post, with 13.7 thousand people reached, has been shared several times. It was used as an engagement post on the thematic groups contacted and as a presentation of the course on our private profiles. Nevertheless, the result of 715 clicks and 273 proper interactions was far beyond expected, and it was one of the main contributors to the boosting of the EIC Facebook page. The EIC page, before the beginning of our campaign, had 41 likes and the increase of those has been of 276% in the two months of the campaign.

Figure 2.1-2: Likes on EIC page

The reached people are 42% women and 58% men and most of the people are between 18 and 44 years old in both genders.

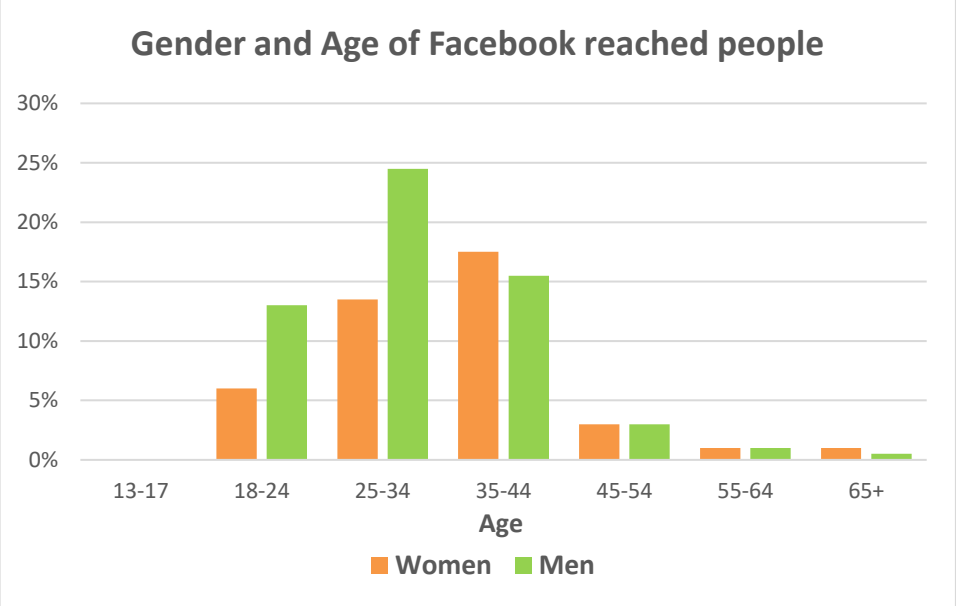


Figure 2.1-3: Gender and Age of FB

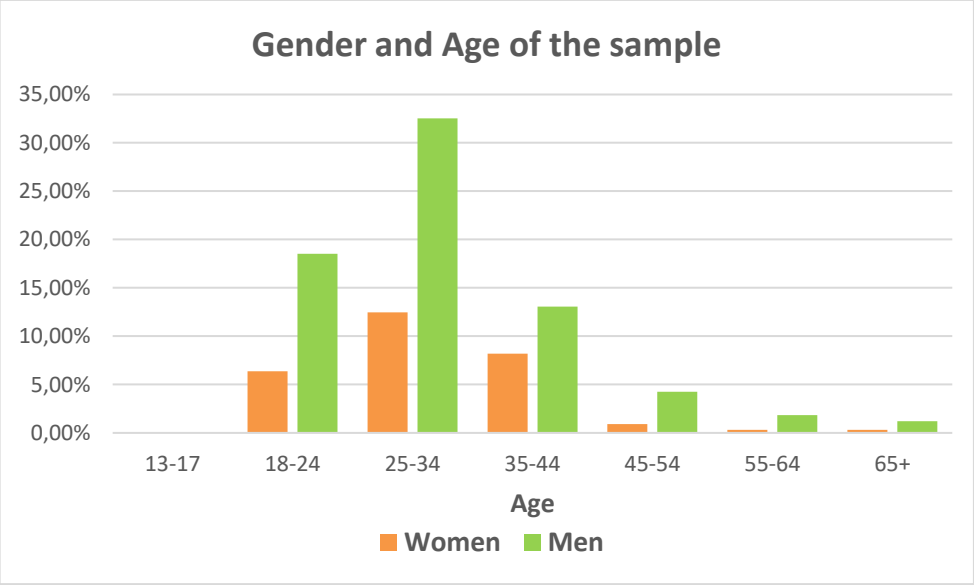


Figure 2.1-4:Gender and Age of the sample

In our sample, the distribution among men and women is unequal, as only 29% of participants are women, but the higher number of participants remain in the same age interval. This may show that the shared contents were more appealing for men

than for women or male entrepreneurs are more than female, coherently with what is described by Hoogendorn, Oosterbeck, van Praag (2013) when considering Danish environment.

Finally, Facebook gives an overview of the demographics of people reached by the posts.

Country	People reached	City	People reached
Italy	447	Turin	93
Spain	10	Milan	67
Germany	5	Rome	21
China	3	Oderzo	18
United Kingdom	3	Pordenone	12
Poland	3	Rivoli	10
Austria	2	Florence	9

Contemporary two rounds of emails were sent to most of the incubators and accelerators in Italy, with a meagre response rate (2,5%) and contacts with some online newspaper were successfully established (e.g."Millionaire").

This campaign ended with 328 contacts with start-ups established, all made through the web-site http://www.thestartuplab.polito.it/. Among those, 142 were effectively finalized and became participant of the Start-up Lab program officially.

2.2 Second phase: the subscription

2.2.1 The questionnaire

To complete the subscription the team leaders were asked to answer a questionnaire regarding qualitative questions about each element of the team and quantitative questions regarding both the behaviour of the leader of the start-up and the behaviour of the entire team.

The questions of the first part of the questionnaire are reported in the following table.

Nr.	Question	Variable	Notes
1	Name Start-up	Text	
2	Reference person	Text	
3	Telephone number of the reference person	Text	
4	Number of members	Number	
5	Name and Surname	Text	For each member of the start-ups
6	Gender	Binary	For each member of the start-ups
7	Age	Number	For each member of the start-ups
8	Are there books (start-up and business) that influenced you particularly?	Text	
9	Where do you live	Text	For each member of the start-ups
10	In average, how many hours do you dedicate to the start-up every week	Number	For each member of the start-ups
11	Do you have a Job external to start-up or do you study	Binary	For each member of the start-ups
12	Field of attended study	Text	For each member of the start-ups
13	Higher studied achieved	Text	For each member of the start-ups
14	Years of experience in start-up sector	Number	For each member of the start-ups
15	Years of working experience	Number	For each member of the start-ups
16	Years of entrepreneurship experience	Number	For each member of the start-ups
17	Years of managerial experience	Number	For each member of the start-ups
18	Precedent experience in writing business plans	Binary	For each member of the start-ups

Some of the questions required a multiple-choice answer, some others a written response and some a numerical answer.

After this, the quantitative questions regarding the behaviour of the leader of the start-up and the response of the entire team were asked. Those questions were structured with multiple-choice answers and allowed to create an identikit of the participants not only regarding their background and experiences, but also according to their psychological characteristics and attitude of the team.

2.2.2 The template

The other tool chosen to know the start-ups was a template sent to have a structured presentation of the idea and of the state of advancement.

The template was used to present:

- Name of the start-up;
- Team composition and their role in the start-up;
- Idea;
- Problem and solution;
- Target customers;
- State of advancement;
- Contacts;
- Competitors;
- Revenue model.

Most of the entrepreneurs chose to stick to the template and not change it with a personal one, so the comparison among teams was straightforward.

The presentations, together with the following phone interviews, were particularly useful to exclude from the course start-ups too advanced for the program, that couldn't have been compared to the others in the future and that couldn't take full advantage of the contents of the course.

Moreover, it was used as a base for the Research Assistant that contacted the entrepreneurs, as described below, to have the first general information about the idea and the team.

2.3 Third phase: phone interviews

The third phase has been based on phone interviews that had the intent of evaluating the scientific approach of each team.

Ten Research Assistants were taught how to interview the entrepreneurs in order to understand which their idea was and if their methods were scientific, according to Camuffo et al. (2017). The scientific method is based on the concept that entrepreneurs may use a very similar approach to the one used by scientists during their experiments, formulating theories, schematized into hypothesis, validated through tests and finally evaluated.

To evaluate the scientific approach, the four factors had to be verified. The interview was structured to give "yes or no" answer to the presence of each of the four elements thanks to the main questions and then, in case of an affirmative answer, to give a vote from 1 to 5 to each sub-question, where one means very low scientific method and five really high. In case of a negative answer to the main question, the assigned points to the sub-questions and the successive ones are 0.

1. Theory	How long have you been working at this idea and how did you decide to develop this entrepreneurial idea? Tell me about your potential clients- Do you have evidence of their problems? Why do you think your solution will be successful?
1.1 Clear_theory	Score to give based on clarity of explanation
1.2 Elaborate_theory	Why does that problem exist? Why your solution should be successful?
1.3 Alternative_theories	Does your client have other issues that are worthy addressing?
1.4 Evidence_theory	Which evidence of the problem do you have?
2. Hypothesis	Did you speak with any potential customer to better understand their problems before developing your solution? What did you want to understand, what did you discover? Which questions did you ask?
2.1 Explicit_hypthesis	Which were the three main things you wanted to understand?
2.2 Coherent_hypothesis	Without a well defined theory the score is automatically low, try to understand if their intent is aligned with their business idea.
2.3 Accurate_hypothesis	Can he/she say what he/she wants to learn in short, concise sentences?

2.4 Falsifiable_hypothesis	How did you understand if your initial ideas were confirmed or not?
3. Test	Have you done any market research to investigate the problem of your potential customers?
3.1 Coherent_test	Which were the three key questions you asked? Could you please tell me specifically?
3.2 Valid_test	In which context did you do the interview/questionnaire (hour, day, place, what people were doing)
3.3 Representative_test	Who did you interview exactly?
3.4 Strict_test	He/she used the right test and right procedures
4. Evaluation	What does it come out from the collected data? Where did you save the data? How did you analyse them?
4.1 Data_evaluation	Which were the main collected data?
4.2 Measure_evaluation	They measure what the entrepreneur wants to measure, and they are trustworthy
4.3 Systematic_evaluation	How did you collect the data? How did you analyse them?
4.4 Explicative_evaluation	Which conclusion do you take?

After the analysis of the interviews the final sample was determined, restricting the participants from 158 who successfully completed the subscription to 142, as 16 of them were considered to be too advanced for the project, because of the presence of a product or a service already well structured (e.g. a working prototype) or the knowledge of the target client already validated through market researches and analysis.

2.4 The data

The database used for the analysis needed in this work has been constructed using the material collected in the previous steps.

It is composed of the answers to the initial questionnaire, added to some information taken from the template, as the number of members and the participation or not to the start-cup.

Of particular interest for this work are twelve of these variables.

2.4.1 The numerosity of teams

First of all, it is relevant to have an overview over the number of members of any team, that varies between 1 and 8. The majority are one-person or two-person teams.

Number of components per team	Number of teams	Percentage
1	55	38,73%
2	37	26,06%
3	18	12,68%
4	20	14,08%
5	7	4,93%
6	3	2,11%
7-8	2	1,41%

2.4.2 The gender of participants

As we saw, only 29% of all the participants on average are women, but there is a high difference among teams of different size. The higher percentage of women are in three people teams, while the lower corresponds to the seven-people team, that doesn't include any woman. The small number of women in teams could lead to lower performance of teams, compared to mixed-gender ones, as stated by an extensive literature about the gender in teams. For example, Hoogendorn, Oosterbeck, van Praag (2013) present an experiment about students randomly assigned to entrepreneurial teams and they show how mixed gender teams perform better than teams composed by members of the same gender.

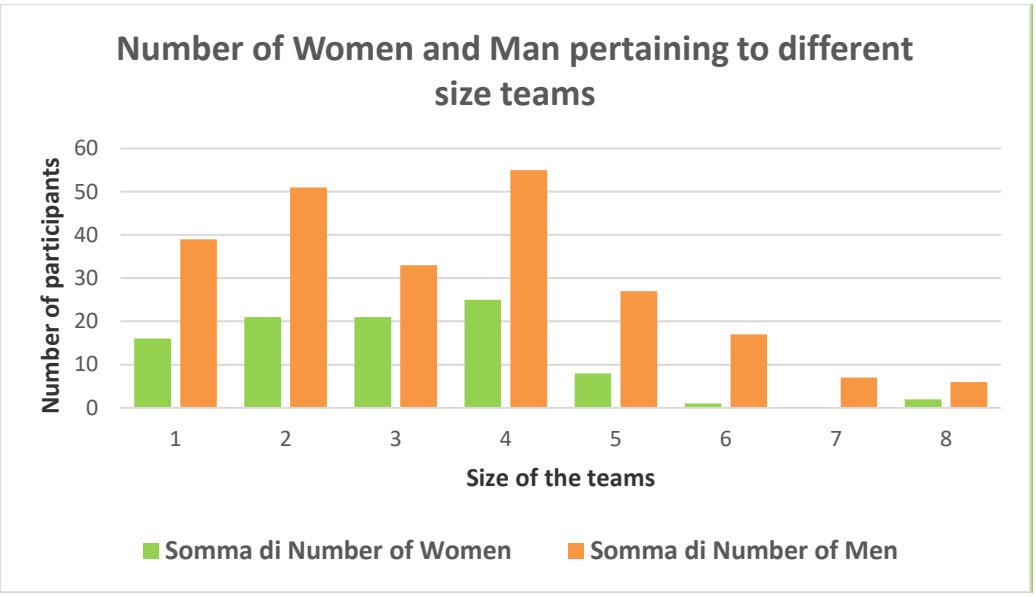


Figure 2.4.2-1:number of Women and Men in different size team

2.4.3 The place where the participants live

One of the questions of the questionnaire was regarding the site where the participants live. The involved regions in Italy are 18 over 20, and some of the participants come from abroad. Although the distribution doesn't reflect the entrepreneurial scenario in Italy, it has similarities with the reached people of our marketing campaign. Moreover, having the course mandatory participation in person and taking place a Saturday every two weeks, some of the interested start-up coming from further away had to renounce for time and cost reasons.

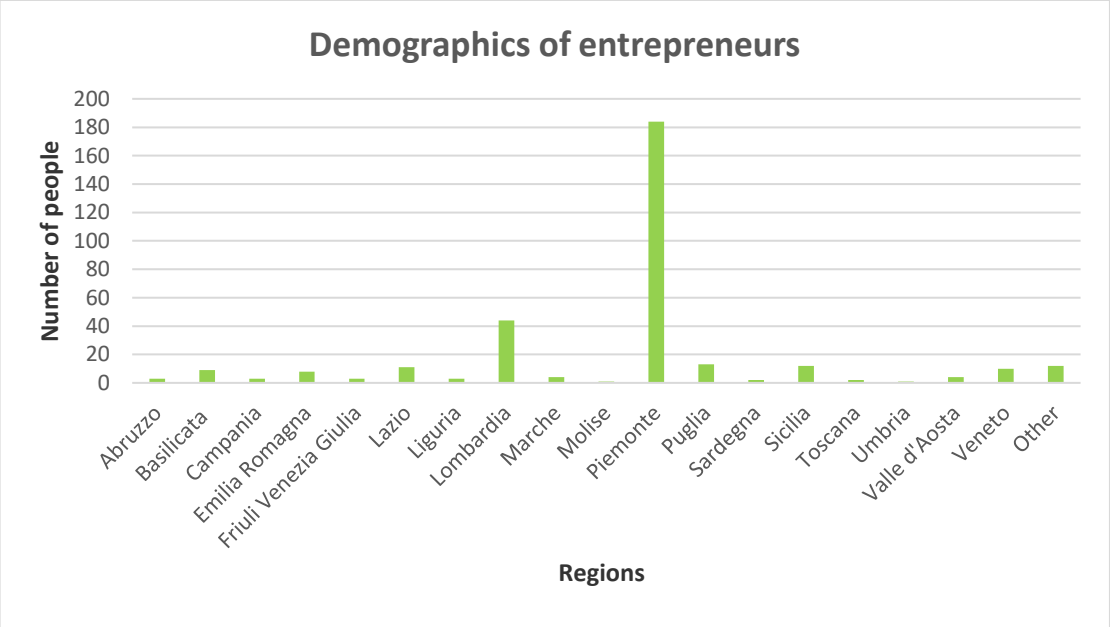


Figure 2.4.3-1: Regions where people live

2.4.4 The age of participants

It appears that the myth of the young successful entrepreneur, with the best idea in his 20, is mainly related to some particularly famous, though isolated, cases, like Bill Gates, Steve Jobs and Mark Zuckerberg. Some recent studies presented on Harvard Business Review seems to indicate a different trend when considering the majority of cases.

"Among the top 0.1% of start-ups based on growth in their first five years, we find that the founders started their companies, on average, when they were 45 years old. These highest-performing firms were identified based on employment growth. The age finding is similar using firms with the fastest sales growth instead, and founder age is similarly high for those start-ups that successfully exit through an IPO or acquisition. In other words, when you look at most successful firms, the average founder age goes up, not down. Overall, the empirical evidence shows that successful entrepreneurs tend to be middle-aged, not young."

The same result is presented in the EU start-up monitor report of 2018, made by Teigertahl, Mauer, Say.

"*When scrutinizing the European founders, a common profile emerges (see figure two): The average founder is male (82.8%), holds a university degree (84.8%) and is currently 38 years old, was 35 years old when founding the business (see annex one and annex two). This goes against the stereotype of a youngster in a garage and rather emphasizes how well equipped most founders actually are, with competencies acquired through a university education, practical knowledge, and experience. It further illustrates that the start-up environment is increasingly sophisticated*."

Regarding then the age of different team members, Harrison et al. (2002) explain how a high difference in age has a negative effect to the work of a team, as in the team's dynamics it brings to social isolation, reduced cohesion and lowered communication.

The age of all the participant to our course is in average 30,71, with the oldest with 72 years old and the youngest 19.

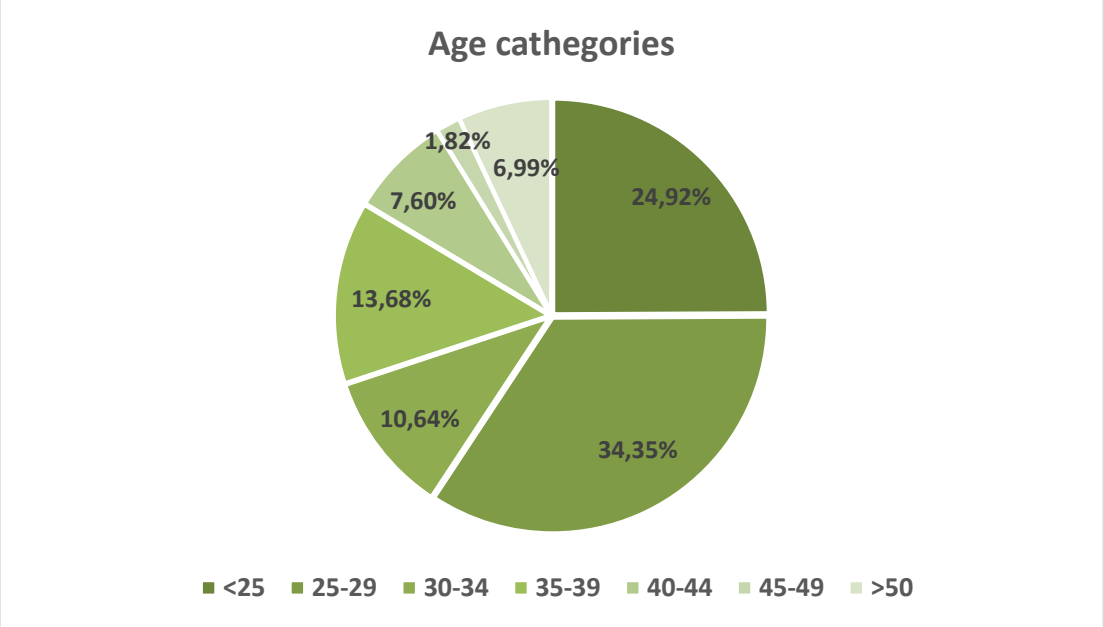


Figure 2.4.4-1:Age of participants

Most of the participants is between 19 and 29 years old (59,27%).

2.4.5 Workers or Students and field of studies

Politecnico di Torino and Università Bocconi held the course, and the percentage of entrepreneurs still involved in their studies is high (34%). This is coherent with the pie chart above, describing the age of participants (60% younger than 30 years).

In Hasegawa, Sugawara (2017) is present how students start-ups influence the economy of Japan, thanks to the monitoring of the projects developed inside different Universities in the country.

The participants provided in the questionnaire information regarding their field of competence, and it is interesting how the one of the students is similar with the field of competence of the entire sample, but it presents a, observable lower value regarding the STEM category and a higher one in the other fields.

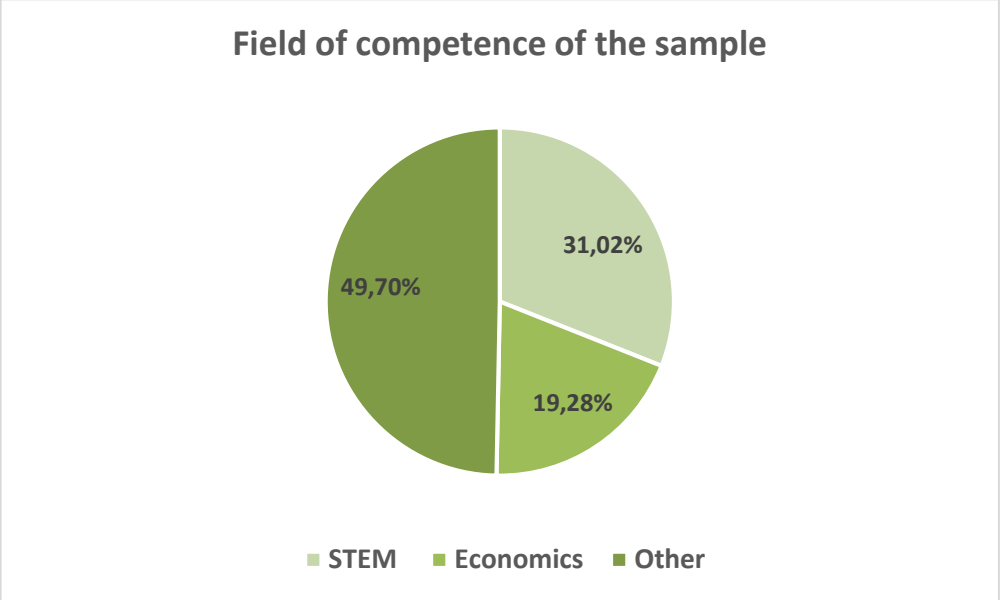


Figure 2.4.5-1: Field of confidence of participants

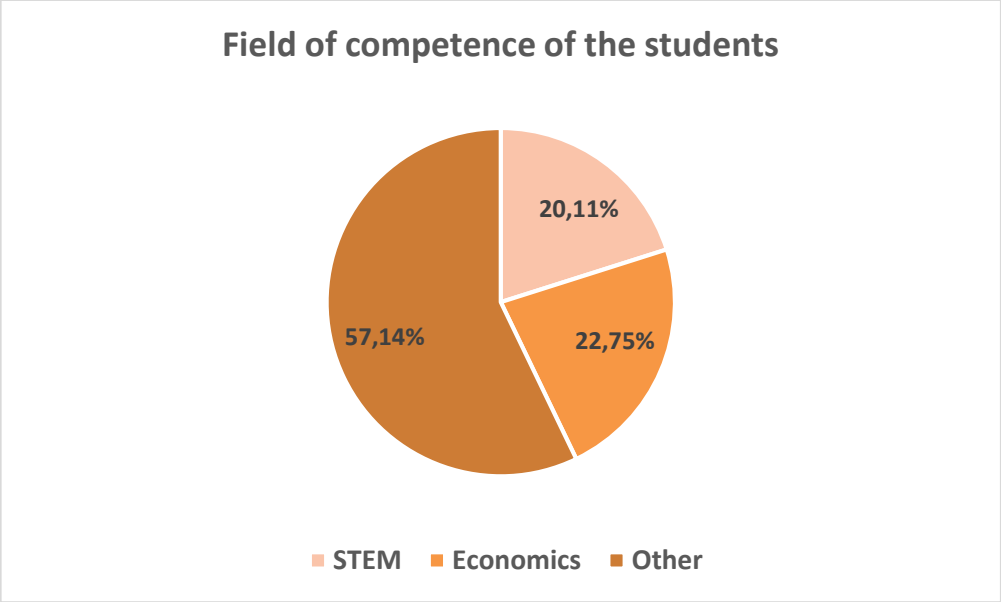


Figure 2.4.5-2: Field of competence of students

2.4.6 Higher studied achieved

Another factor included in the database is the higher level of instruction reached. Regarding the founders this factor has been studied by the EU Start-up Monitor 2018, as it is shown below.

COUNTRY	PERCENTAGE VALUES					
	Less than high school degree	High school degree or equivalent	Some university / college but no degree	Bachelor's or equivalent	Master's or equivalent	Doctorial or equivalent
Austria*	-	16.70%	5.90%	15.50%	48.90%	9.90%
Belgium	1.23%	3.70%	9.88%	11.11%	62.96%	9.88%
Czech Republic	1.85%	14.81%	5.56%	12.96%	57.41%	7.41%
Denmark	2.13%	2.13%	4.26%	21.28%	63.83%	6.38%
France	1.43%	1.43%	1.43%	1.43%	78.57%	14.29%
Germany	0.00%	1.95%	8.29%	20.98%	49.76%	18.05%
Greece	0.00%	2.44%	2.44%	26.83%	53.66%	14.63%
Hungary	5.26%	7.89%	13.16%	23.68%	44.74%	5.26%
Ireland	0.00%	3.23%	7.26%	28.23%	45.97%	14.52%
Italy	0.00%	13.94%	7.88%	17.58%	37.58%	21.21%
Netherlands	1.39%	0.00%	8.33%	19.44%	62.50%	5.56%
Poland	0.00%	8.45%	7.04%	16.90%	60.56%	4.23%
Portugal	1.28%	1.28%	2.56%	20.51%	56.41%	14.10%
Slovakia	2.94%	2.94%	8.82%	2.94%	58.82%	23.53%
Slovenia	0.00%	13.89%	13.89%	38.89%	25.00%	5.56%
Spain	1.04%	3.13%	9.38%	14.58%	57.29%	11.46%
Sweden	0.00%	3.92%	19.61%	11.76%	58.82%	3.92%
United Kingdom	0.00%	1.45%	10.14%	26.81%	51.45%	10.14%
EU average	**0.67%**	**4.95%**	**7.89%**	**19.25%**	**53.01%**	**12.57%**
Israel	1.79%	3.57%	5.36%	41.07%	33.93%	12.50%
Switzerland	0.68%	2.70%	4.73%	18.92%	47.30%	24.32%
Turkey	0.00%	2.38%	7.14%	35.71%	35.71%	19.05%

Figure 2.4.6-1: studies achieved in EU Start-up monitor

In our sample the multiple choice was among:

- High school degree;
- Bachelor's degree;
- Master's degree;
- Master in Business Administration;
- PhD;
- Professional qualification;
- None of the above.

The leader's answers are reported below, to be comparable with the EU results.

	None	Professional qualification	High school degree	Bachelor's degree	Master's degree	MBA	PhD
Sample	0,00%	2,82%	39,44%	21,13%	28,17%	6,34%	2,11%

The percentage of founders with less than high school degree in the EU is 0,67%, in Italy, it is 0% and in our sample is 2,82%.

The percentage of high school degree is in the sample almost 40%, while in Italy it is around 20% and in the EU around 13%.

Finally, the percentage of Master's degree in Europe reach 53%, while in Italy it's 37% and in our sample, it's 28%.

The lower level of academic qualifications obtained in our sample, compared with the national and international scenario, can be partially explained by the age of entrepreneurs, that are averagely younger in this research sample compared to the sample of the study of the EU start-up monitor.

2.4.7 Previous work experiences

In the EU start-up monitor 2018 it is reported that most of the founders create their own company when they already have some working experience. The same observation is verifiable in Zheng (2010), where it is discussed how founders of start-ups often have common working experiences.

In our database the variables related to working experience are four:

1. Experience in start-up sector;
2. Working experience;
3. Entrepreneurship experience;
4. Managerial experience.

Experience	Experience in start-up sector	Working experience	Entrepreneurship experience	Managerial experience
Average number of years	3,37	7,44	2,12	1,92

As expectable the working experience is in average higher than the experience in the sector of the start-up or the experiences as entrepreneurs or at managerial level.

2.4.8 Experience in Business Plans

The difficulty of redacting a business plan and the precision required to do it could be associated with the approach the members of our entrepreneurial teams have regarding their start-up.

In our sample, only 114 participants over 329 report an experience in redacting Business Plans. This could be related with the target of the marketing campaign described above.

3 THE VARIABLES

The eleven factors used to create the database for the analysis are described in the previous chapter, and they delineate the demographics, the studies of the participants and the experiences of the members of the teams regarding the amount of worked years, the time dedicated to the entrepreneurial activity or the start-up sector.

The values regarding each of the factor have been considered at a team level, instead of the personal level used until now to describe them. In this way, it has been observed the heterogeneity of each of the teams, thanks to the calculation of the Blau's index.

These new variables have been used together with scientific variable, team variables and drop-out factor to inquiry the heterogeneity in the teams and its effect.

3.1 The Blau's Index

The Blau's index is a diversity index that measures the probability that two entities taken at random from the dataset of interest (with replacement) represent a different type.

It has been used to measure heterogeneity following Ensley, Hmieleski (2007). In their analysis Ensley and Hmieleski examined the relationship among leadership behaviour, top management team heterogeneity and industry environmental dynamism on new venture performance, comparing the Inc. 500 list of America's fastest growing start-ups and a random sample of USA new ventures. To measure four dimensions of heterogeneity they calculated Blau's (1977) categorical index for each factor (education level, specialization and function) with the following formula:

$$Blau's\ Categorical\ Index = 1 - \sum pi^2$$

Where pi is the population percentage with a specific characteristic. The index is always a number between 0 and 1, where 0 corresponds to complete homogeneity and 1 to complete heterogeneity.

The same index has been broadly used in literature (Kaiser and Mueller, 2015, Foo 2011, Amason et al. 2006) and in the work of Bantel and Jackson (2019), where they studied how different heterogeneity factors affect innovation in Top Management Teams.

With the same approach, the Blau's index have been calculated in each team for the eleven factors considered.

3.1.1 Heterogeneity in gender

The Blau's index values for gender are [0, ½], due to the binary nature of the variable the index cannot overcome ½ and 97 teams are homogeneous on this variable.

The distribution of the Blau's index for each factor has been plotted, to have an overview of the situation. Then, due to the high number of homogeneous ones, it has also been plotted excluding the one-person teams and then all the homogeneous team. In this way, it is possible to observe how the number of homogeneous teams overcomes all the others, followed by the teams with Blau's index value of 0,5.

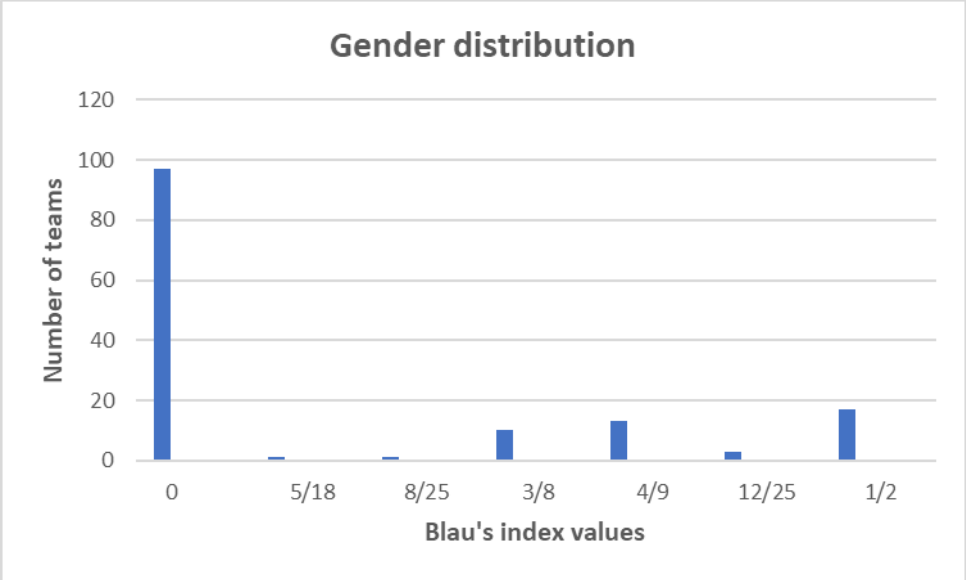


Figure 3.1.1-1: Blau's index gender distribution

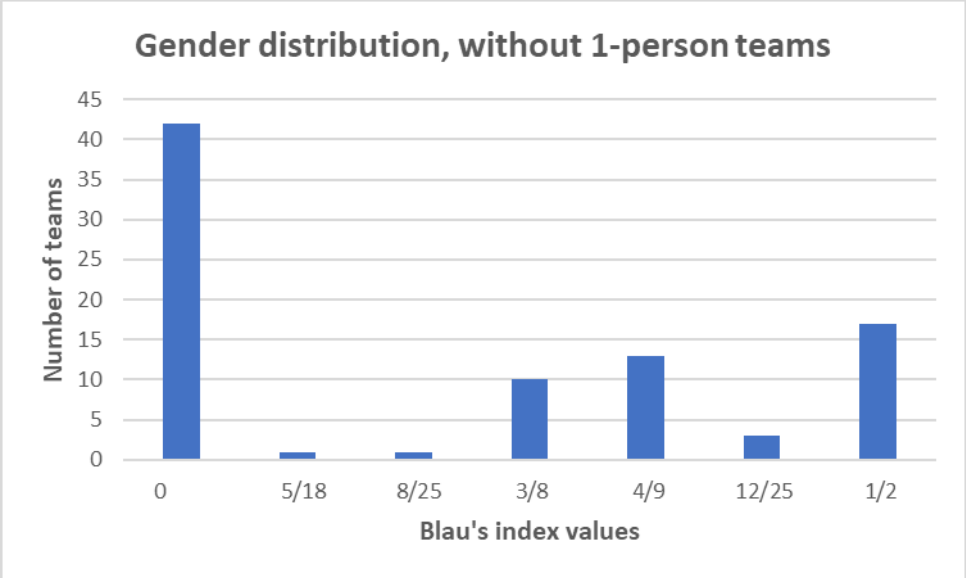


Figure 3.1.1-2: Blau's index gender distribution without one-person teams

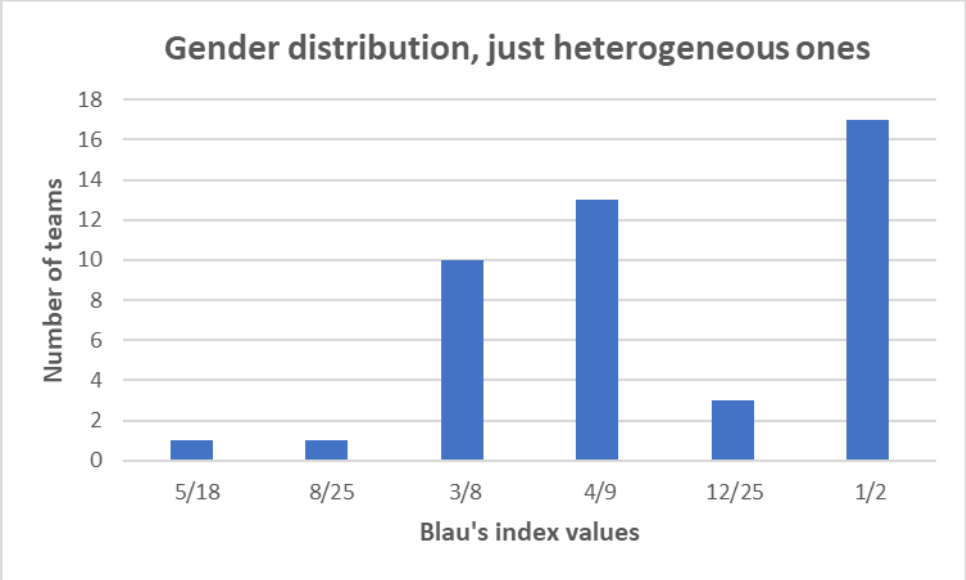


Figure 3.1.1-3: Blau's index gender distribution only heterogeneous

3.1.2 Heterogeneity in the regions where the participants live

The distribution of the areas of participants reaches a higher Blau's index value than the gender's one since there are more than 20 places indicated by the participants. Nevertheless, the number of homogeneous teams over this variable is even higher (113 over 142), with 67 teams coming from the Piemonte region.

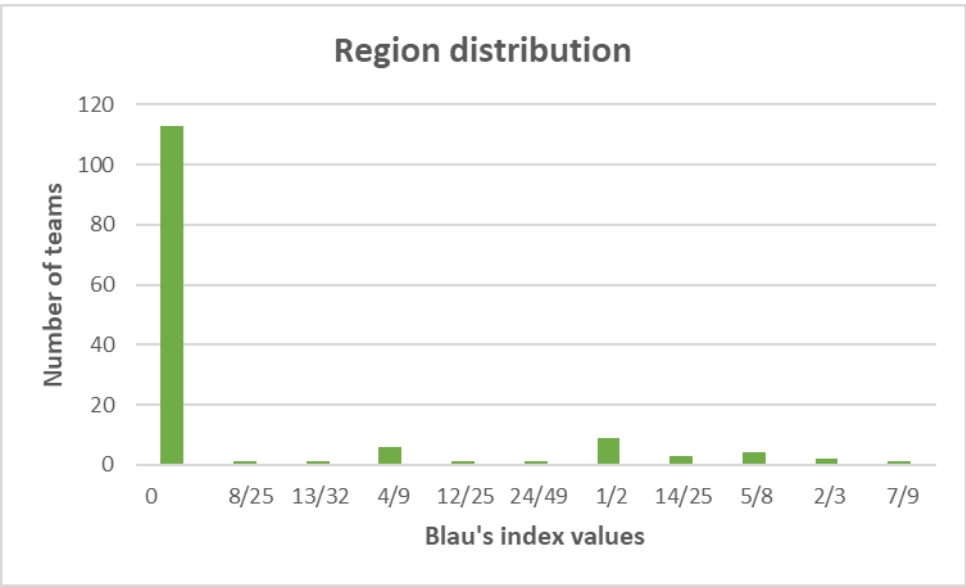


Figure 3.1.2 -1:Blau's index region distribution

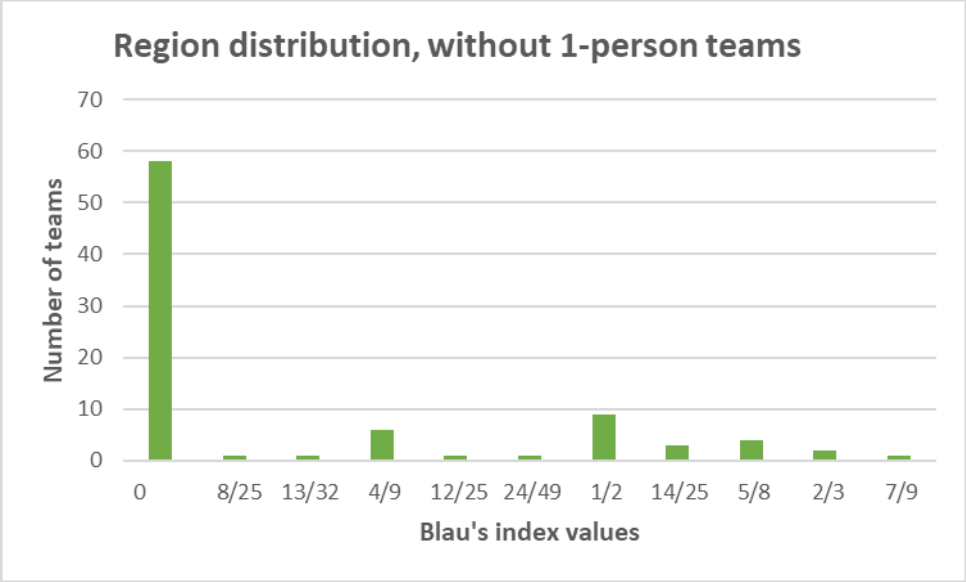


Figure 3.1.2 -2:Blau's index region distribution without one-person teams

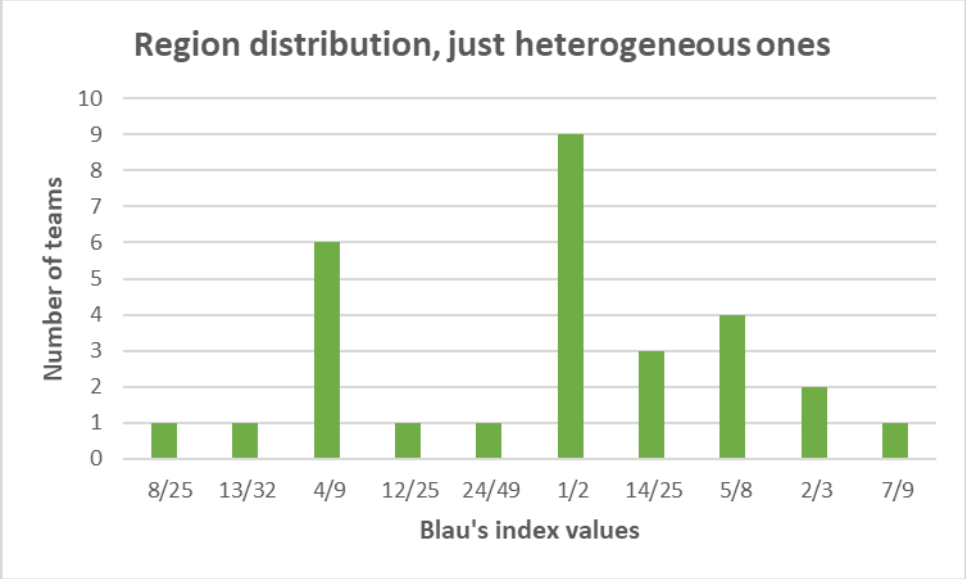


Figure 3.1.2-3: Blau's index region distribution only heterogeneous

3.1.3 Heterogeneity in age

The age of participants presents a high number of different values. This factor has been categorized into seven homogeneous classes:

Age	Class
<24	1
25-29	2
30-34	3
35-39	4
40-44	5
45-49	6
>50	7

The Blau's index has then been calculated considering these seven categories.

The number of homogeneous teams in this factor is 85, and the values of Blau's index go from 0 to ¾.

The most significant of the distribution graphs is the one representing the distribution of the 87 teams composed by at least two members, as the one representing the entire sample has a bias in the elevated number of 0, due to the fact that a numerosity equal to 1 doesn't allow any heterogeneity and the one excluding all the homogeneous ones doesn't provide a comparable view over the different factors.

For this reason, the distribution without one-person teams will be presented; the other graphs may be found in the appendix.

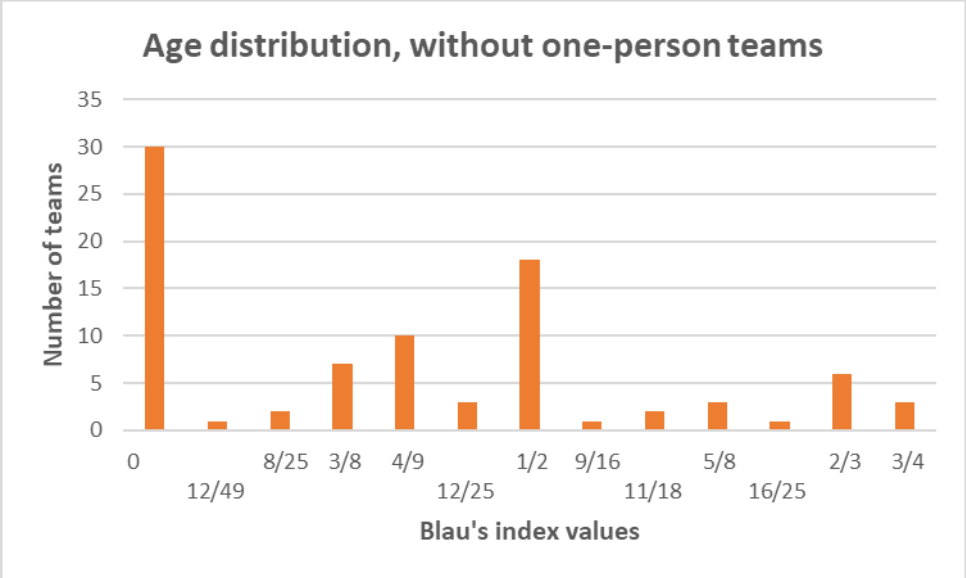


Figure 3.1.3-1: Blau's index age distribution

3.1.4 Heterogeneity in working or studying

This case is again a binary variable and the Blau's index values go from 0 to ½. There are 81 teams homogeneous on this factor; it is the lowest number among the eleven considered characteristics. Moreover, we can notice it has a high number of teams where 50% of the entrepreneurs is a student, and the other 50% is a worker.

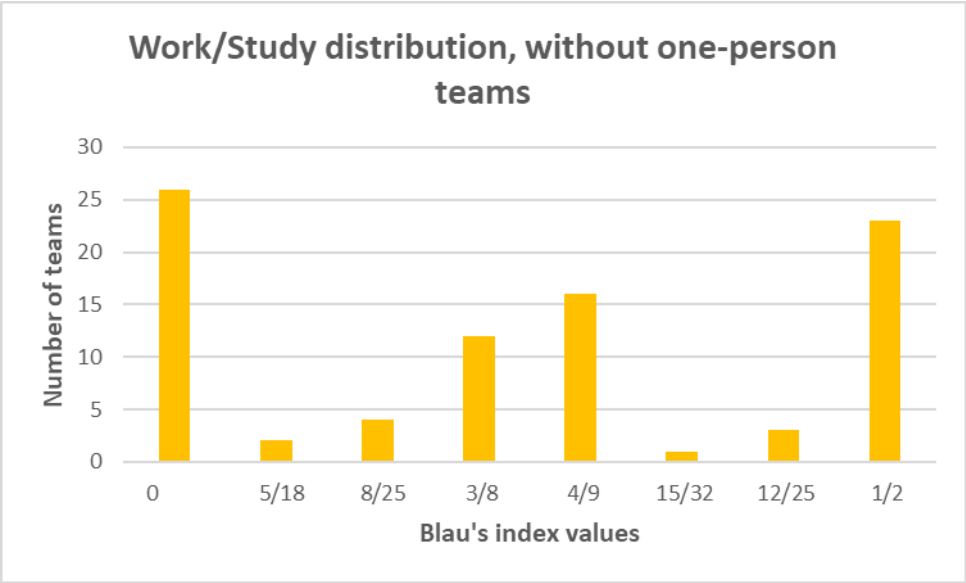


Figure 3.1.4-1: Blau's index work/study distribution

3.1.5 Heterogeneity in field of competence

Independently of being students or workers, the entrepreneurs answered a question regarding their sphere of expertise.

Inside each team, the heterogeneity is calculated considering as fields of competence STEM, Economics or other.

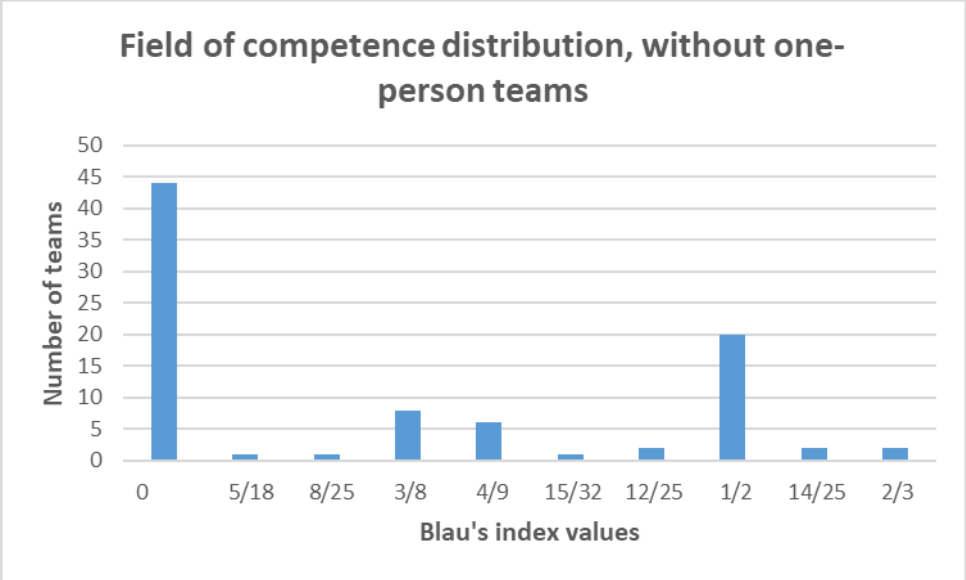
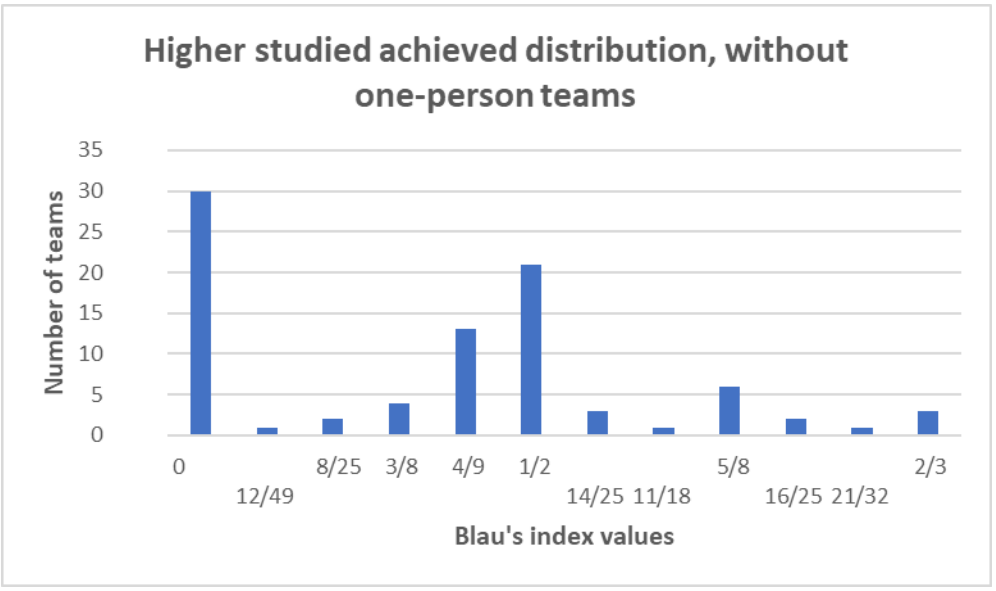


Figure 3.1.5-1: Blau's index field of confidence distribution

3.1.6 Heterogeneity in higher studies achieved.

It has been seen how the level of studied achieved is lower the Italian or European average.

Compared to other variables in this case the number of homogeneous is not so high, it's 85 teams over 142. The possible variables were the ones from the questionnaire and the maximum heterogeneity value reached is $\frac{2}{3}$.



.

Figure 3.1.6-1: Blau's index higher studied achieved distribution

3.1.7 Heterogeneity in experiences

For the different kind of experiences measured it has been necessary to create classes to categorize all the possible values. In this case, differently from the approach followed for the age of participants, ranges have been set not homogeneously, but considering the learning factor.

Starting from the German Psychologist Hermann Ebbinghaus, many studied how the capacity of learning has a non-linear shape and mainly it can be exponential or s-shaped. According to Wright, that studied the learning curve of workers in aviation in 1936: *"As repetitions take place workers tend to demand less time to perform tasks due to familiarity with the operation and tools, and because shortcuts to task execution are found."*

This model has been studied and generalized to the monitoring of the performance of workers exposed to a new task, regardless of the field (Michel Jose Anzanello, Flavio Sanson Fogliatto, 2011).

Due to this concept the class division has been the following:

Years of work	Class
0	0
1-3	1
4-6	2
7-9	3
10-14	4
15-20	5
>20	6

And the seven values have been used for the Blau's index in the four factors related to experience:

- Experience in start-up sector;
- Working experience;
- Entrepreneurship experience;
- Managerial experience.

The number of homogeneous teams in the experience in start-up sector is 100.

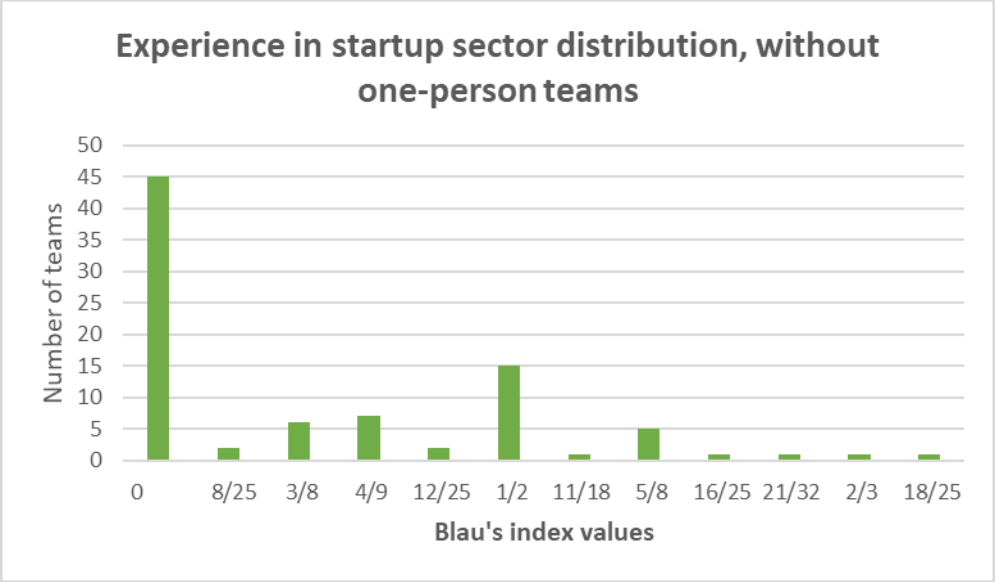


Figure 3.1.7-1: Blau's index experience in start-up sector distribution

In working experience, it is 81.

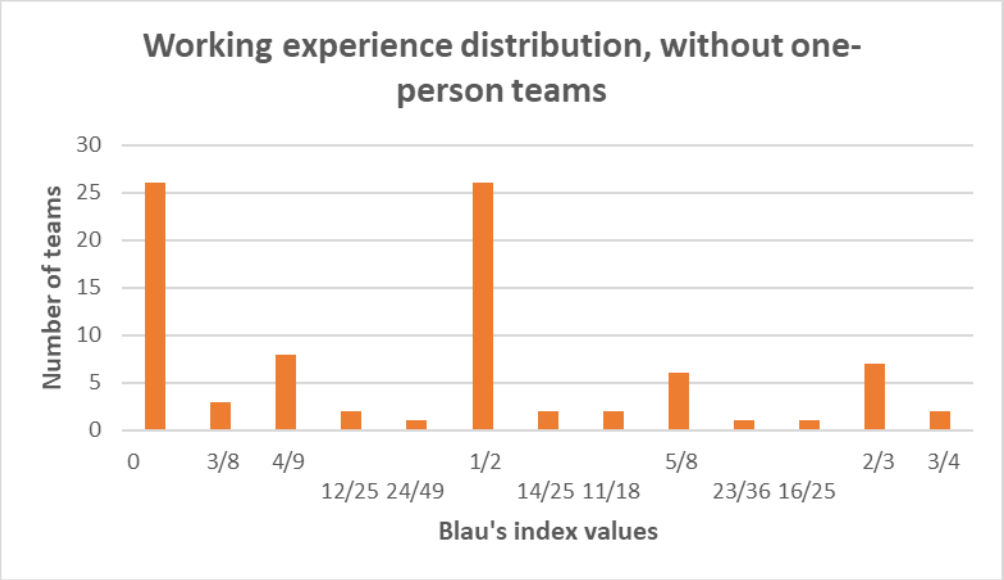


Figure 3.1.7-2: Blau's index working experience distribution

In entrepreneurship experience, it is 102.

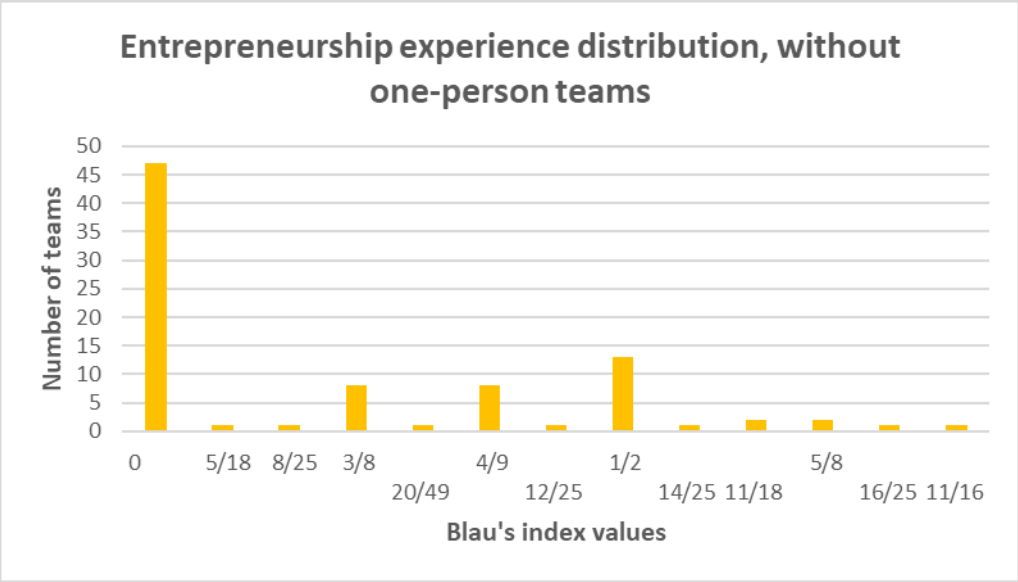


Figure 3.1.7-3: Blau's index entrepreneurship experience distribution

Finally, in managerial experience, it is 99.

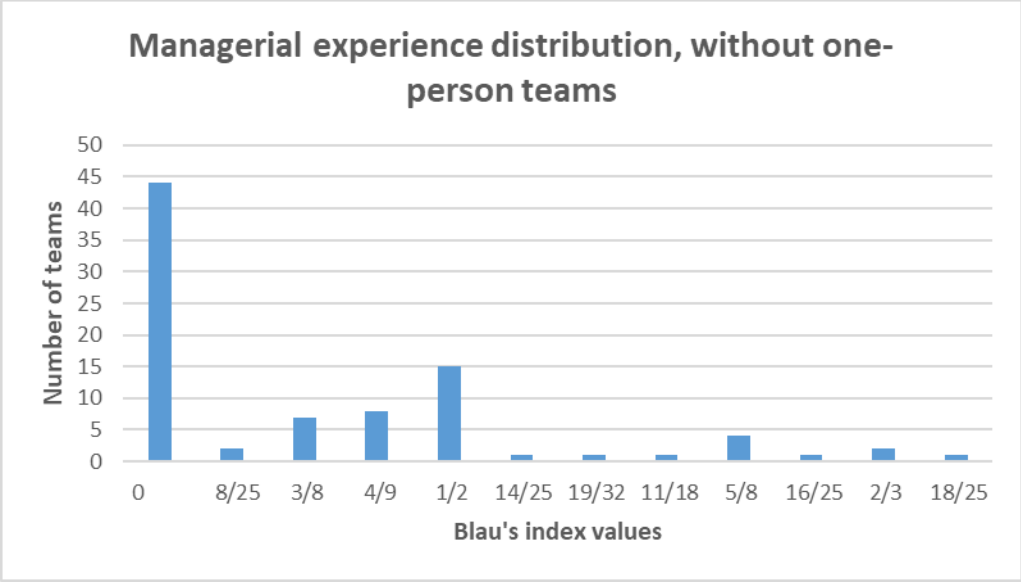


Figure 3.1.7-4: Blau's index Managerieal experience distribution

3.1.8 Heterogeneity in experience in business plans

The teams that have a heterogeneity in the experience of preparing business plans are 35, compared to 107 without heterogeneity. This is coherent with the fact that only 65,34% of the entrepreneurs reported experience in redacting business plans.

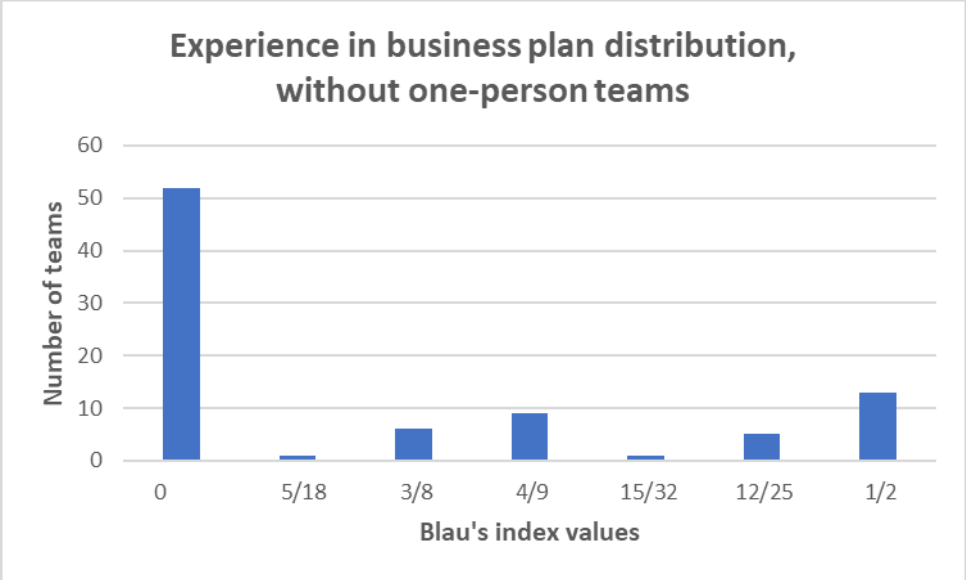


Figure 3.1.8-1: Blau's index experience in business plan distribution

3.2 The traits of a start-up team

Some of the characteristics that define a team are determinants of the way that the team will face decisions. In the initial questionnaire, there were eleven questions that the leader of the team was asked to answer on behalf of his team and himself.

The questions were asked as sentences where they had to express in a scale from 1 to 5 their agreement, where one means entirely in disaccord and five completely in accord, using the scale REI 40 (Pacini, Epstein, 1999).

The first five of them were created to understand the confidence the team has regarding themselves and their capacity.

Confidence	
Question 15_1	We trust our entrepreneurial capacity
Question 15_2	We are sure we are adopting the best possible strategy to develop our idea
Question 15_3	We are sure about our capacity of carrying out the entrepreneurial activity
Question 15_4	We master the skills needed in our project
Question 15_5	We are sure there are not better Business Models for our ides

In this analysis the average of the provided answers was used as the first variable of the team.

After confidence, the second variable that has been considered is the analytic capacity of the team.

Even the best of the results could be useless if there isn't the capacity of properly analyse it. Rigorousness and scientific approach in evaluating can determine the success or the failure of an idea. To categorize the analytic capacity four questions were asked.

Analytic	
Question 16_1	Analyse the situation and look at the fact is an important part of the decision process regarding our start-up
Question 16_2	We carefully evaluate all the possible alternatives before deciding what to do for our start-up
Question 16_3	We prefer to collect all available information before taking a decision for our start-up
Question 16_4	We consider different elements when we take a decision for our start-up: we carefully evaluate pro and cons of each situation our start-up has to face

The third team trait is intuition. Intuition is an innate factor that people, and entrepreneurs among them, have.

"Intuition draws on our inborn ability to synthesize information quickly and effectively—an ability that may be hindered by more formalized procedures" and furthermore "*intuition may be integral to successfully completing tasks that involve high complexity and short time horizons, such as corporate planning, stock analysis, and performance appraisal*" (Dane, Pratt, 2007).

It has been inquired with two questions in the questionnaire.

Intuitive	
Question 17_1	We tend to follow our intuitions when we take decisions for our start-up
Question 17_2	We consider emotions and intuition more than analysis when taking decisions for our start-up

3.3 The traits of the leader

Expressed in the same scale as the traits of the teams, 42 questions were asked in the initial questionnaire regarding the traits of the leader.

The characteristics found are:

1. Locus of Control refers to the belief of the leader to be able to control and modify the events. Who has internal locus of control thinks that achieving the goals depends on himself, not from external events. He refers the success or unsuccess to factors related to his own abilities.
2. Risk taker: this variable and the next one measure the propensity to risk of the leader toward entrepreneurial risk or to caution. The motivation is the perception of a higher risk of loss compared to the chance of higher potential reward.
3. Risk averse: it is the opposite of the previous variable. It shall be remembered that the risk propensity is often connected to the innovation propensity and risk averse leaders tend to belong to the category of late majority in Moore's curve (Cantamessa, Montagna, 2016).
4. Self-Efficacy: it refers to the belief of a person of successfully facing the different situations in life. Being self-efficient means trusting in one's abilities to organise and execute what is necessary to successfully reach a goal.
5. Self-regulation: it is the process through which the person control its own thoughts, emotions and behaviours, to adapt them to external expectations or goal reaching. Through self-regulation, modifications and auto-corrective actions are put in place to reach the prefixed goal.

3.4 The scientific factor

Eisenmann, Ries and Dillard (2013) introduced the concept of lean start-up. Lean start-up method has its foundation in the idea of lean production, in the core value of avoiding waist and making the processes faster.

It is a hypothesis-driven approach to entrepreneurship. This means that the entrepreneur creates a series of Minimum Viable Products, and each of them represents the smallest set of activities needed to disprove a hypothesis. Based on the feedback they receive, entrepreneurs must decide if they should go on the tested path, pivoting their idea or, in most radical cases if they should abandon that.

The process each entrepreneur has to follow when using a hypothesis- driven approach is represented below.

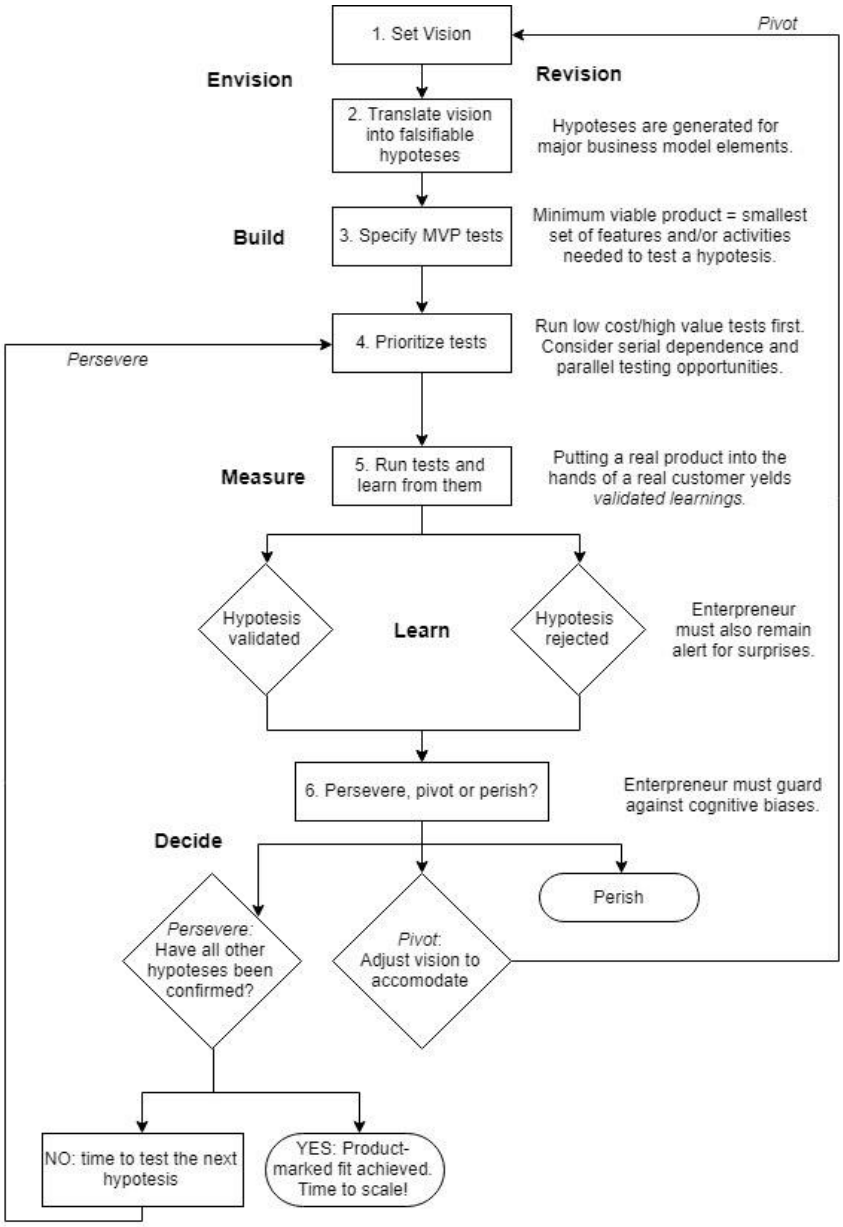


Figure 3.5-1: Hypothesis-driven entrepreneurship process steps

The phone calls, described in the previous chapter as one of the tools used to gain information regarding the entrepreneurial approach of the teams, permit the creation of a variable that measures the rigorousness of the used method and if a team is keen on testing its hypothesis before creating a product for the market.

The variable regarding the scientific factor includes the four elements that compose the scientific method: the theory, the set of hypotheses defining the theory, the test of the hypotheses and the evaluation of the tests. For each of these four factors, four sub-questions were asked and evaluated by the Research assistants in a scale 1 to 5.

Considering the questions extensively written in table XXX the value for each of the four elements is calculated as

$$Theory = \frac{Score_{1.1} + Score_{1.2} + Score_{1.3} + Score_{1.4}}{4}$$

$$Hypothesis = \frac{Score_{2.1} + Score_{2.2} + Score_{2.3} + Score_{2.4}}{4}$$

$$Test = \frac{Score_{3.1} + Score_{3.2} + Score_{3.3} + Score_{3.4}}{4}$$

$$Evaluation = \frac{Score_{4.1} + Score_{4.2} + Score_{4.3} + Score_{4.4}}{4}$$

The scientific variable has then been calculated as:

$$Scientific = \frac{Theory + Hypothesis + Test + Evaluation}{4}$$

3.5 Dropouts

The teams used to create the sample have been monitored for some months, with phone calls held by the research assistants every two weeks for six rounds and every month from the seventh round.

The phone calls started after four of the lessons the entrepreneurs had to attend and were aimed at understanding how the teams were developing their ideas, and if they were implementing what was thought during the course.

Moreover, one more timeframe has been added as t0, and it regards the phone interviews made at the subscription.

	Period of the call
t0	Start of October
t1	5-9 December
t2	19-23 December
t3	2-5 January
t4	16-19 January
t5	30 January-3 February
t6	13-17 February
t7	13-17 March
t8	17-21 April

The variable indicating the drop-out is a dummy variable, and it states 1 when during one of these calls the decision of dropping-out was announced.

4. ANALYSIS AND RESULTS

In this chapter the analysis conducted with the database previously described are explained. Firstly, it is investigated if there is a correlation among the eleven factors considered, and how this correlation can lead to a clustering of the factors into a smaller number of variables.

Secondly, it will be shown the connection between heterogeneity and scientific approach.

Thirdly, it will be investigated the relationship of these new variables and the traits of a team.

Finally, those variables will be related with dropouts in time.

4.1 Correlation and clustering

The high number of variables considered until now may be dependent from one another.

When such dependency exists, the Factor Analysis is the tool that can let us understand how those variables can be regrouped.

4.1.1 The correlation matrix

Among the eleven factors considered when calculating heterogeneity, not all of them are independent. To identify the relationships among those factors the correlation matrix has been calculated.

		Sex	Place	Age	Work/Study	Field of competence	Higher studied achieved	Experience in startup sector	Working experience	Entrepreneurship experience	Managerial experience	Experience in business plan
Sex	Pearson's correlation	1	0,183*	0,350**	0,342**	0,283**	0,418**	0,406**	0,370**	0,206*	0,350**	0,369**
	Meaningfulness		0,029	0,000	0,000	0,001	0,000	0,000	0,000	0,014	0,000	0,000
	N	142	142	142	142	142	142	142	142	142	142	142
Place	Pearson's correlation	0,183*	1	0,379**	0,371**	0,377**	0,373**	0,210*	0,377**	0,311**	0,239**	0,188*
	Meaningfulness	0,029		0,000	0,000	0,000	0,000	0,12	0,000	0,000	0,004	0,025
	N	142	142	142	142	142	142	142	142	142	142	142

Age	Pearson's correlation Meaningfulness N	0,350** 0,000 142	0,379** 0,000 142	1 142	0,571** 0,000 142	0,290** 0,000 142	0,491** 0,000 142	0,385** 0,000 142	0,617** 0,000 142	0,471** 0,000 142	0,394** 0,000 142	0,394** 0,000 142
Work/Study	Pearson's correlation Meaningfulness N	0,342** 0,000 142	0,371** 0,000 142	0,571** 0,000 142	1 142	0,480** 0,000 142	0,628** 0.000 142	0,399** 0,000 142	0,469** 0,000 142	0,413** 0,000 142	0,372** 0,000 142	0,377** 0,000 142
Field of competence	Pearson's correlation Meaningfulness N	0,283** 0,001 142	0,377** 0,000 142	0,290** 0,000 142	0,480** 0,000 142	1 142	0,459** 0,000 142	0,365** 0,000 142	0,362** 0,000 142	0,405** 0,000 142	0,425** 0,000 142	0,336** 0,000 142
Higher studied achieved	Pearson's correlation Meaningfulness N	0,418** 0,000 142	0,373** 0,000 142	0,491** 0,000 142	0,628** 0.000 142	0,459** 0,000 142	1 142	0,461** 0,000 142	0,531** 0,000 142	0,552** 0,000 142	0,538** 0,000 142	0,501** 0,000 142
Experience in startup sector	Pearson's correlation Meaningfulness N	0,406** 0,000 142	0,210* 0,12 142	0,385** 0,000 142	0,399** 0,000 142	0,365** 0,000 142	0,461** 0,000 142	1 142	0,485** 0,000 142	0,555** 0,000 142	0,584** 0,000 142	0,309** 0,000 142
Working experience	Pearson's correlation Meaningfulness N	0,370** 0,000 142	0,377** 0,000 142	0,617** 0,000 142	0,469** 0,000 142	0,362** 0,000 142	0,531** 0,000 142	0,485** 0,000 142	1 142	0,576** 0,000 142	0,557** 0,000 142	0,385** 0,000 142
Entrepreneurship experience	Pearson's correlation Meaningfulness N	0,206* 0,014 142	0,311** 0,000 142	0,471** 0,000 142	0,413** 0,000 142	0,405** 0,000 142	0,552** 0,000 142	0,555** 0,000 142	0,576** 0,000 142	1 142	0,744** 0,000 142	0,347** 0,000 142
Managerial experience	Pearson's correlation Meaningfulness N	0,350** 0,000 142	0,239** 0,004 142	0,394** 0,000 142	0,372** 0,000 142	0,425** 0,000 142	0,538** 0,000 142	0,584** 0,000 142	0,557** 0,000 142	0,744** 0,000 142	1 142	0,409** 0,000 142
Experience in business plan	Pearson's correlation Meaningfulness N	0,369** 0,000 142	0,188* 0,025 142	0,394** 0,000 142	0,377** 0,000 142	0,336** 0,000 142	0,501** 0,000 142	0,309** 0,000 142	0,385** 0,000 142	0,347** 0,000 142	0,409** 0,000 142	1 142

* The correlation is meaningful at level 0,05 (2-tails)

** The correlation is meaningful at level 0,01 (2-tails)

The correlations higher than 0,4 have been highlighted. Due to the high number of these, and the meaningfulness at level 0,01 in most of the cases, some Factor Analyses have been conducted, to cluster the eleven factors in categories.

4.1.2 Exploratory Factor Analysis

The explanatory factor analysis has the goal of understanding which items must be grouped and how many variables should be created to explain the relation among the initial factors correctly.

To better explain, from a set of p variables, it is extracted a reduced set of m components or factors that accounts for most of the variance in the p variables. A set of p variables is reduced to a set of m underlying superordinate dimensions.

These underlying factors are inferred from the correlations among the p variables.

The idea is to group variables that are highly correlated with one another (as we saw in the correlation matrix), presumably because the same underlying dimension influences them all.

Each component is a linear combination of the p variables. The first component accounts for the largest possible amount of variance. The second component, formed from the variance remaining after that associated with the first component has been extracted, accounts for the second largest amount of variance.

This process takes place thanks to the IBM software SPSS.

The number of clusters can be decided according to different theories. The first one says It should be the number of eigenvalues higher than one in the graph of the decreasing eigenvalues. The first component will always have the highest total variance, and the last component will always have the least. The second theory says that it should be considered the number of components to the left of the "elbow" that is visible in the plot. A third theory suggests having a variance explained over 70%, but this results to be untenable for entrepreneurial researches, where such high results are rarely reached.

During the first FA, the number of clusters has been left as a free variable and so it was set by the program itself, based on the number of eigenvalues higher than one in the graph of the decreasing eigenvalues, that in this case are 2.

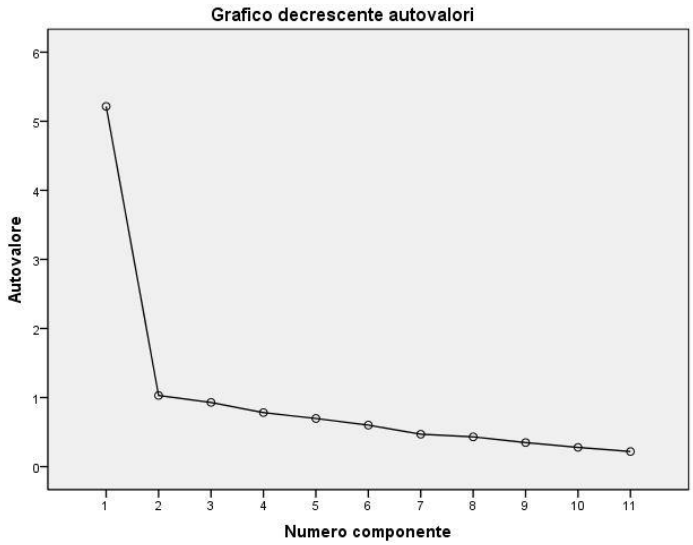


Figure 4.1.2 -1:Graph of decreasing eigenvalues

To be sure those decisions are statistically significant we checked on two important tests: one about MSA and the other about KMO.

Kaiser's Measure of Sampling Adequacy (MSA) for a variable x_i is the ratio of the sum of the squared simple r's between x_i and each other x to (that same sum plus the sum of the squared partial r's between x_i and each other x). Recall that squared r's can be thought of as variances.

$$MSA = \frac{\sum r_{ij}^2}{\sum r_{ij}^2 + \sum pr_{ij}^2}$$

Small values of MSA indicate that the correlations between x_i and the other variables are unique, that is, not related to the remaining variables outside each simple correlation. Kaiser has described MSAs above 0,9 as marvellous, above 0,8 as meritorious, above 0,7 as middling, above 0,6 as mediocre, above 0,5 as miserable, and below 0,5 as unacceptable. For this reason, values as high as possible were hoped and the ones above 0,7 were considered good value. The values found were all above 0.8.

Correlazione anti-immagine	Sex	,850[a]	,006	-,101	-,008	-,049	-,137	-,134	,262	-,087	-,226	-,153
	Place	,006	,894[a]	-,137	-,046	-,224	,073	,074	-,058	-,124	,057	-,107
	Age	-,101	-,137	,860[a]	-,327	,136	-,133	,079	-,144	-,349	-,005	,029
	Work/Study	-,008	-,046	-,327	,866[a]	-,252	,002	,075	,024	-,001	-,083	-,360
	Field of competence	-,049	-,224	,136	-,252	,899[a]	-,098	-,114	-,053	-,004	-,055	-,045
	Experience in business plan	-,137	,073	-,133	,002	-,098	,918[a]	-,117	,034	-,028	,042	-,230
	Managerial experience	-,134	,074	,079	,075	-,114	-,117	,851[a]	-,526	-,143	-,198	-,080
	Entrepreneurship experience	,262	-,058	-,144	,024	-,053	,034	-,526	,836[a]	-,135	-,183	-,170
	Working experience	-,087	-,124	-,349	-,001	-,004	-,028	-,143	-,135	,922[a]	-,089	-,070
	Experience in startup sector	-,226	,057	-,005	-,083	-,055	,042	-,198	-,183	-,089	,926[a]	-,016
	Higher studied achieved	-,153	-,107	,029	-,360	-,045	-,230	-,080	-,170	-,070	-,016	,906[a]

Figure 4.1.2-2: Anti-image correlation

The a in the image indicates the MSA values.

The KMO test gave us a suitable result as it's higher than 0,7, as we already knew because it's the overall value of the MSAs. Once again, the threshold for a good KMO value is 0.7.

Test KMO e di Bartlett

Misura di adeguatezza campionaria KMO (Keiser Meyer Olkin).		,882
Test di sfericità di Bartlett	Chi-quadrato appross.	677,173
	df	55
	Sig.	,000

Figure 4.1.2-3: Test KMO and Bartlett

The explained variance with two components it's 56.8% of the total variance and it's interesting to notice how it's almost equally divided into the two factors, that makes us think that there may be two main groups, two main components grouping the variance.

Varianza totale spiegata

Componente	Autovalori iniziali			Pesi dei fattori non ruotati			Pesi dei fattori ruotati		
	Totale	% di varianza	% cumulata	Totale	% di varianza	% cumulata	Totale	% di varianza	% cumulata
1	5,216	47,416	47,416	5,216	47,416	47,416	3,296	29,964	29,964
2	1,030	9,362	56,778	1,030	9,362	56,778	2,950	26,815	56,778
3	,929	8,447	65,225						
4	,782	7,107	72,333						
5	,697	6,336	78,669						
6	,601	5,465	84,134						
7	,469	4,266	88,400						
8	,431	3,914	92,314						
9	,348	3,167	95,481						
10	,278	2,531	98,012						
11	,219	1,988	100,000						

Metodo di estrazione: Analisi componenti principali.

Figure 4.1.2-4: Total variance explained

In the rotated matrix of components, we can observe that the first four values have a predominance in component 1, the last five values are surely in component 2, and the experience in business plan and sex of the participant have a less defined division but are one in the first group and one in the second.

Matrice dei componenti ruotata[a]

	Componente	
	1	2
Managerial experience	,869	,178
Entrepreneurship experience	,799	,255
Experience in startup sector	,773	,181
Working experience	,590	,499
Experience in business plan	,436	,418
Sex	,402	,373
Place	-,007	,758
Work/Study	,292	,750
Age	,369	,654
Higher studied achieved	,524	,611
Field of competence	,329	,566

Metodo estrazione: analisi componenti principali.
Metodo rotazione: Varimax con normalizzazione di Kaiser.

a. La rotazione ha raggiunto i criteri di convergenza in 3 iterazioni.

Figure4.1.2-5: Rotated components matrix

As it's never good to assume to choose the best option at first try, we can observe what happens if three components are forced.

The explained variance is higher, but with an increase lower than from the first to the second factor: it passes from 56.8 to 65.2.

Varianza totale spiegata

Componente	Autovalori iniziali			Pesi dei fattori non ruotati			Pesi dei fattori ruotati		
	Totale	% di varianza	% cumulata	Totale	% di varianza	% cumulata	Totale	% di varianza	% cumulata
1	5,216	47,416	47,416	5,216	47,416	47,416	2,781	25,283	25,283
2	1,030	9,362	56,778	1,030	9,362	56,778	2,424	22,032	47,315
3	,929	8,447	65,225	,929	8,447	65,225	1,970	17,911	65,225
4	,782	7,107	72,333						
5	,697	6,336	78,669						
6	,601	5,465	84,134						
7	,469	4,266	88,400						
8	,431	3,914	92,314						
9	,348	3,167	95,481						
10	,278	2,531	98,012						
11	,219	1,988	100,000						

Metodo di estrazione: Analisi componenti principali.

Figure4.1.2-6 : Total explained variance

With three clusters the components group the variables like this:

1. Managerial experience, Entrepreneurship experience, Experience in start-up sector, Working experience;
2. Place, Work/Study, Age, Field of competence, Higher studied achieved;
3. Sex, Experience in business plan.

Matrice dei componenti ruotata[a]

	Componente		
	1	2	3
Managerial experience	,857	,163	,223
Entrepreneurship experience	,856	,314	,046
Experience in startup sector	,714	,114	,328
Working experience	,557	,460	,292
Place	,074	,843	-,059
Work/Study	,209	,658	,418
Age	,300	,577	,375
Field of competence	,314	,548	,210
Higher studied achieved	,423	,499	,479
Sex	,141	,090	,822
Experience in business plan	,238	,202	,676

Metodo estrazione: analisi componenti principali.
Metodo rotazione: Varimax con normalizzazione di Kaiser.

a. La rotazione ha raggiunto i criteri di convergenza in 5 iterazioni.

Figure 4.1.2-7: Rotated components matrix

It was observable that the less defining variable was the gender of member of start-ups. It was then excluded to see if the explained variance grows.

KMO test result is 0.884 and MSA are always higher than 0.8, so, as said, they are "meritorious".

The explained variance with two components is 59.9%, so roughly 3% higher than the variance explained with two components grouping eleven variables.

Varianza totale spiegata

Componente	Autovalori iniziali			Pesi dei fattori non ruotati			Pesi dei fattori ruotati		
	Totale	% di varianza	% cumulata	Totale	% di varianza	% cumulata	Totale	% di varianza	% cumulata
1	4,958	49,581	49,581	4,958	49,581	49,581	3,141	31,412	31,412
2	1,030	10,298	59,879	1,030	10,298	59,879	2,847	28,467	59,879
3	,804	8,043	67,922						
4	,781	7,811	75,733						
5	,607	6,073	81,806						
6	,473	4,734	86,540						
7	,469	4,691	91,230						
8	,362	3,616	94,846						
9	,279	2,792	97,638						
10	,236	2,362	100,000						

Metodo di estrazione: Analisi componenti principali.

*Figure 4.1.2-8**Errore. Per applicare 0 al testo da visualizzare in questo punto, utilizzare la scheda Home.**: Total explained variable*

Taking away the gender variable, the two components maintain the division they had before, with one component indicating the working experiences and the other one the background ones.

Matrice dei componenti ruotata[a]

	Componente	
	1	2
Place	-,004	,765
Age	,367	,656
Work/Study	,291	,753
Field of competence	,329	,570
Higher studied achieved	,520	,612
Experience in startup sector	,768	,179
Working experience	,590	,503
Entrepreneurship experience	,813	,273
Managerial experience	,872	,185
Experience in business plan	,429	,413

Metodo estrazione: analisi componenti principali.
Metodo rotazione: Varimax con normalizzazione di Kaiser.

a. La rotazione ha raggiunto i criteri di convergenza in 3 iterazioni.

Figure4.1.2-9: Rotated component matrix

If once more the clustering into three components is forced the explained variance is 67.9, 2.7% higher than considering three factors and 11 variables and the division in three components is:

1. Experience in start-up sector, Working experience, Entrepreneurship experience, Managerial experience;
2. Age, Work/Study, Higher studied achieved, Experience in business plan;
3. Place, Field of competence.

Matrice dei componenti ruotata[a]

	Componente		
	1	2	3
Place	,096	,057	,885
Age	,274	,585	,415
Work/Study	,199	,613	,510
Field of competence	,346	,248	,539
Higher studied achieved	,418	,614	,351
Experience in startup sector	,767	,193	,129
Working experience	,551	,407	,365
Entrepreneurship experience	,823	,210	,234
Managerial experience	,859	,241	,110
Experience in business plan	,205	,843	-,050

Metodo estrazione: analisi componenti principali.
Metodo rotazione: Varimax con normalizzazione di Kaiser.

a. La rotazione ha raggiunto i criteri di convergenza in 4 iterazioni.

Figure 4.1.2-10: Rotated component matrix

As previously said, the sample of data used has 55 start-ups composed by just one member developing his idea in this early stage.

Deleting those 55 teams from the database used for the second Factor Analysis, a third FA emerge, analysing 10 variables on 87 teams.

The tests of KMO and MSA produce much lower results, respectively 0.696 for KMO and MSA values between 0.540 and 0.846, that means they're less significant, but still admissible.

Test KMO e di Bartlett

Misura di adeguatezza campionaria KMO (Keiser Meyer Olkin).		,696
Test di sfericità di Bartlett	Chi-quadrato appross.	140,728
	df	45
	Sig.	,000

Figure 4.1.2-11: Test KMO and Bartlett

Correlazione anti-immagine	Place	,597[a]	-,127	-,033	-,212	-,101	,064	-,104	-,065	,078	,076
	Age	-,127	,568[a]	-,233	,171	,046	,000	-,251	-,148	,082	-,130
	Work/Study	-,033	-,233	,540[a]	-,161	-,288	-,036	,122	-,021	,098	,026
	Field of competence	-,212	,171	-,161	,631[a]	-,019	-,038	,070	-,069	-,101	-,087
	Higher studied achieved	-,101	,046	-,288	-,019	,739[a]	-,031	-,021	-,154	-,088	-,241
	Experience in startup sector	,064	,000	-,036	-,038	-,031	,846[a]	-,055	-,148	-,222	,021
	Working experience	-,104	-,251	,122	,070	-,021	-,055	,757[a]	-,158	-,116	-,011
	Entrepreneurship experience	-,065	-,148	-,021	-,069	-,154	-,148	-,158	,723[a]	-,518	,062
	Managerial experience	,078	,082	,098	-,101	-,088	-,222	-,116	-,518	,698[a]	-,131
	Experience in business plan	,076	-,130	,026	-,087	-,241	,021	-,011	,062	-,131	,662[a]

Figure 4.1.2-12: Anti image correlation

The number of eigenvalues above one is four, so are the components automatically calculated in the rotated matrix.

Varianza totale spiegata

Componente	Autovalori iniziali			Pesi dei fattori non ruotati			Pesi dei fattori ruotati		
	Totale	% di varianza	% cumulata	Totale	% di varianza	% cumulata	Totale	% di varianza	% cumulata
1	2,744	27,442	27,442	2,744	27,442	27,442	2,249	22,491	22,491
2	1,366	13,664	41,105	1,366	13,664	41,105	1,533	15,332	37,823
3	1,229	12,294	53,400	1,229	12,294	53,400	1,349	13,487	51,310
4	1,048	10,479	63,879	1,048	10,479	63,879	1,257	12,569	63,879
5	,888	8,881	72,760						
6	,703	7,029	79,789						
7	,643	6,427	86,216						
8	,582	5,820	92,036						
9	,479	4,786	96,822						
10	,318	3,178	100,000						

Metodo di estrazione: Analisi componenti principali.

Figure 4.1.2-13: Total variance explained

The explained variance is 63.9, considering four components.

Matrice dei componenti ruotata[a]

	Componente			
	1	2	3	4
Place	,007	,003	,228	,814
Age	,010	,259	,804	,106
Work/Study	-,145	,664	,087	,343
Field of competence	,277	,239	-,454	,576
Higher studied achieved	,303	,685	,032	,136
Experience in startup sector	,685	,056	-,016	-,023
Working experience	,463	-,100	,626	,085
Entrepreneurship experience	,787	,155	,203	,151
Managerial experience	,851	,134	,022	-,007
Experience in business plan	,180	,666	,051	-,292

Metodo estrazione: analisi componenti principali.
Metodo rotazione: Varimax con normalizzazione di Kaiser.

a. La rotazione ha raggiunto i criteri di convergenza in 5 iterazioni.

Figure 4.1.2-14: Rotated components matrix

The four components divide the variables in:

1. Experience in start-up sector, Entrepreneurship experience, Managerial experience;
2. Work/Study, Higher studied achieved, Experience in business plan;
3. Age, Working experience;
4. Place, Field of competence.

Probably reducing ten variables in 4 clusters is not enough, as it results in dispersive division, so it's reasonable to try to reduce them to two of them, as they were in the other Factor Analyses.

The negative aspect is that the explained variance goes down to 41.1%, but the bright side is that the division is the same we obtained considering 142 start-ups, with the only exception of the Experience in business plan factor, that moves with the other component.

Matrice dei componenti ruotata[a]

	Componente	
	1	2
Place	-,024	,535
Age	,208	,374
Work/Study	-,129	,737
Field of competence	,099	,481
Higher studied achieved	,311	,621
Experience in startup sector	,659	,030
Working experience	,588	,060
Entrepreneurship experience	,797	,244
Managerial experience	,830	,106
Experience in business plan	,244	,345

Metodo estrazione: analisi componenti principali.
Metodo rotazione: Varimax con normalizzazione di Kaiser.

a. La rotazione ha raggiunto i criteri di convergenza in 3 iterazioni.

Figure 4.1.2-15: Rotated components matrix

Finally, the same sample of 87 start-ups with more than one member was used for the forth clustering, that was taking into consideration all the 11 variables.

The test of KMO produces slightly higher results than with the sample using ten variables, but the MSA has low values.

Test KMO e di Bartlett

Misura di adeguatezza campionaria KMO (Keiser Meyer Olkin).		,704
Test di sfericità di Bartlett	Chi-quadrato appross.	173,180
	df	55
	Sig.	,000

Figure 4.1.2-16: KMO and Bartlett test

Correlazione anti-immagine	Sex	,419[a]	,016	-,034	,083	,010	-,108	-,199	-,010	,238	-,110	-,147
	Place	,016	,653[a]	-,126	-,033	-,213	-,101	,059	-,110	-,059	,076	,068
	Age	-,034	-,126	,604[a]	-,244	,169	,057	,007	-,289	-,147	,093	-,155
	Work/Study	,083	-,033	-,244	,596[a]	-,176	-,302	-,060	,084	,009	,087	-,007
	Field of competence	,010	-,213	,169	-,176	,672[a]	-,020	-,043	,043	-,060	-,100	-,104
	Higher studied achieved	-,108	-,101	,057	-,302	-,020	,761[a]	-,008	-,048	-,172	-,069	-,240
	Experience in startup sector	-,199	,059	,007	-,060	-,043	-,008	,816[a]	-,070	-,185	-,193	,037
	Working experience	-,010	-,110	-,289	,084	,043	-,048	-,070	,791[a]	-,143	-,132	,010
	Entrepreneurship experience	,238	-,059	-,147	,009	-,060	-,172	-,185	-,143	,707[a]	-,525	,030
	Managerial experience	-,110	,076	,093	,087	-,100	-,069	-,193	-,132	-,525	,716[a]	-,128
	Experience in business plan	-,147	,068	-,155	-,007	-,104	-,240	,037	,010	,030	-,128	,729[a]

Figure 4.1.2- 17: Anti image correlation

Once more the number of eigenvalues above one is four, so are the components automatically calculated in the rotated matrix.

Due to the shape of the curve of the eigenvalues it is admissible to force the eigenvalues to two, where the slope of the curve has the most radical change.

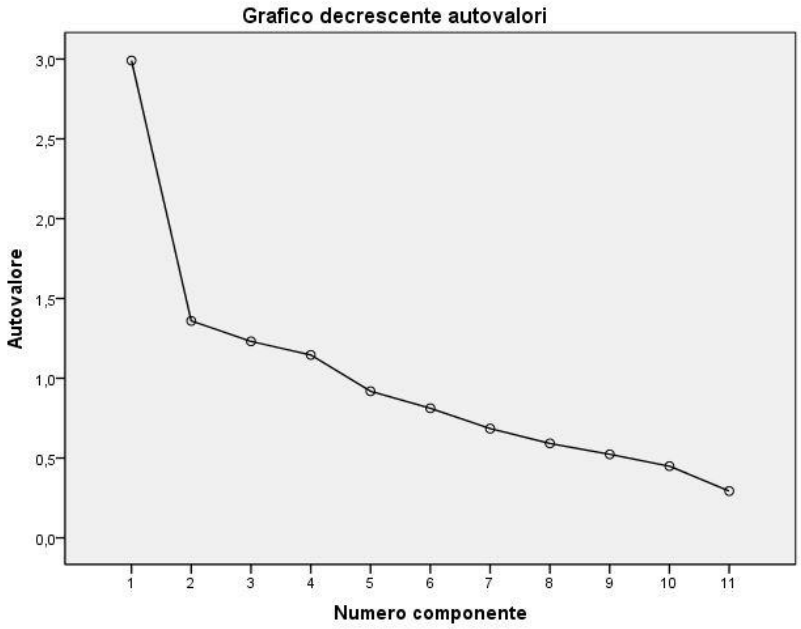


Figure 4.1.2-18: Graph of decreasing eigenvalues

Doing that the explained variance passes from 61,16 % to 39,55 % and we obtain the following rotated matrix.

Matrice dei componenti ruotata[a]

	Componente	
	1	2
Sex	,294	-,131
Place	-,083	,600
Age	,146	,521
Work/Study	-,086	,720
Field of competence	,154	,422
Higher studied achieved	,366	,564
Experience in startup sector	,708	,018
Working experience	,509	,282
Entrepreneurship experience	,735	,304
Managerial experience	,835	,118
Experience in business plan	,338	,328

Metodo estrazione: analisi componenti principali.
Metodo rotazione: Varimax con normalizzazione di Kaiser.

a. La rotazione ha raggiunto i criteri di convergenza in 3 iterazioni.

Figure 4.1.2-19: Rotated components matrix

In this clustering the two clusters are:

1. Gender, Experience in start-up sector, Working experience, Entrepreneurship experience Managerial experience and experience in business plans;
2. Place, Age, Work/Study, Field of competence and Higher studied achieved.

Those are exactly the ones from the first FA, with lower values due to the absence of the 55 one-person teams.

4.2 The heterogeneity variable

The clustering obtained thanks to the last Factor Analyses has been used to define a variable of heterogeneity. To be more specific, three dummy variables have been defined.

The first dummy, called "Dummy_Homogeneous", assumes value one when the eleven Blau's indexes regarding that team have all value zero. To this group belong the 55 teams composed by a solo-entrepreneur, that have by definition no heterogeneity, and two other teams completely homogeneous, for a total of 57 teams, that is the 40,14%.

The second dummy, called "Dummy_1", groups the teams that have a higher heterogeneity in the working experience, and more in common regarding the background. Forty-four teams assume value one in this variable, the 30,98%.

The third dummy, called "Dummy_2" has value one when the teams have a higher heterogeneity on the background values and a lower heterogeneity in working experiences. Forty-one start-ups are in this category, 28,87%.

To assign the teams to each dummy for each team, two values have been calculated. The first one multiplies each Factor Loading of the component one times the Blau's index of the correspondent variable, as shown by the colours in the tables below, and sum all the products. For the second value, the same thing has been done with the Factor Loadings of component two.

	Component1	**Component2**
Gender	0,294	-0,131
Place	-0,083	0,6
Age	0,146	0,521
Work/Study	-0,086	0,72
Feld of competence	0,154	0,422
Higher studies achieved	0,366	0,564
Experience in start-up sector	0,708	0,018
Working experience	0,509	0,282
Entrepreneurial experience	0,735	0,304

Managerial experience	0,835	0,118
Experience in business plans	0,338	0,328

	Gender	Place	Age	Work/ Study	Feld of competence	Higher studies achieved	Experience in start-up sector	Working experience	Entrepreneurial experience	Managerial experience	Experience in business plans
Team1											
Team2											
….											

Comparing the two values, the higher determined the belonging to one group or the other. In case of sum equal to zero, the team will have value one in the dummy homogeneous.

4.2.1 Level curves

Defining the heterogeneity variable as the belonging of each team to one of the three categories has brought to 57 homogeneous teams, 44 of the first kind (higher heterogeneity in working experience) and 41 of the second kind (higher heterogeneity in the background).

Nevertheless, not all the factor loadings were high, so it has been seen how the groups were changing when modifying the minimum threshold of the factor loadings.

First, it has been set a threshold of 0,3, as it is the lower value that would have excluded a variable, the gender. As already seen from the Factor Analyses, the gender was the less clearly assigned to one of the two components and it is now the first to be excluded.

The second variable that did not have a clear definition was the Experience in business plan, and it is the second variable excluded when the threshold was set to 0,4.

The minimum level has been increased up to 0,8, that is the threshold value that leaves only one Blau's index to be the discriminant of the belonging of teams to different categories.

Below it is shown an overview of the excluded factors increasing the threshold and how the number of teams included in each dummy varies.

Level of threshold	Number of excluded factors	New excluded factors	Number of Homogeneous	Number of Dummy1	Number of Dummy2
0	0		57	44	41
0,3	1	Gender	58	35	49
0,4	2	Experience in business plan	58	34	50
0,5	3	Field of competence	60	38	44
0,6	6	Age, Higher studies achieved, Working experience	66	42	34
0,7	7	Place	68	48	28
0,8	8	Work/Study, Experience in start-up sector, Entrepreneurial experience	99	43	0

To better visualise the change occurring to the group the graph below represents the teams of each category.

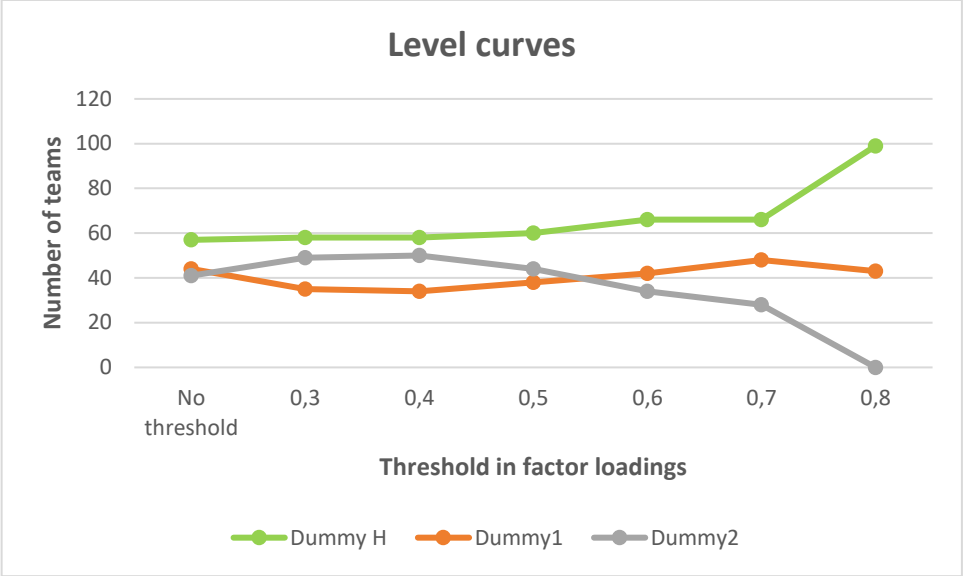


Figure 4.1.2-1: Level curves

4.3 Heterogeneity and scientific method

To understand if the new heterogeneity variable could be related to the scientific approach of the entrepreneurial team, a regression analysis has been done.

The scientific approach that it is repeated once more it is the capacity of formulating a theory, hypothesis, test and evaluation, is considered here at the pre-course level. It is investigated if the belonging to a group or the other and the presence of higher heterogeneity in the team regarding background factors or working experiences can influence the scientific approach.

To do the regression analysis, the model created by Panelli, Minasso (2019) has been used.

The statistical method used is the Ordinary Linear Regression (OLR). It is the most used in literature, and it has as the goal of identifying a data interpolation curve represented by the independent variables, aimed at explaining a given dependent variable.

The dependent variable is the scientific factor, that is continuous in the interval [0, 5] as it is the average of non-continuous variables with value between 0 and 5.

To investigate the link between the scientific approach and the heterogeneity, the OLS model has been chosen as the most appropriate.

The dummy indicating homogeneous teams has been used as a fixed variable, and it has been measured how scientific are the other dummies compared to that one.

There are two scientific factors, as the variable regarding the confidence factor has been calculated in two different ways and expressed as c1 and c2 (as it is visible in the table below).

The results regarding the dummies influence on scientific factor are very close to zero, even slightly negative when considering the factor c2.

	scie_av	scie_av
c1	-0.184	
	(0.89)	
c2		-0.270
		(1.57)
a1	-0.101	-0.074
	(0.46)	(0.34)
i1	0.012	0.013
	(0.11)	(0.11)
nteam	0.071	0.078
	(0.38)	(0.42)
nstud	0.256	0.262
	(1.26)	(1.29)
d_fisi	0.365	0.389
	(1.13)	(1.19)
ndonne	-0.022	-0.038
	(0.12)	(0.20)
d_tstem	-0.204	-0.275
	(0.54)	(0.72)
d_tecon	-0.134	-0.118
	(0.32)	(0.29)
averbpexp	0.730	0.741
	(2.27)**	(2.34)**
t_averorelavoro	0.022	0.023
	(2.03)**	(2.15)**
t_avertitolostud	0.017	0.015
	(0.31)	(0.28)
averageage	-0.030	-0.027
	(0.82)	(0.75)
d_book	-0.097	-0.134

	(0.20)	(0.28)
tannistartupexp	0.033	0.031
	(1.16)	(1.11)
tanniworkexp	0.019	0.019
	(0.54)	(0.55)
tannientrexp	-0.031	-0.034
	(0.72)	(0.79)
tannimanexp	0.007	0.006
	(0.14)	(0.13)
Dummy_1	-0.000	-0.015
	(0.00)	(0.04)
Dummy_2	-0.082	-0.069
	(0.21)	(0.18)
d_fashion	-0.406	-0.431
	(0.98)	(1.02)
d_anim	-0.426	-0.433
	(0.87)	(0.88)
d_media	-0.756	-0.765
	(1.76)*	(1.79)*
d_edu	0.178	0.182
	(0.34)	(0.35)
d_casa	-0.076	-0.062
	(0.14)	(0.12)
d_amb	0.159	0.126
	(0.24)	(0.20)
d_auto	-0.415	-0.430
	(0.73)	(0.76)
d_food	-0.386	-0.398
	(0.84)	(0.88)
d_sal	-0.560	-0.583
	(1.12)	(1.17)
d_softw	0.157	0.168
	(0.33)	(0.36)
d_indu	0.808	0.905
	(1.47)	(1.67)*
d_elettronica	-0.591	-0.641
	(1.07)	(1.16)
d_agrico	-0.096	-0.049
	(0.24)	(0.12)
d_energy	-1.959	-2.033
	(3.59)***	(3.83)***
d_hard	0.331	0.341
	(0.44)	(0.46)
d_servcon	-0.162	-0.157
	(0.34)	(0.34)
d_nordest	-1.287	-1.281
	(2.52)**	(2.54)**

d_centro	-0.003	-0.059
	(0.01)	(0.13)
d_sud	-0.256	-0.275
	(0.63)	(0.71)
d_isole	-0.318	-0.275
	(0.75)	(0.65)
_cons	2.648	2.867
	(1.63)	(1.81)*
R^2	0.33	0.34
N	142	142

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

To further investigate if there could be a relationship between heterogeneity and scientific factor, a second heterogeneity variable has been created.

In this case, for each team, two variables were created as the sum of the Blau's factors, divided according to the factor loadings of the Factor Analysis described above.

Variable1	Variable2
Gender	Place
Experience in start-up sector	Age
Working experience	Work/study
Entrepreneurial experience	Field of competence
Managerial experience	Higher studies achieved
Experience in business plan	

Each of these variables is structured as a continuous variable in the interval [0,6], being the sum of variables from 0 to 1, but the superior border is never reached, due to the low values of Blau's indexes.

A second regression analysis has been performed, and below the results related to these new variables are reported.

	scie_av	scie_av
bi_Cluster_1	0.064	0.040
	(0.33)	(0.21)
bi_Cluster_2	0.337	0.360
	(1.30)	(1.38)

Once more, the results are quite low and non-meaningful, even if the second variable has higher values in its influence over the scientific approach.

The entire second regression analysis is available in the appendix.

4.3.1 The scientific factor, heterogeneity and field of competence

Among all the variables presenting heterogeneity, the field of competence is mainly relevant when talking about scientific method. As said before, the scientific method is based on the way scientists approach a problem and the possible choices in the initial questionnaire.

It is qualitatively shown the relationship among the scientific factor and the heterogeneity variable (homogeneous teams, teams aggregated in their background and teams aggregated at work). The presented graphs are to compare teams with most members in STEM and Economic field and majority of members in humanistic field.

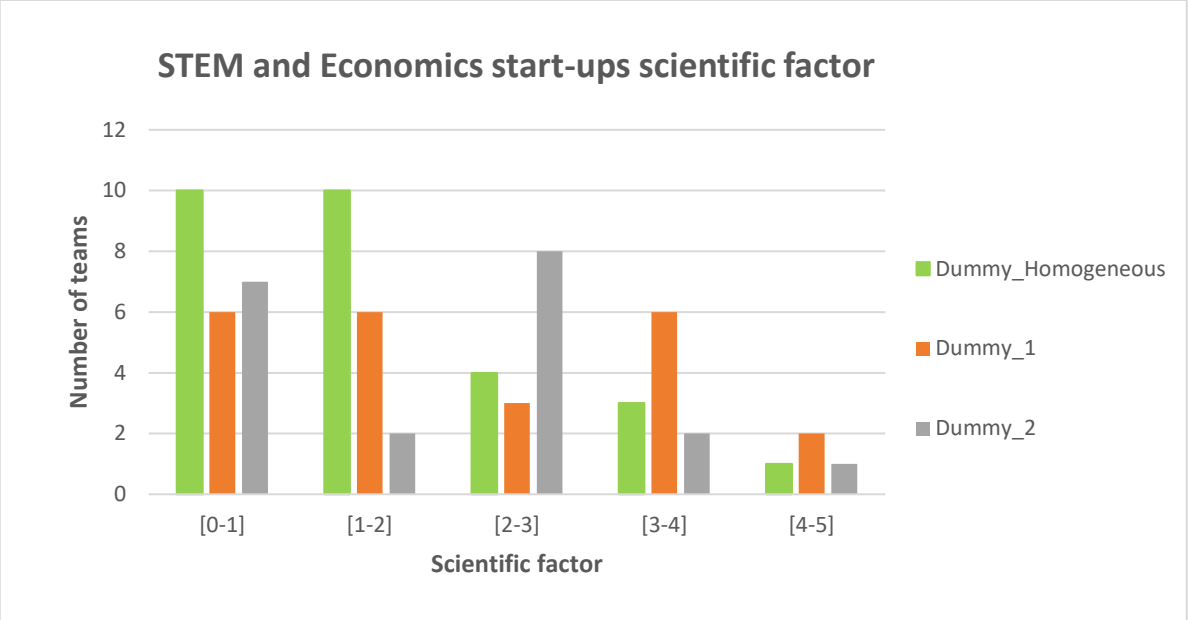


Figure 4.3.1-1: Scientific factor of STEM and Economics teams

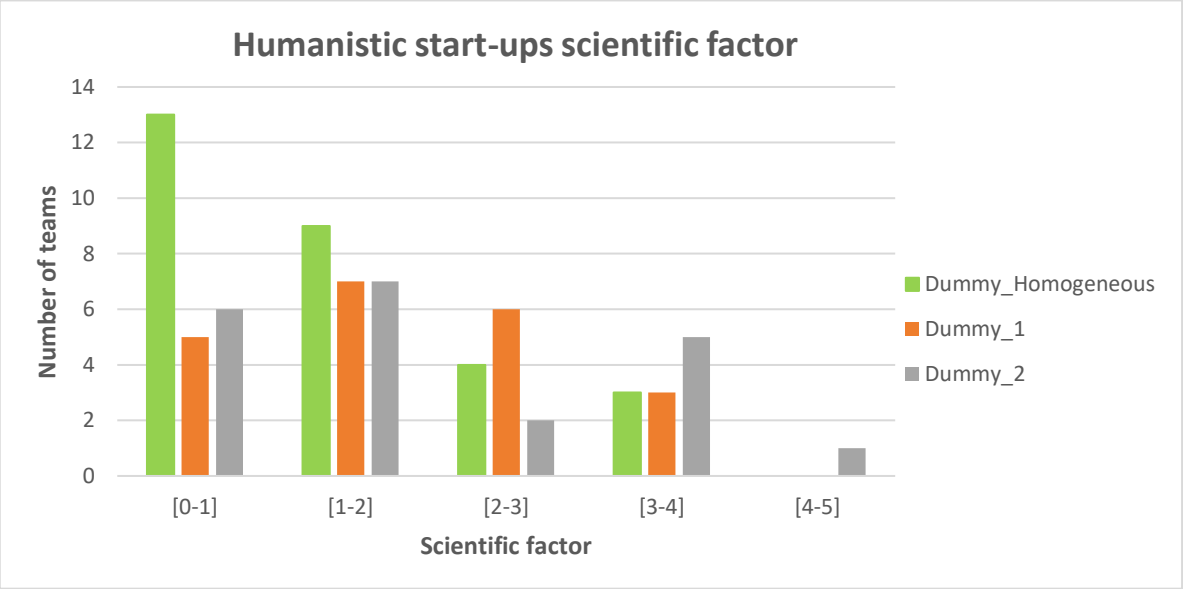


Figure 4.3.1-2: Scientific factor of Humanistic teams

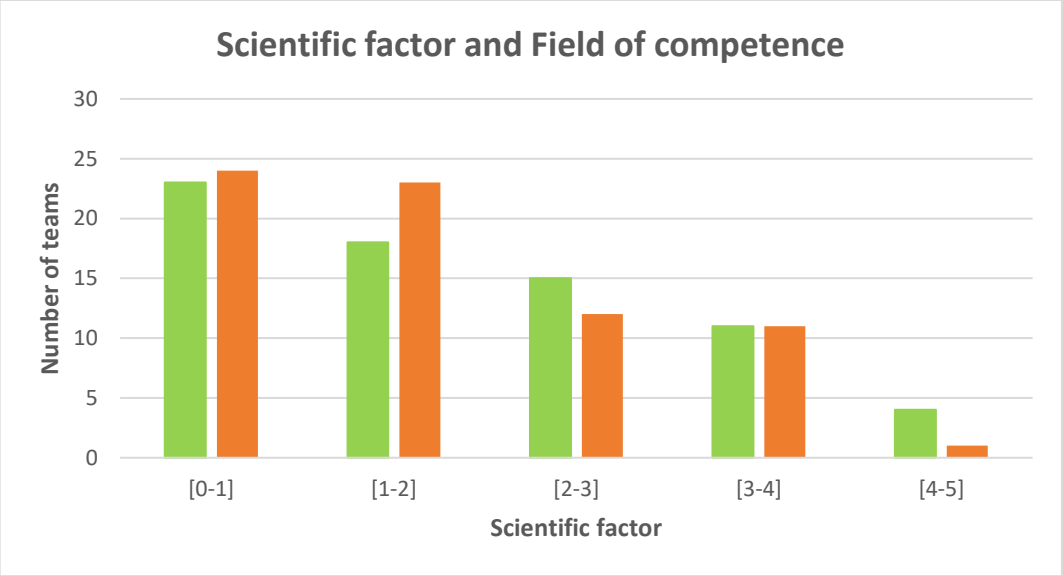


Figure 4.3.1-3: Scientific factor and field of competence

It is observable in graph 4.3.1-1 and 4.3.1-2 how the number of teams with scientific factor between four and five is higher in case of start-ups from STEM and Economics fields, slightly lower if we take scientific values between zero and one and lower in case of values between one and two.

This is further visible in the graph 4.3.1-3 where it is shown the trend of the scientific factor based on the field of competence.

In the graph below, it is shown in blue the teams from STEM and Economics and in orange the humanistic teams and there are no relevant differences on the team formation.

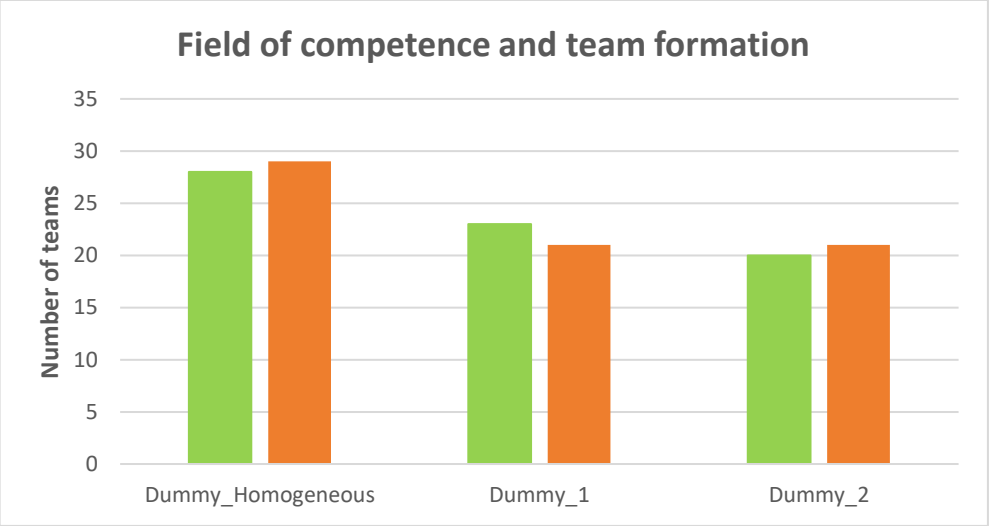


Figure 4.3.1-4: Field of competence and team formation

4.4 Heterogeneity and traits of the team

Confidence, analyticity and intuition are the traits defined for the team.

It has been inquired if there is any diversity in one of these traits among teams with different heterogeneity variables. The analysis was qualitative, and the graph below shows how the differences in the average behaviour of the teams were not relevant.

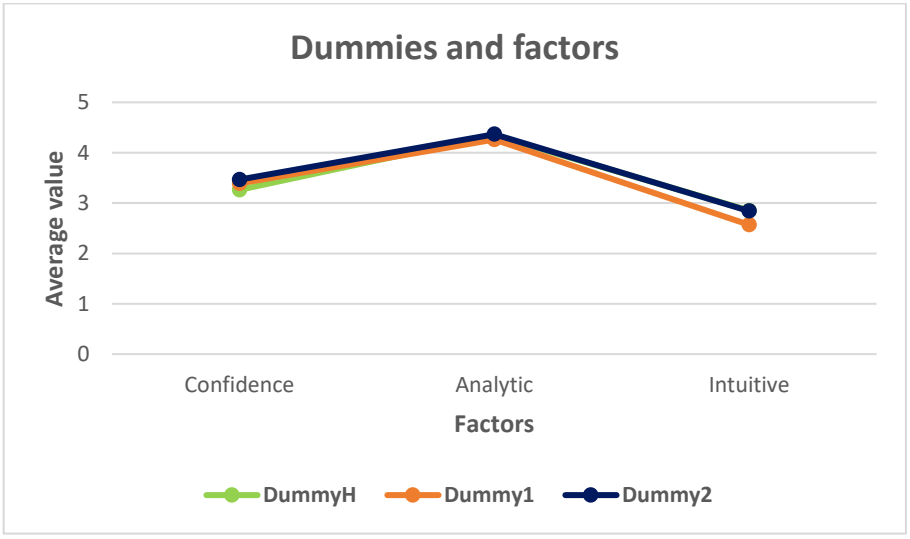


Figure 4.4-1: Dummies and traits of the team

To double check the existence of a relationship between Heterogeneity variables and the traits of the team it has been constructed a correlation matrix reported below.

Correlation among heterogeneity and other factors	Dummy 1	Dummy 2	Dummy 3	Confidence	Analytic	Intuitive
Dummy 1	1					
Dummy 2	-0,54871	1				
Dummy 3	-0,52175	-0,42692	1			
Confidence	-0,13659	0,03273	0,114348	1		
Analytic	0,028335	-0,07176	0,042581	0,227732	1	
Intuitive	0,08	-0,13944	0,055756	0,151824	-0,17975	1

Neither of the dummies is strongly correlated with these traits.

4.4.1 Heterogeneity and traits of the leaders

Similar consideration has been extended to the traits of the leader of each team.

The traits detected concerning the leaders of each teams are:

- Locus of control;
- Risktaker;
- Riskaverse;
- Self-efficacy;
- Self-regulation.

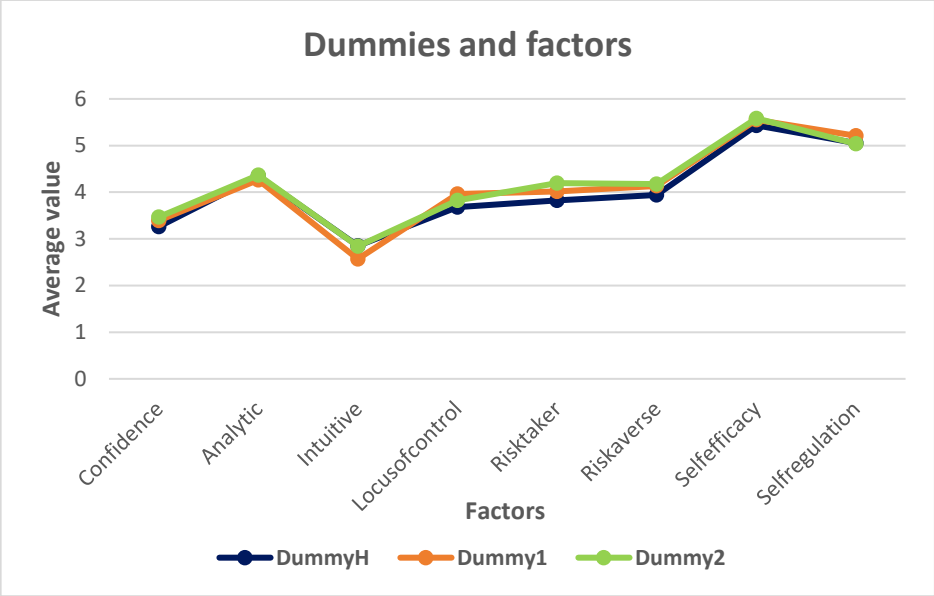


Figure 4.4.1-1: Heterogeneity and traits of the leader

The graph above doesn't show a distinctive difference on the average behaviour of leaders when belonging to different heterogeneity groups.

To double check also for the traits of the team a correlation matrix is presented below.

Correlation among heterogeneity and other factors	Dummy 1	Dummy 2	Dummy 3	Locusofcontrol	Risktaker	Riskaverse	Selfefficacy	Selfregulation
Dummy 1	1							
Dummy 2	-0,54871	1						
Dummy 3	-0,52175	-0,42692	1					
Locusofcontrol	-0,15796	0,15072	0,01705	1				
Risktaker	-0,13675	0,01785	0,12971	0,384128	1			
Riskaverse	-0,10468	0,04484	0,06748	0,099075	-0,18135	1		
Selfefficacy	-0,06489	0,02528	0,04439	0,193133	0,214784	0,177301	1	
Selfregulation	-0,04181	0,09007	-0,04669	-0,13991	-0,32223	0,12506	0,40508	1

Once more there is no correlation shown.

The complete matrixes, with meaningful levels can be found in the appendix.

4.4.2 Heterogeneity and traits of the team for the most heterogeneous groups

The same analysis has been reproduced considering as a separate category the most heterogeneous start-ups that had cumulated Blau's indexes higher than 4,5.

The twelve teams with higher heterogeneity are the following:

Id start-up	**∑(Blau's indexes)**
151	6,0938
21	5,8400
79	5,6111
14	5,1111
194	4,8889
286	4,8800
12	4,8750
310	4,7500
162	4,6667
28	4,6250
178	4,5000
302	4,5000

The curve of those twelve teams doesn't particularly differentiate from the others either.

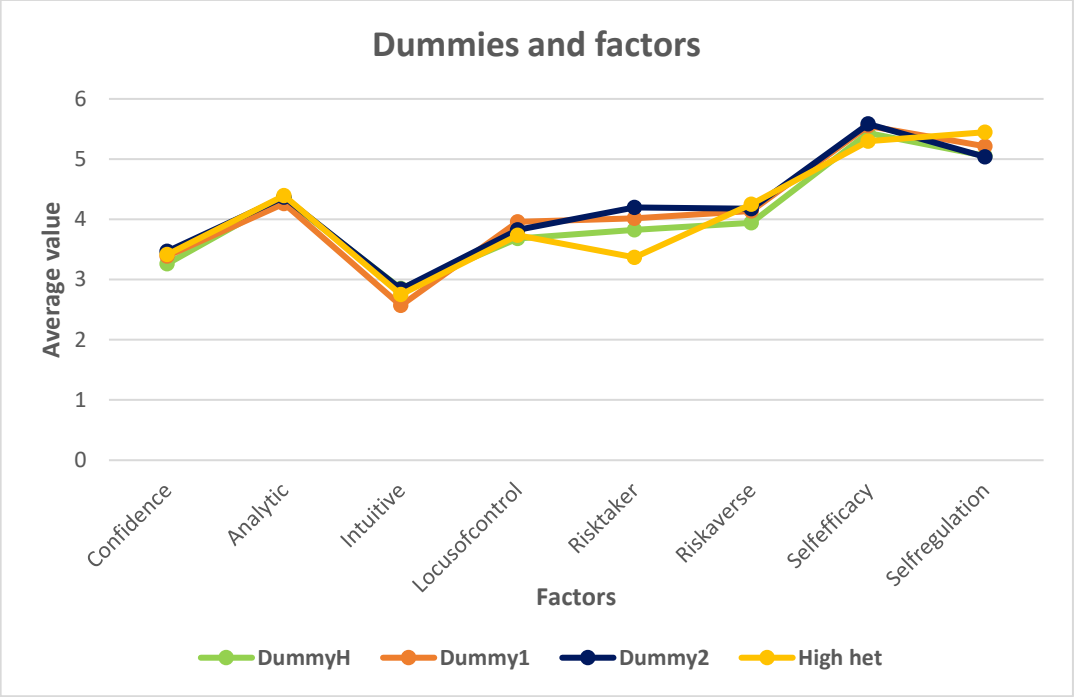


Figure 4.4.2-1: High heterogeneity and team and leader factors

The only appreciable difference is regarding the behaviour on the risk attitude of the leader, that is lower in case of higher heterogeneity.

4.5 Heterogeneity and Drop-outs

The last analysis regards the connection between heterogeneity and the drop-out trend.

During the first seven months of the project, thirty-five teams dropped-out. Inside the different categories, 26,32% of homogeneous teams dropped out, 18,18% of the heterogeneous on working experiences and 29,27% of the heterogeneous on the background.

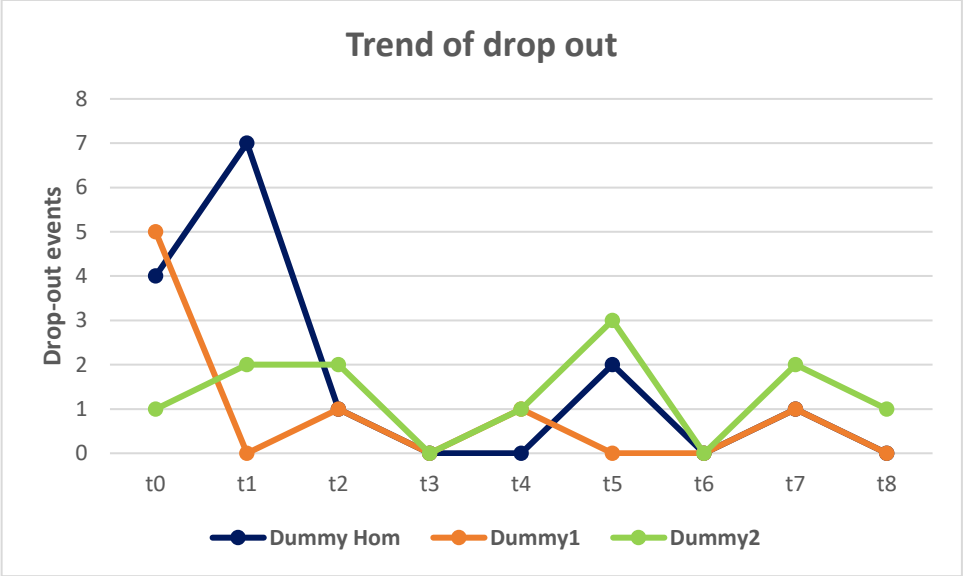


Figure 4.5-1: Trend of drop-out

Following what has been done in the previous chapter we also observed if clustering the teams according to the field of competence of their members could underline some differences in their drop-out trend. 20 teams dropped-out from the humanistic teams and 15 from the STEM and Economics. Moreover, the highest difference is in the first period.

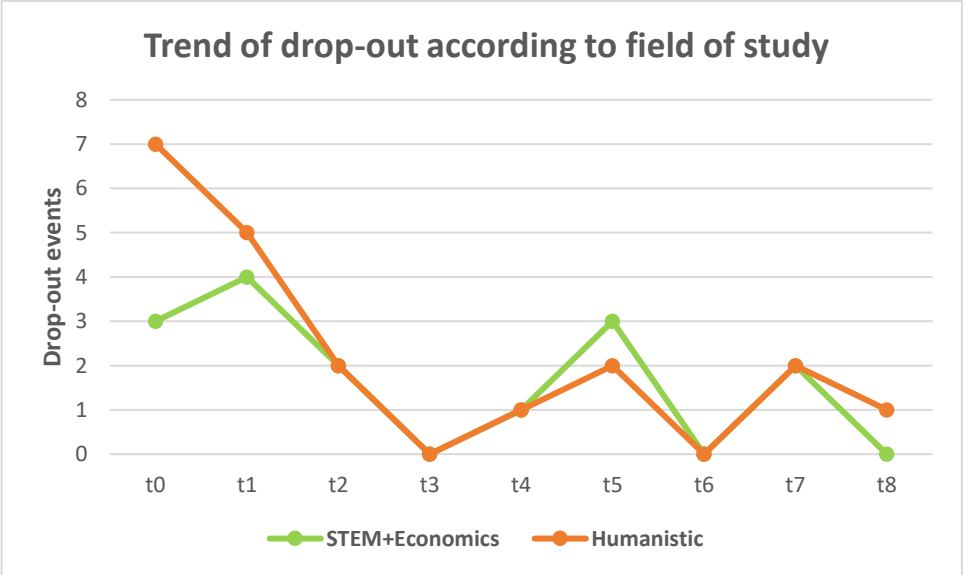


Figure 4.5-2: Drop-out according to studies

4.6 Results evaluation and answer to the hypothesis

It is now reported how the results of the previous analysis answers to the hypothesis of this work.

4.6.1 Heterogeneity in teams

The first hypothesis was:

Hypothesis 1a: Most of the teams of such early-stage start-ups are homogeneous on most of the factors.

Hypothesis 1b: Most of the teams of such early-stage start-ups are heterogeneous on most of the factors.

We can see how in our sample 38,73% of the teams are one-person teams, and, obviously cannot present any heterogeneity factor.

Among the remaining 61,27%, the number of heterogeneous factors is increasing with the increase in the number of people in the team.

Number of components per team	Number of teams	Percentage	Number of heterogeneous factors in average	Percentage of heterogeneous factors in average
1	55	38,73%	0	0%
2	37	26,06%	4,19	38,09%
3	18	12,68%	6,61	60,09%
4	20	14,08%	6,7	60,91%
5	7	4,93%	8,43	76,64%
6	3	2,11%	9,33	84,82%
7-8	2	1,41%	8	72,73%

The trend of the percentage of heterogeneous factors is logarithmic, so we can assert that even if the average is 3,62 heterogeneous factors over 11 considered, the teams with the highest numerosity also present a high heterogeneity.

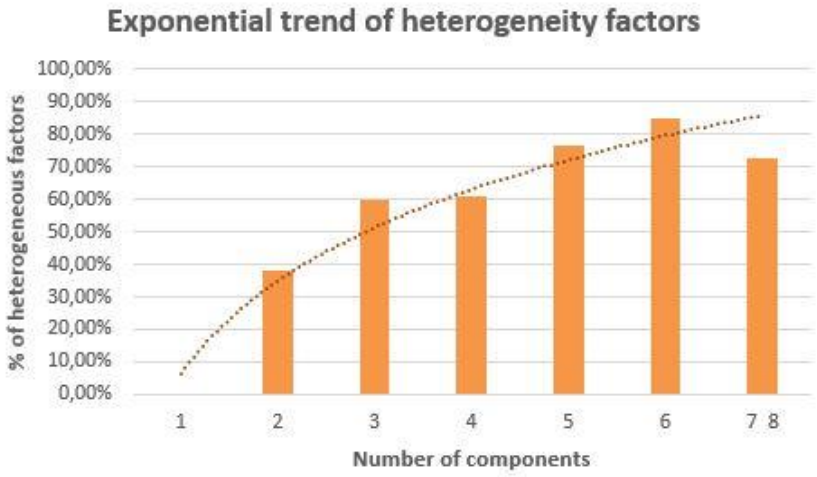


Figure 4.6.1-1: Trend of heterogeneity factor

The Blau's index, that is created to vary between 0 and 1, due to the small size of the teams and to the low number of options in most of the categories analyzed, arrives in its higher value to 7/9 in the origin heterogeneity, but several times it cannot exceed ½, as it is shown in the table below.

Heterogeneity	Min Blau's index	Max Blau's index	#0	#0, without 1-person teams	#heterogeneous
Sex	0	1/2	97	42	45
Origin	0	7/9	113	58	29
Age	0	3/4	85	30	57
Work	0	1/2	81	26	61
Field of competence	0	2/3	99	44	43
Higher studied achieved	0	2/3	85	30	57
Experience in startup sector	0	5/7	100	45	42
Working experience	0	3/4	81	26	61
Entrepreneurship experience	0	2/3	102	47	40
Managerial experience	0	5/7	99	44	43
Experience in business plan	0	1/2	107	52	35

4.6.2 The heterogeneity variable

The second hypothesis was:

Hypothesis 2: There is a correlation between the studied factors.

As it was seen in Korunka et al. (2003) factors regarding the entrepreneurs can be clustered to find categories with commonalities.

In this work the diversity factors have been clustered, and they provide us with the three groups: homogeneous teams, teams with high heterogeneity in working experience and teams with higher heterogeneity in background. Changing the sample with the exclusion of the gender variable or changing the number of variables did not affect the categories.

We can consequently say that the teams participating in The Start-up Lab course did not aggregate with the intent of adding different skills to the team, as it happens in top management teams. On the contrary, those early-stage teams were created because of commonalities, because of a common background or because of connections made at the workplace.

This is coherent with what Ruef, Aldrich and Carter (2003) affirm:

"*During the process of group formation, the choice of members based on shared identities, functional considerations, or status expectations is inevitably constrained by structural opportunities for social contact*."

Sam Altman, founder of the prestigious Y Combinator accelerator, says "*mediocre people at a big company cause some problems, but they don't usually kill the company. A single mediocre hire in the first five will kill a start-up.*"

It is much easier for a leader to choose a team for the entrepreneurial idea among the people he knows, he had some past in common, and he can more easily trust.

4.6.3 Heterogeneity and traits of the team

The third hypotheses were the following:

Hypothesis 3a: There is a correlation between the different kind of heterogeneity of the team and the traits of the team.

Hypothesis 3b: There is a correlation between the different kind of heterogeneity of the team and the traits of the leader.

The traits that characterize a team have the same average value independently of the way the team was formed or the fact that it is a one-person team.

The curves of the graph describing the traits based on heterogeneity groups are very close to each other, even overlapping in some points. It seems that the teams do not differ in their comportments due to the way they were formed; they are similar regardless of their composition.

The only difference is with the most heterogeneous groups. The curve takes a different angle regarding the risk attitude of the leader, that is more prudent when the team is more heterogeneous.

Having a high degree of heterogeneity involves considering different points of view and taking a lower risk connected to a biased point of view.

4.6.4 Heterogeneity and scientific approach

The fourth hypothesis presented was:

Hypothesis 4: There is a correlation between the kind of heterogeneity and the scientific approach.

In this work, the hypothesis is not confirmed. It appears that the heterogeneity groups do not affect the initial scientific approach of the team.

It could be deduced that the way those teams were formed is different in the two clusters but has in common a lack of strategy in choosing the people. For this reason, it does not influence the scientific method of the team.

On the contrary, clustering the teams for Field of competence there is a difference: a higher scientific factor level for STEM and Economics teams compared to Humanistic teams.

4.6.5 Heterogeneity and drop-outs

The last hypothesis was concerning drop-outs:

H5: There is a different trend in drop-outs according to the different kinds of heterogeneity.

In this last case, the hypothesis is verified, and the qualitative graph constructed shows how the teams composed by only one member appear to drop-out sooner than the others, at the beginning of the course. Not having partners in the initial stage of a project may reveal to be challenging, for the psychological obstacle of not sharing the obstacles with someone else.

"These benefits [of combining talents to create and advance in enterprise] included pooling financial and physical resources, spreading risk and anxiety, increasing the stock of skills and expertise available, and compensating for individual weaknesses." (Cooney, 2005)

It follows that in a business founded by one person, these benefits are not there, and the challenges are more difficult to face.

Observing the drop-outs of the teams based on their field of confidence, the same result found for homogeneous teams is found for humanistic teams Those groups, having a different background and less analytic competences, tend to abandon the idea more easily in the first period, being less prepared to face the challenges of the first phase of an idea.

CONCLUSIONS

The aim of this work was to investigate the diversity of team composition in early-stage start-ups.

The investigated hypotheses have been decided after a thorough analysis of the existing literature over heterogeneity in teams, with the intent of investigating how diverse factors influence each other and can be clustered, of filling the gap in the study of the relationship between heterogeneity in teams and scientific approach and of analyzing the drop-out trend of start-up according to their heterogeneity.

From the work done emerged how the high correlation among the eleven heterogeneity factors could be explained thanks to the relationship those factors have. Following the same reasoning made by Korunka et al. (2003), they have been clustered thanks to a Factor Analysis in two main categories: the first one includes all the teams that have an higher heterogeneity in working experiences and that could have been formed due to a common background, presenting less heterogeneity in factors as place where they live, age or being students or workers; the second one includes teams with higher heterogeneity in the background factors, but more similar experiences regarding the years of working experience, entrepreneurial experience, managerial experience or experience in the start-up sector.

Considering these results, the relationship among the membership to one of the two categories mentioned above or to a completely homogeneous team and the scientific approach to decision making was studied first with all the eleven factors, and then taking away the less significant. The result obtained is that the composition of the team doesn't influence the scientific approach that the group or the solo-entrepreneur follows.

Moreover, the drop-out level has been in percentage similar for homogeneous teams and teams with higher heterogeneity in the background and lower for the

teams with higher heterogeneity in working experience and more similar background, and it is happening considerably faster in case of start-ups composed by only one member.

Finally, considering the specific factor of Field of Competence, the start-ups result more scientific and the tendency of dropping-out is more accentuated in Humanistic teams.

The obtained results are not definitive and can be explanatory for this work, not been generalized to any case. It would be interesting studying the same topics in a broader group, as the sample of this work is a group of 142 start-ups, 55 of them composed by a solo-entrepreneur and this leads to unavoidable bias.

Moreover, the result of a lack of correlation among the kind of heterogeneity and the scientific approach could be related to fact that teams were formed because of common background or common work experience, not because of a strategic study of the needed competences, as also the most heterogeneous startups have the same behavior of the majority. In the future it might be done a similar analysis to teams created considering the skills of each member.

APPENDIX

APPENDIX A Questionnaire: Items related to the psychological characters of the leader

FACTOR Identifier
ITEM (scale of response from 1 "totally disagree" to 7 "completely agree")
Locus of Control
LOC-I
q18_1 In most jobs you need to be very lucky to excel
q18_2 One always ends up earning in proportion to what one is worth
q18_3 To make money you simply need to know the right people
q18_4 To have a good position you need to be helped by luck
q18_5 Earnings are mainly the result of hard work
q18_6 There is a direct relationship between a person's abilities and the position he holds
q18_7 Many difficulties encountered in work are due to one's superiors
q18_8 Generally the people who work well get rewards
q18_9 Promotions are awarded to people who work well
q18_10 To find a good job, knowledge is more important personal and actual capabilities
q18_11 A well prepared person always finds a satisfying job
q18_12 To get a really good job you need acquaintances high places
Propensity to Risk
q19_ * Risk taker
q20_ * Risk Adverse
q19_1 I can be rather careless and accept to take big risks
q19_2 I think I often act in a rather bold and courageous way
q19_3 I am a rather courageous and daring person and I like to try my luck in various situations
q19_4 Often I have the courage to do risky things that other people are in general reluctant to do
q19_5 I think I am often less cautious than other people
q20_1 In important matters I never take unnecessary risks, which can be avoided
q20_2 In important situations I never deliberately chose to take risks that I could have avoided
q20_3 I always try to avoid situations that risk getting me into trouble with the others people
q20_4 I am always very cautious and I think first of all about security
q20_5 I prefer to avoid doing things that expose me to possible criticism and for which bankruptcy I can be held responsible
Self Efficacy
q21_1 I think I will always succeed in achieving the goal even if I have to perform a difficult task
q21_2 In the face of new tasks and challenges I have always been confident of being able to carry them out
q21_3 I am convinced that I will succeed
q21_4 When I set something I almost always get better results than others
q21_5 When I support a test or an exam I am convinced that I can pass it positively
q21_6 I trust that my results will be recognized and appreciated by others
q21_7 I do not feel in difficulty in front of any situation, as I am up to now always managed to get by with my skills
q21_8 I have never had problems to understand immediately and to face even the more complicated situations
q21_9 I think I grasp the crux of the matter before the others
Self Regulation

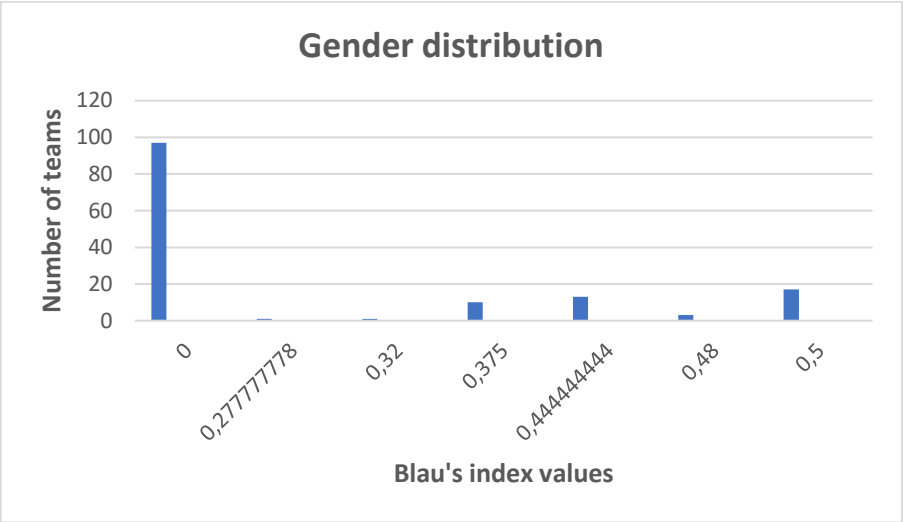
q22_1 People can count on me to meet the scheduled and scheduled times
q22_2 I find it hard to say no
q22_3 I change my mind quite often
q22_4 Others would describe me as an impulsive person
q22_5 I would like to have greater self-discipline
q22_6 I let myself be carried away by my feelings
q22_7 I don't get discouraged easily
q22_8 Sometimes I can't avoid doing something, even though I know it's wrong
q22_9 I often act without thinking about all the alternatives
q22_10 I often do things that seem right to me in the present, even at the expense of future goals
q22_11 When I pursue a goal I hardly change my way, even if I make myself I realize that this is not the best way

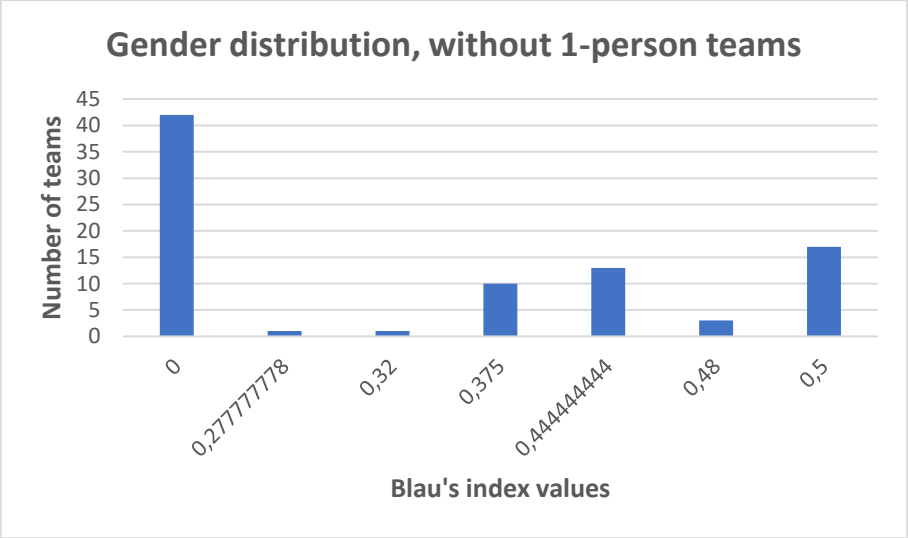
APPENDIX B Questionnaire: Items related to the psychological characteristics of the team

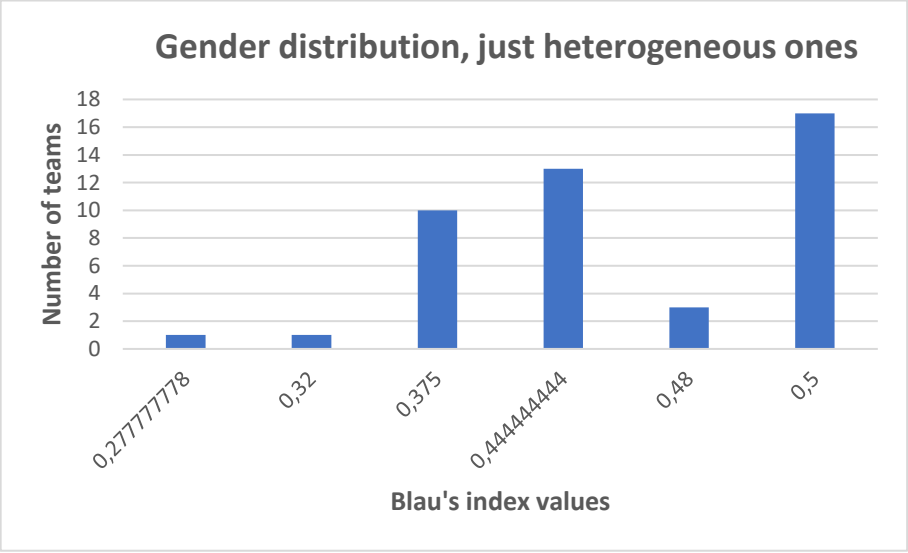
FACTOR Identifier
ITEM (scale of response from 1 "completely at odds" to 5 "altogether agree")
Confidence
q15_1 We have confidence in our entrepreneurial skills
q15_2 We are sure we are adopting the best possible strategy for our idea
q15_3 We are confident of our ability to do business
q15_4 We master the skills necessary for our project
business
q15_5 We are certain there are no better business models than the current one for the
our idea
Analytic
q16_1 Analyzing the situation and looking at the facts is an important part of the process
of decision making regarding our startup
q16_2 We carefully evaluate all the possible alternatives before deciding what do for our startup
q16_3 We prefer to collect all the necessary information before taking one decision for our startup
q16_4 We consider different elements when we take one decision for our startup usually we carefully evaluate the pros and cons of every situation facing our startup
Intuitive
q17_1 We tend to follow our intuition when making decisions for the
our start-up
q17_2 We take feelings and intuition into consideration rather than analysis
decisions for our startup

APPENDIX C Distribution graphs

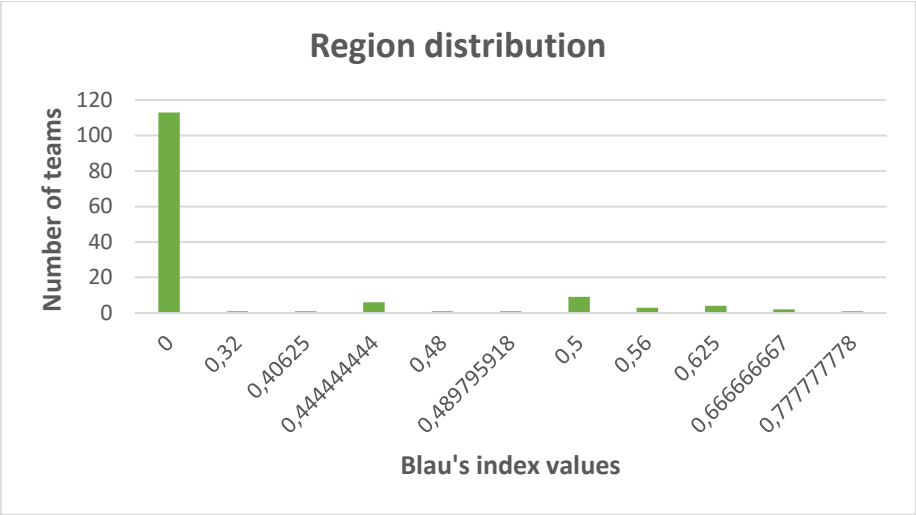
Gender

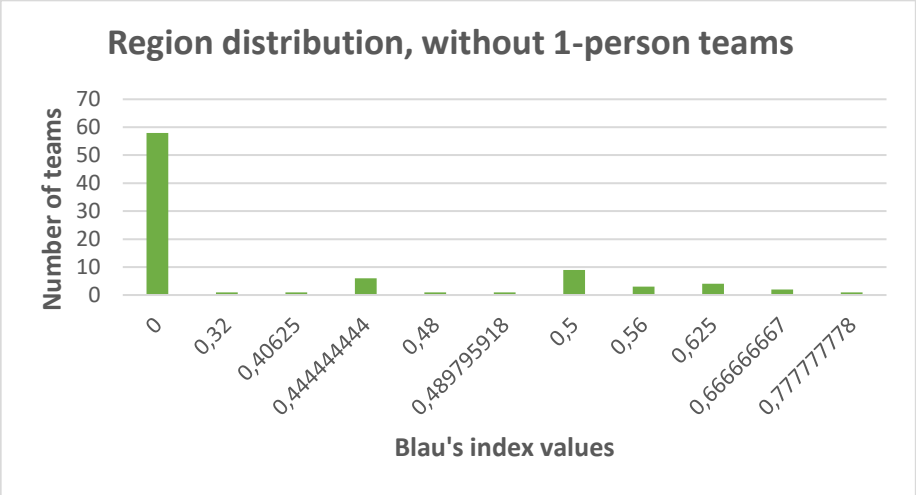

Gender distribution
Number of teams
120
100
80
60
40
20
0
0
0,277777778
0,32
0,375
0,444444444
0,48
0,5
Blau's index values

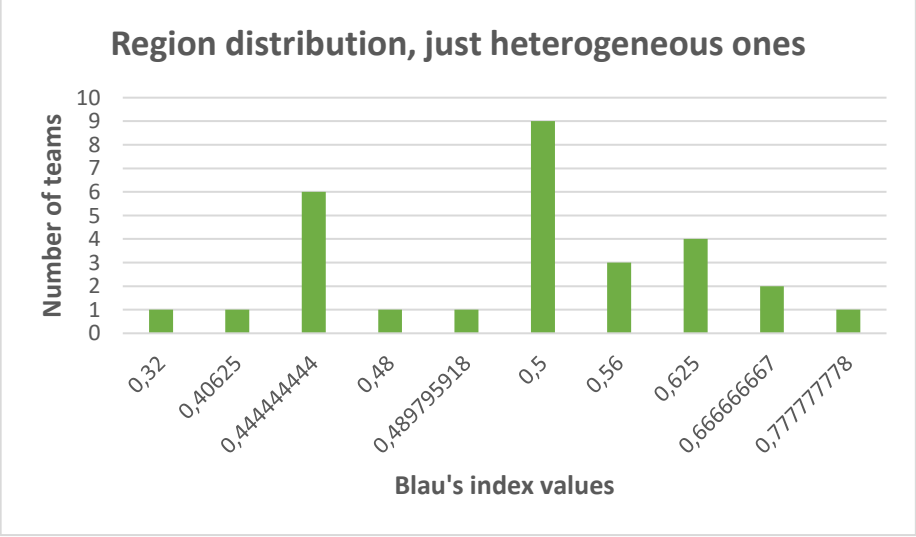

Gender distribution, without 1-person teams
Number of teams
45
40
35
30
25
20
15
10
5
0
0
0,277777778
0,32
0,375
0,444444444
0,48
0,5
Blau's index values


Gender distribution, just heterogeneous ones
Number of teams
18
16
14
12
10
8
6
4
2
0
0,277777778
0,32
0,375
0,444444444
0,48
0,5
Blau's index values

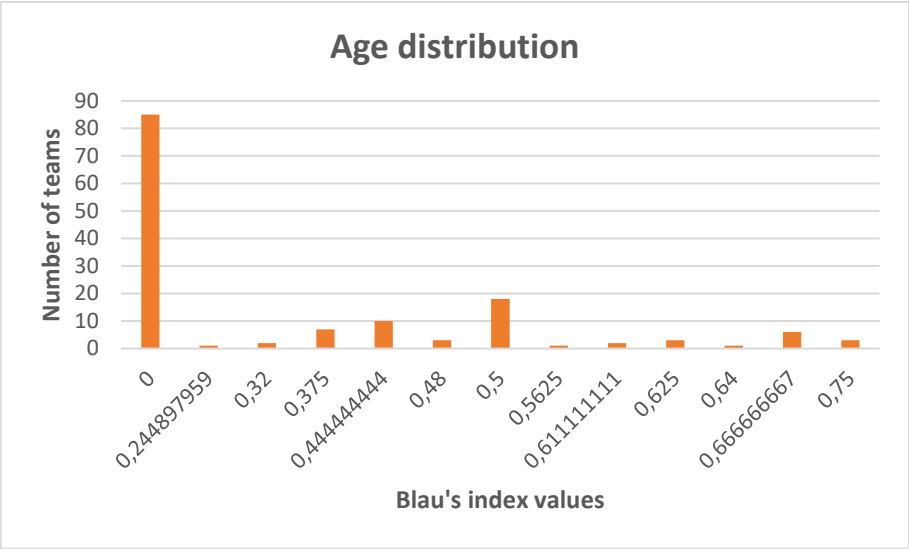
Region

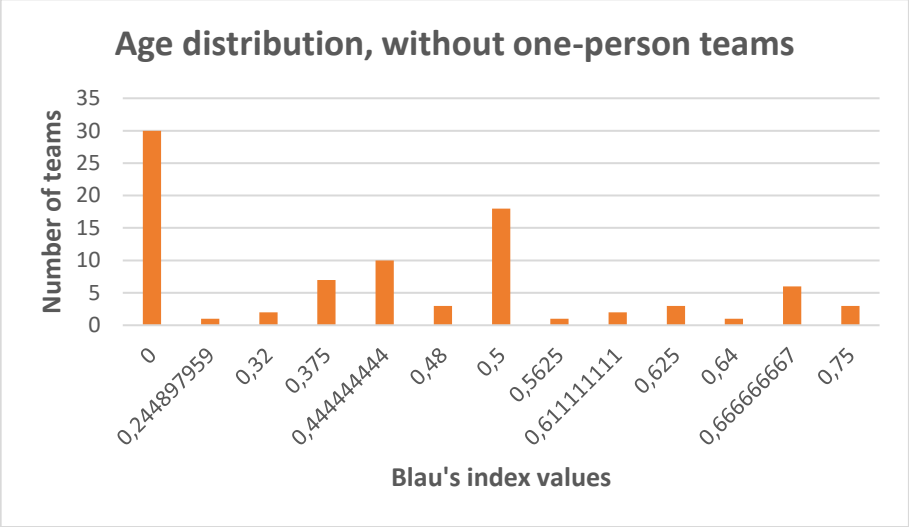

Region distribution
Number of teams
120
100
80
60
40
20
0
0
0,32
0,40625
0,44444444
0,48
0,489795918
0,5
0,56
0,625
0,666666667
0,777777778
Blau's index values

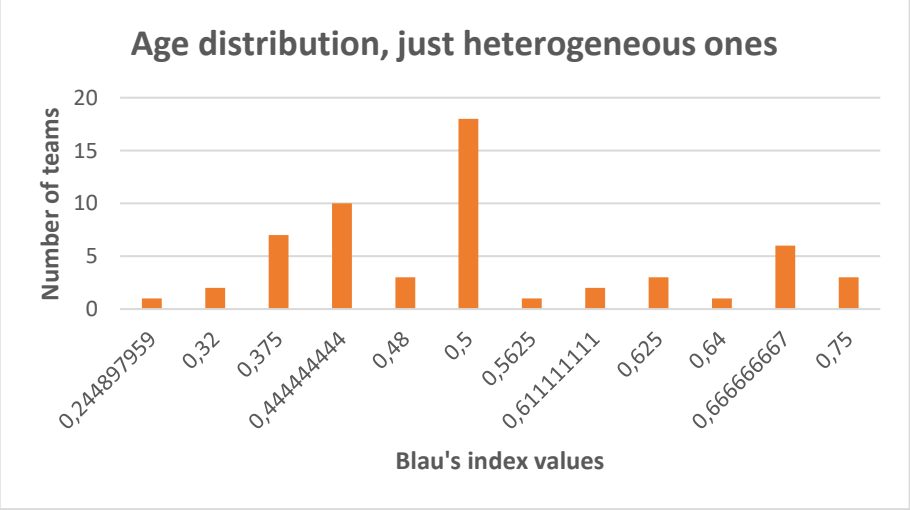

Region distribution, without 1-person teams
Number of teams
70
60
50
40
30
20
10
0
0
0,32
0,40625
0,44444444
0,48
0,489795918
0,5
0,56
0,625
0,666666667
0,777777778
Blau's index values


Region distribution, just heterogeneous ones
Number of teams
10
9
8
7
6
5
4
3
2
1
0
0,32
0,40625
0,44444444
0,48
0,489795918
0,5
0,56
0,625
0,666666667
0,777777778
Blau's index values

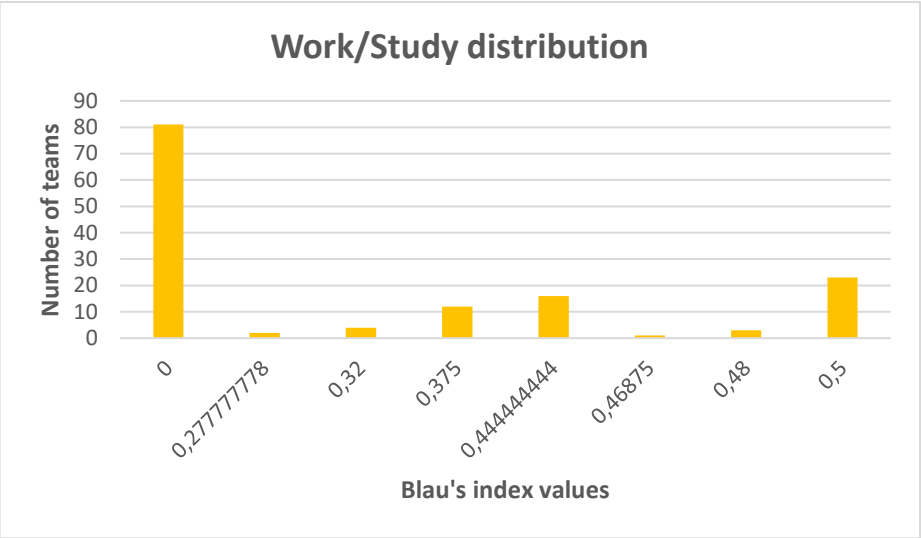
Age

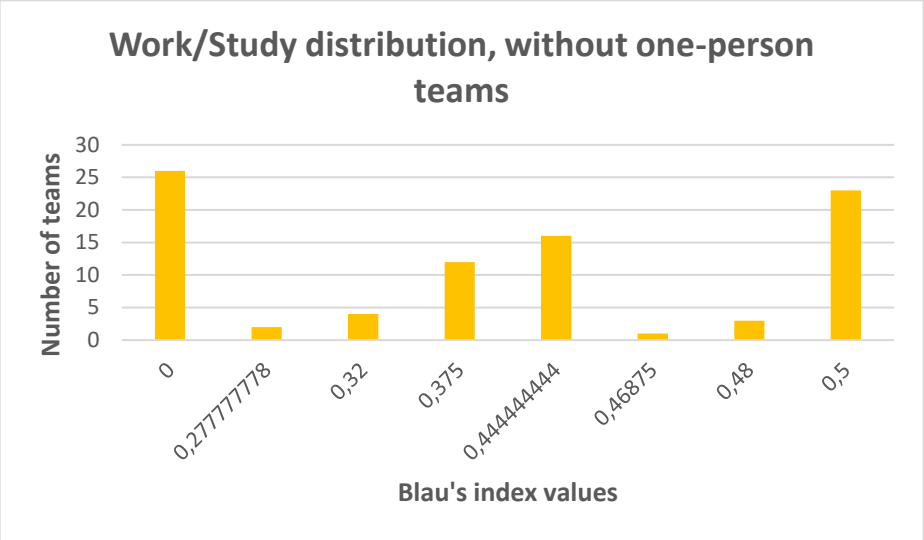

Age distribution
Number of teams
90
80
70
60
50
40
30
20
10
0
0
0,244897959
0,32
0,375
0,444444444
0,48
0,5
0,5625
0,611111111
0,625
0,64
0,666666667
0,75
Blau's index values

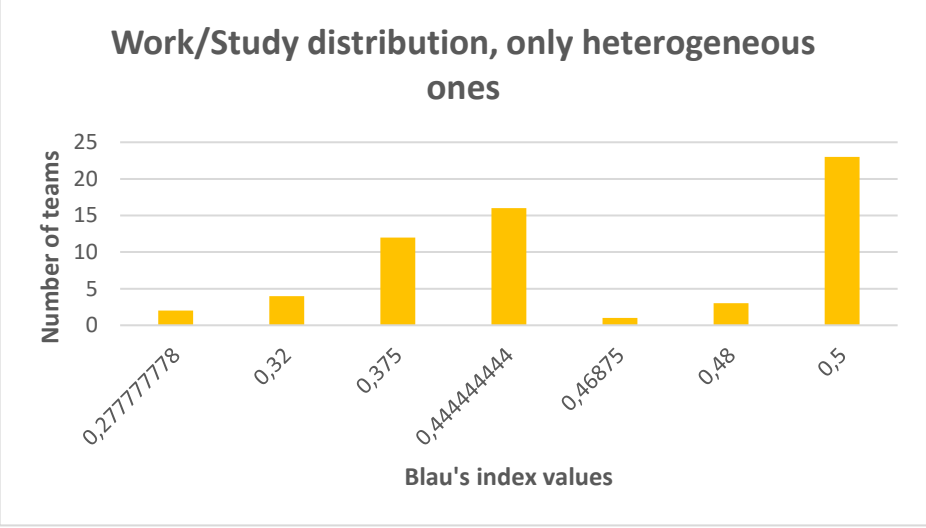

Age distribution, without one-person teams
Number of teams
35
30
25
20
15
10
5
0
0
0,244897959
0,32
0,375
0,444444444
0,48
0,5
0,5625
0,611111111
0,625
0,64
0,666666667
0,75
Blau's index values


Age distribution, just heterogeneous ones
Number of teams
20
15
10
5
0
0,244897959
0,32
0,375
0,444444444
0,48
0,5
0,5625
0,611111111
0,625
0,64
0,666666667
0,75
Blau's index values

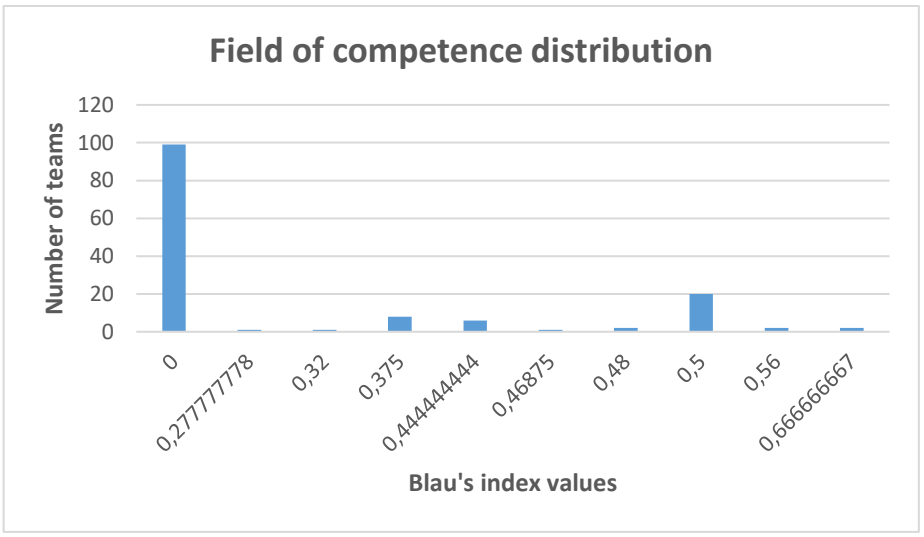
Work/Study

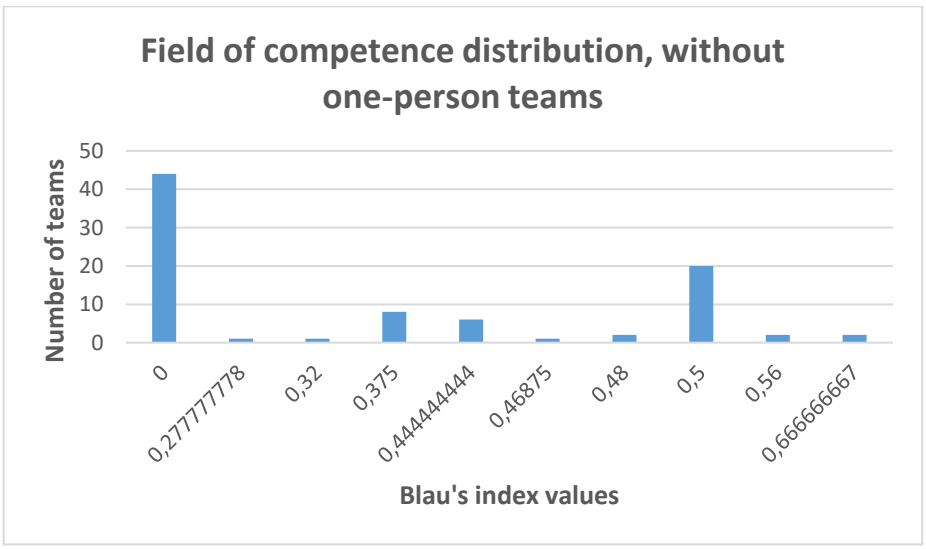

Work/Study distribution
Number of teams
90
80
70
60
50
40
30
20
10
0
0
0,277777778
0,32
0,375
0,444444444
0,46875
0,48
0,5
Blau's index values

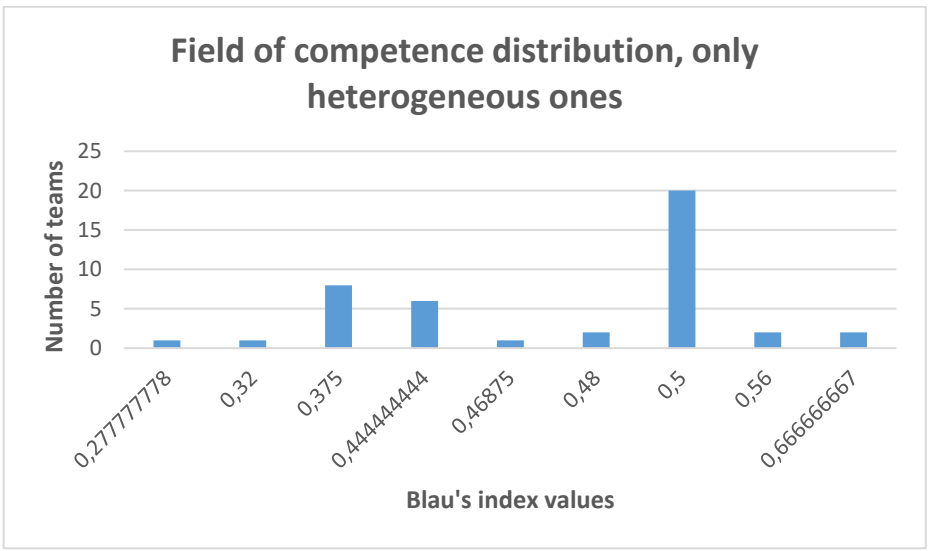

Work/Study distribution, without one-person teams
Number of teams
30
25
20
15
10
5
0
0
0,277777778
0,32
0,375
0,444444444
0,46875
0,48
0,5
Blau's index values


Work/Study distribution, only heterogeneous ones
Number of teams
25
20
15
10
5
0
0,277777778
0,32
0,375
0,444444444
0,46875
0,48
0,5
Blau's index values

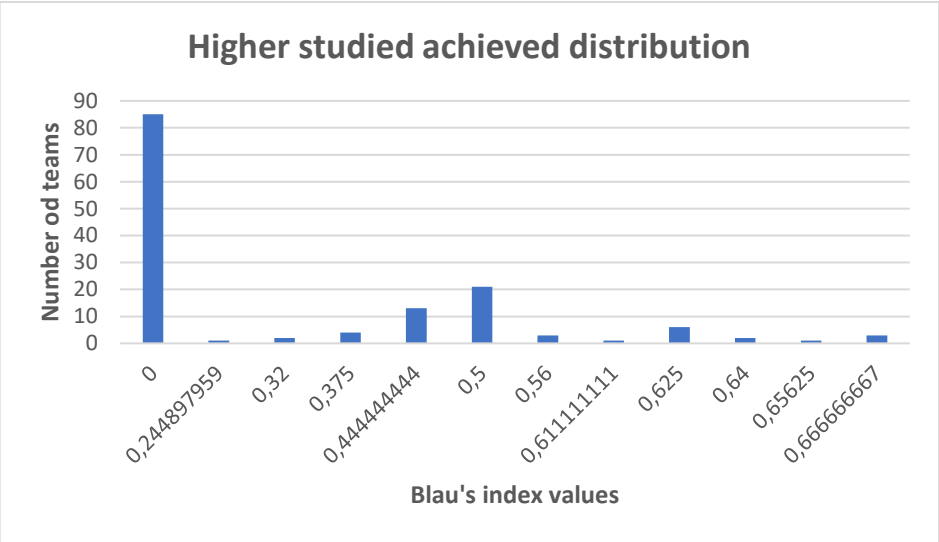
Field of competence

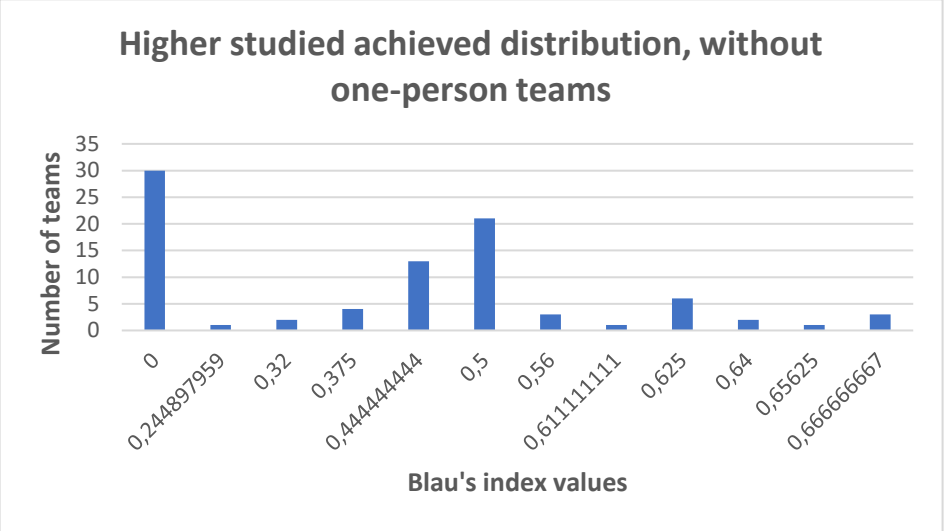


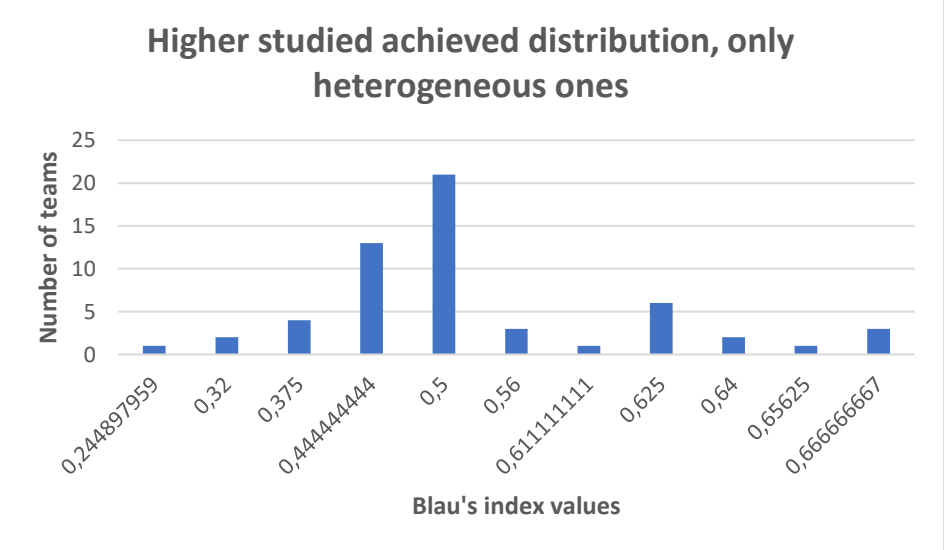




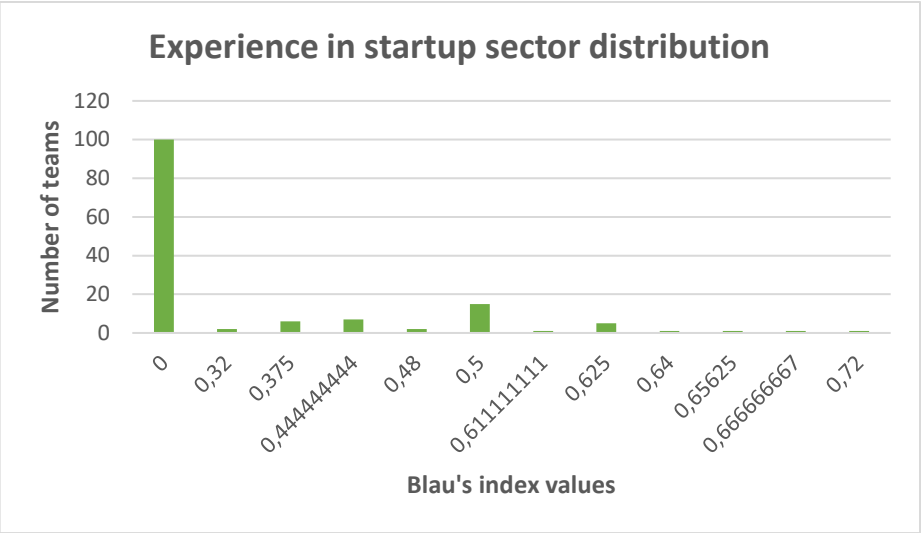
Higher studies achieved

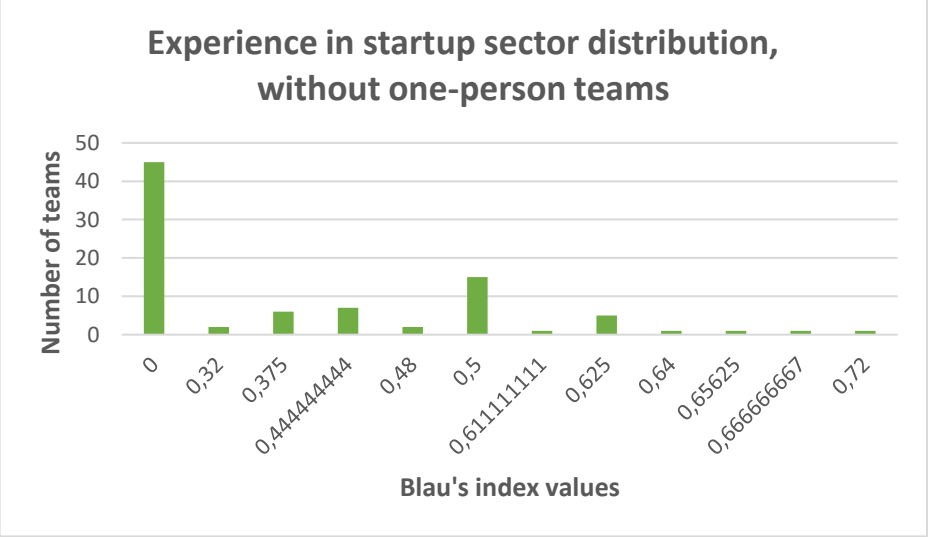


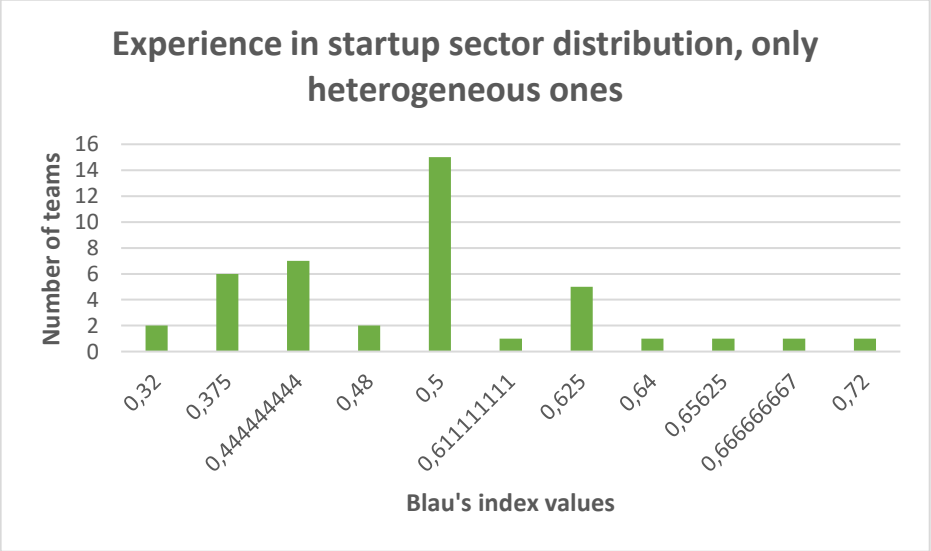




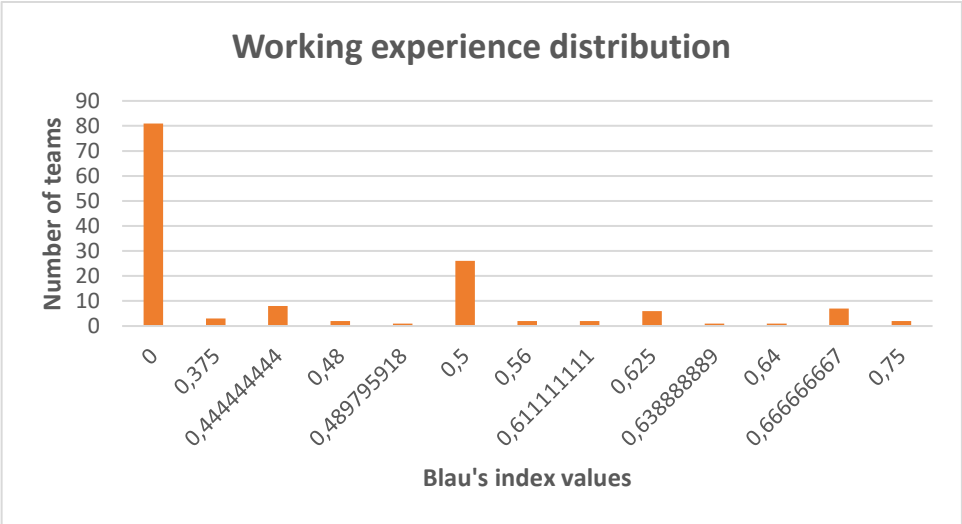
Experience in start-up sector

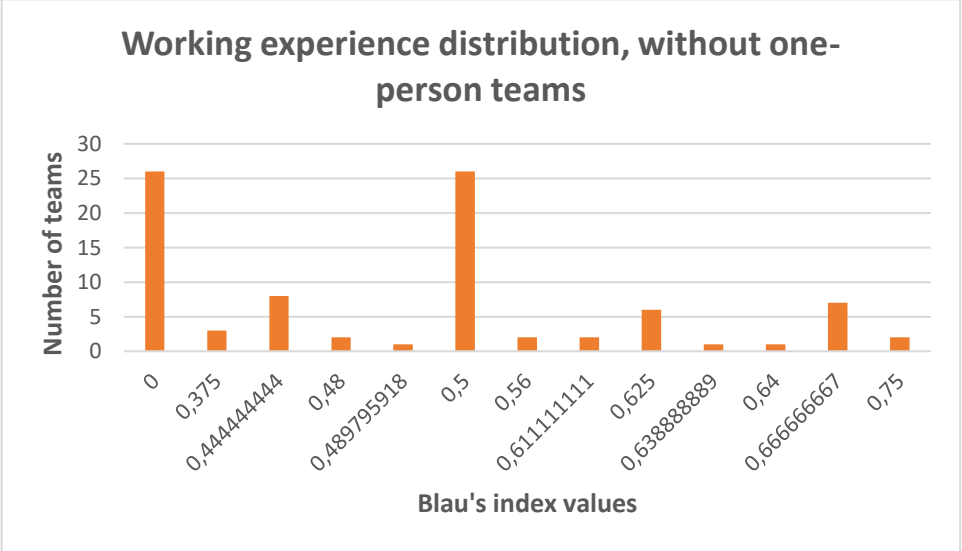


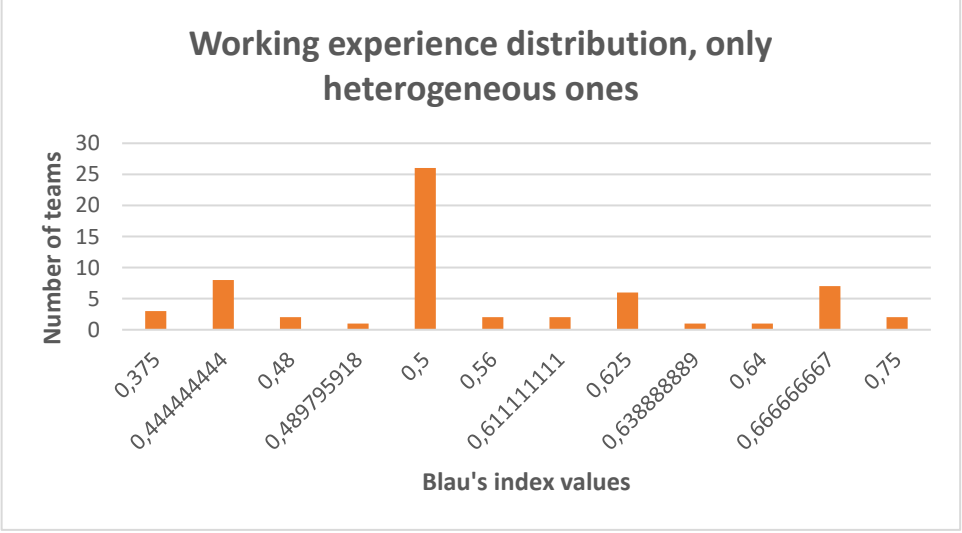




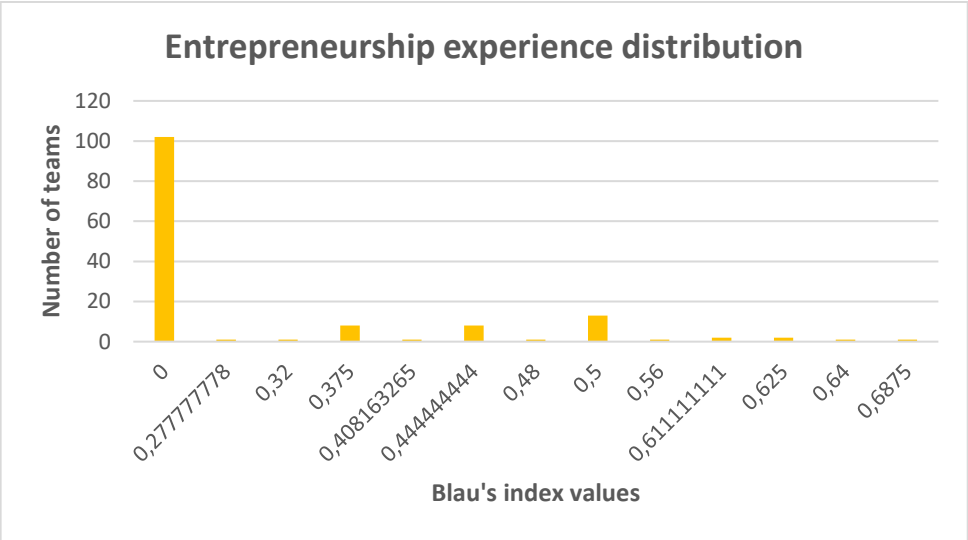
Working experience

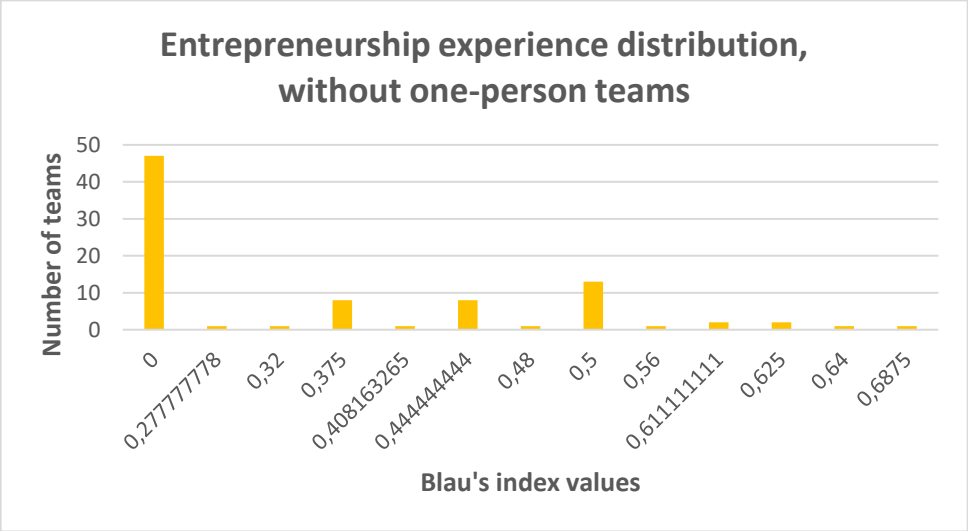


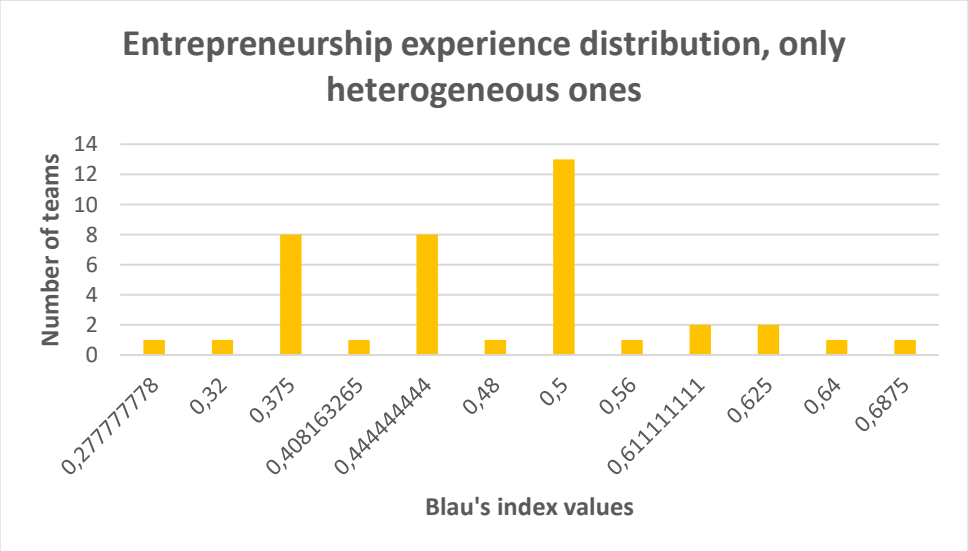




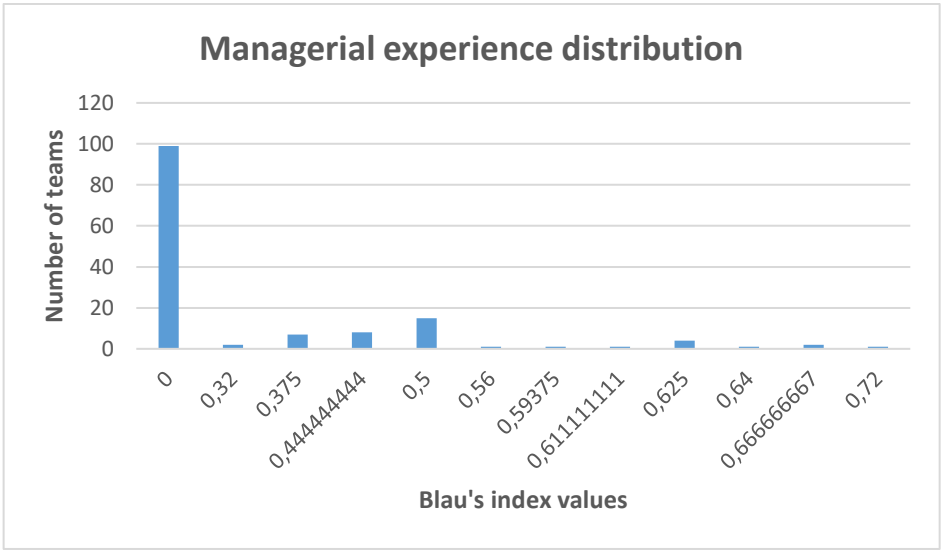
Entrepreneurship experience

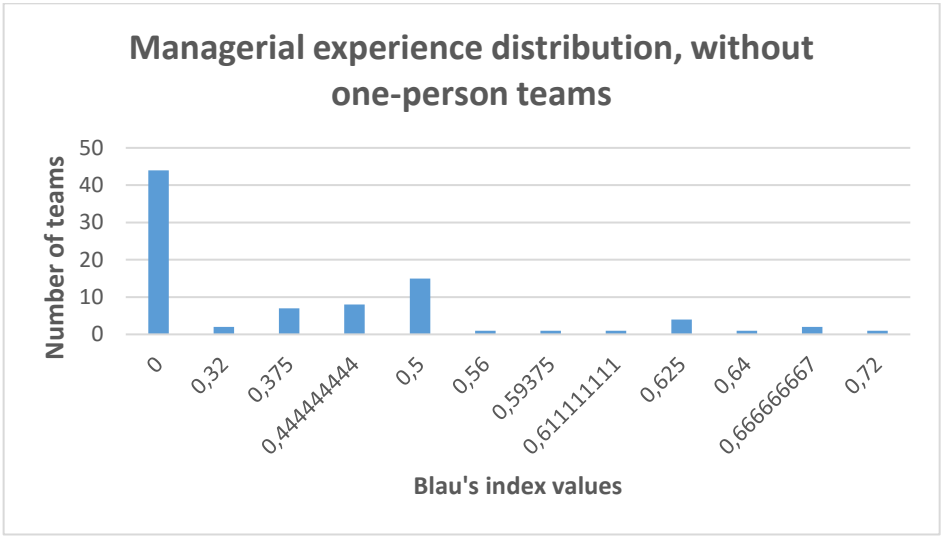


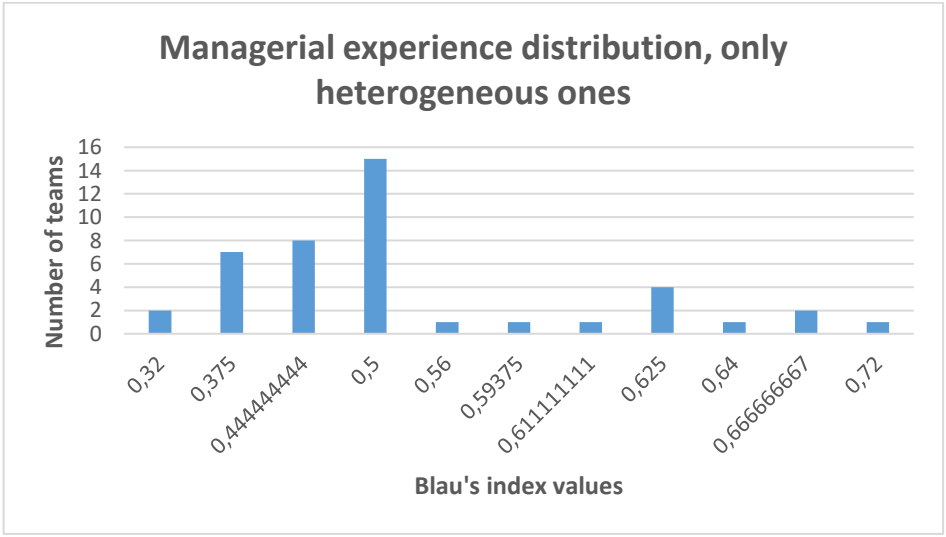




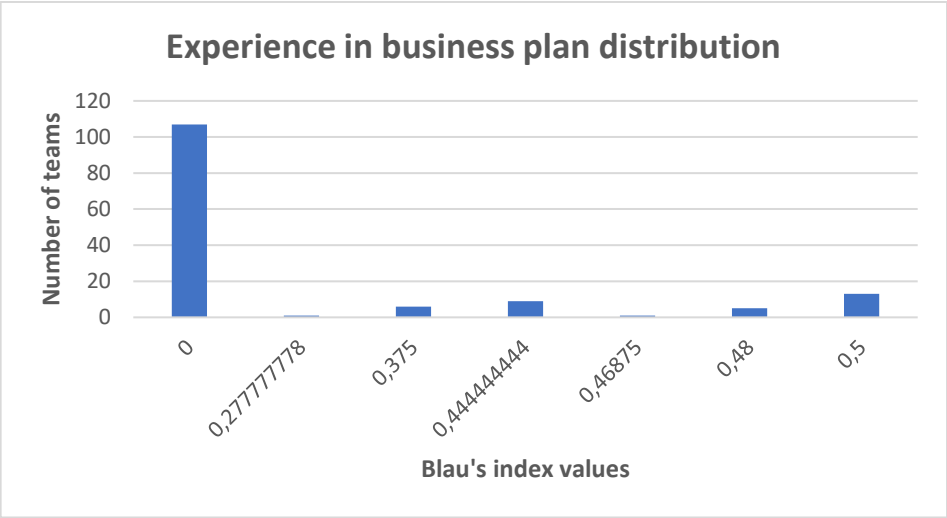
Managerial experience

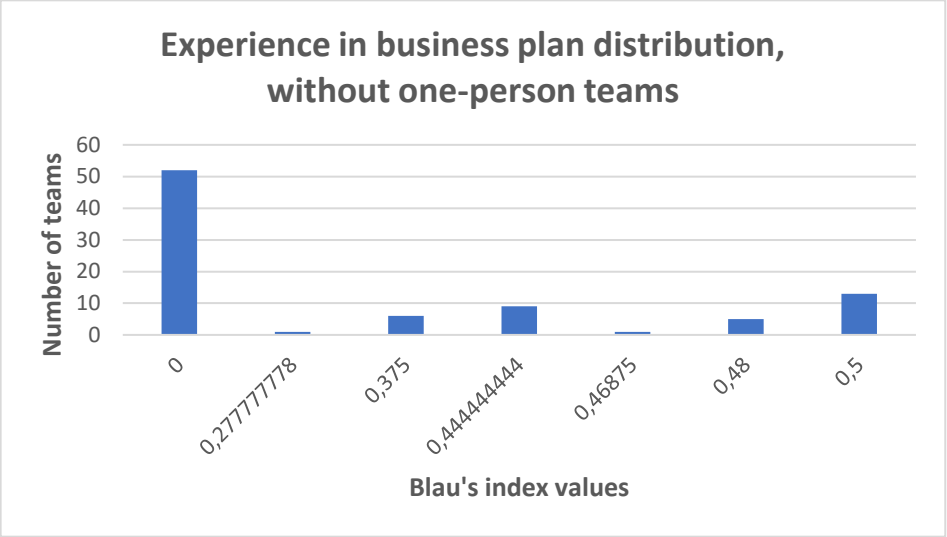


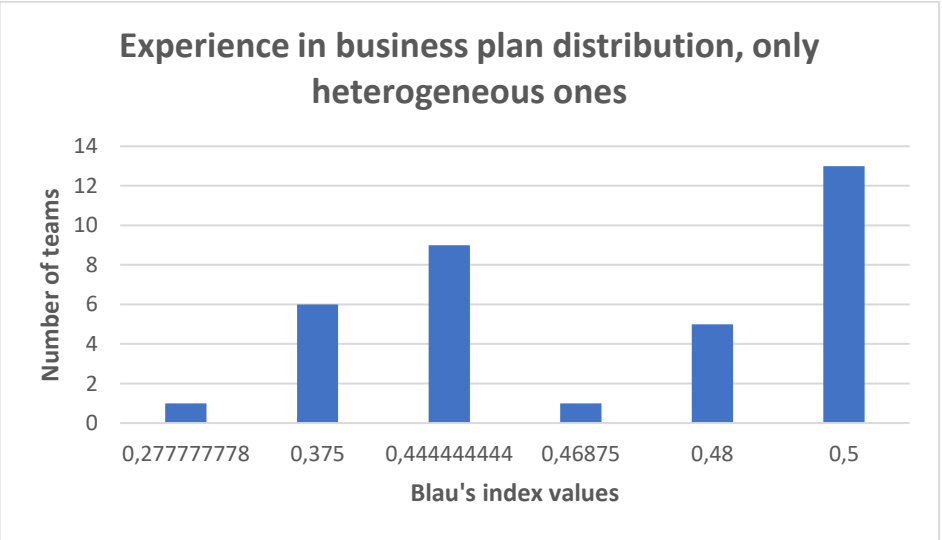




Experience in business plans







APPENDIX D: Regression analysis with the sum of Blau's Factor as heterogeneity variable

	scie_av	scie_av
c1	-0.190	
	(0.91)	
c2		-0.284
		(1.63)
a1	-0.110	-0.079
	(0.51)	(0.37)
i1	0.017	0.017
	(0.15)	(0.16)
nteam	-0.041	-0.030
	(0.21)	(0.15)
nstud	0.142	0.146
	(0.69)	(0.72)
d_fisi	0.466	0.489
	(1.41)	(1.47)
ndonne	-0.044	-0.060
	(0.25)	(0.34)
d_tstem	-0.250	-0.323
	(0.68)	(0.86)
d_tecon	-0.190	-0.176
	(0.45)	(0.42)
averbpexp	0.703	0.717
	(2.21)**	(2.29)**
t_averorelavoro	0.022	0.023
	(2.04)**	(2.17)**
t_avertitolostud	0.007	0.006
	(0.13)	(0.11)
averageage	-0.027	-0.024
	(0.72)	(0.65)
d_book	-0.005	-0.042
	(0.01)	(0.09)
tannistartupexp	0.036	0.034
	(1.32)	(1.25)
tanniworkexp	0.010	0.011
	(0.29)	(0.29)
tannientrexp	-0.036	-0.039
	(0.84)	(0.93)
tannimanexp	0.000	-0.000
	(0.01)	(0.00)
bi_Cluster_1	0.064	0.040
	(0.33)	(0.21)
bi_Cluster_2	0.337	0.360
	(1.30)	(1.38)
d_fashion	-0.416	-0.441

	(1.01)	(1.05)
d_anim	-0.363	-0.368
	(0.75)	(0.76)
d_media	-0.766	-0.774
	(1.83)*	(1.85)*
d_edu	0.059	0.063
	(0.12)	(0.13)
d_casa	-0.330	-0.312
	(0.68)	(0.65)
d_amb	0.023	-0.017
	(0.03)	(0.03)
d_auto	-0.587	-0.604
	(1.14)	(1.17)
d_food	-0.402	-0.417
	(0.87)	(0.91)
d_sal	-0.483	-0.504
	(0.97)	(1.01)
d_softw	0.226	0.229
	(0.49)	(0.50)
d_indu	0.750	0.860
	(1.40)	(1.64)
d_elettronica	-0.908	-0.962
	(1.64)	(1.74)*
d_agrico	-0.082	-0.028
	(0.21)	(0.07)
d_energy	-2.001	-2.068
	(3.89)***	(4.19)***
d_hard	0.365	0.378
	(0.51)	(0.54)
d_servcon	-0.231	-0.230
	(0.47)	(0.47)
d_nordest	-1.218	-1.213
	(2.51)**	(2.55)**
d_centro	0.114	0.058
	(0.27)	(0.13)
d_sud	-0.294	-0.323
	(0.76)	(0.85)
d_isole	-0.341	-0.297
	(0.72)	(0.62)
_cons	2.868	3.081
	(1.77)*	(1.96)*
R^2	0.35	0.36
N	142	142

APPENDIX E: Correlation matrix Heterogeneity and traits of the team

Correlazioni

		Dummy 1	Dummy 2	Dummy 3	confidence	analytic	intuitive
Dummy 1	Correlazione di Pearson	1	-,549**	-,522**	-,137	,028	,080
	Sig. (2-code)		,000	,000	,105	,738	,344
	N	142	142	142	142	142	142
Dummy 2	Correlazione di Pearson	-,549**	1	-,427**	,033	-,072	-,139
	Sig. (2-code)	,000		,000	,699	,396	,098
	N	142	142	142	142	142	142
Dummy 3	Correlazione di Pearson	-,522**	-,427**	1	,114	,043	,056
	Sig. (2-code)	,000	,000		,175	,615	,510
	N	142	142	142	142	142	142
confidence	Correlazione di Pearson	-,137	,033	,114	1	,228**	,152
	Sig. (2-code)	,105	,699	,175		,006	,071
	N	142	142	142	142	142	142
analytic	Correlazione di Pearson	,028	-,072	,043	,228**	1	-,180*
	Sig. (2-code)	,738	,396	,615	,006		,032
	N	142	142	142	142	142	142
intuitive	Correlazione di Pearson	,080	-,139	,056	,152	-,180*	1
	Sig. (2-code)	,344	,098	,510	,071	,032	
	N	142	142	142	142	142	142

**. La correlazione è significativa al livello 0,01 (2-code).

*. La correlazione è significativa al livello 0,05 (2-code).

Appendix F: Correlation matrix heterogeneity and traits of the leader

Correlazioni

		Dummy 1	Dummy 2	Dummy 3	locusofcontrol	risktaker	riskaverse	selfefficacy	selfregulation
Dummy 1	Correlazione di Pearson	1	-,549**	-,522**	-,158	-,137	-,105	-,065	-,042
	Sig. (2-code)		,000	,000	,060	,105	,215	,443	,621
	N	142	142	142	142	142	142	142	142
Dummy 2	Correlazione di Pearson	-,549**	1	-,427**	,151	,018	,045	,025	,090
	Sig. (2-code)	,000		,000	,073	,833	,596	,765	,286
	N	142	142	142	142	142	142	142	142
Dummy 3	Correlazione di Pearson	-,522**	-,427**	1	,017	,130	,067	,044	-,047
	Sig. (2-code)	,000	,000		,840	,124	,425	,600	,581
	N	142	142	142	142	142	142	142	142
locusofcontrol	Correlazione di Pearson	-,158	,151	,017	1	,384**	,099	,193*	-,140
	Sig. (2-code)	,060	,073	,840		,000	,241	,021	,097
	N	142	142	142	142	142	142	142	142
risktaker	Correlazione di Pearson	-,137	,018	,130	,384**	1	-,181*	,215*	-,322**
	Sig. (2-code)	,105	,833	,124	,000		,031	,010	,000
	N	142	142	142	142	142	142	142	142
riskaverse	Correlazione di Pearson	-,105	,045	,067	,099	-,181*	1	,177*	,125
	Sig. (2-code)	,215	,596	,425	,241	,031		,035	,138
	N	142	142	142	142	142	142	142	142
selfefficacy	Correlazione di Pearson	-,065	,025	,044	,193*	,215*	,177*	1	,405**
	Sig. (2-code)	,443	,765	,600	,021	,010	,035		,000
	N	142	142	142	142	142	142	142	142
selfregulation	Correlazione di Pearson	-,042	,090	-,047	-,140	-,322**	,125	,405**	1
	Sig. (2-code)	,621	,286	,581	,097	,000	,138	,000	
	N	142	142	142	142	142	142	142	142

**. La correlazione è significativa al livello 0,01 (2-code).

*. La correlazione è significativa al livello 0,05 (2-code).

BIBLIOGRAPHY

Amason A. C., Shrader R. C., Tompson G. H. (2006) Newness and novelty: Relating top management team composition to new venture performance *Journal of Business Venturing* 21 (2006) 125- 148

Bantel K.A., Jackson S.E. (1989) Top Management and Innovations in Banking: Does the Composition of the Top Team Make a Difference? *Strategic Management Journal*, Vol. 10, Special Issue: Strategic Leaders and Leadership (Summer, 1989) pp. 107-124

Bernile G., Bhagwat V., Yonker S. (2018) Board diversity, firm risk, and corporate policies *Journal of Financial Economics*, 2018, vol. 127, issue 3, 588-612

Camuffo, A., Cordova, A., & Gambardella, A. (2017). A Scientific Approach to Entrepreneurial Decision- Making: Evidence from a Randomized Control Trial.

Cantamessa M., Montagna F. (2016) Management of Innovation and Product Development: Integrating Business and Technological Perspectives

Clarysse Bart, Moray Nathalie (2004) A process study of entrepreneurial team formation: the case of a research-based spin-off *Journal of Business Venturing* 19 (2004) 55-79

Cooney, T.M. (2005) Editorial: What is an Entrepreneurial Team? Dublin Institute of Technology, Ireland. *International Small Business Journal,* Vol 23(3):226-235

Cope J., Cave F., Eccles S. (2004) Attitudes of venture capital investors towards entrepreneurs with previous business failure, *Venture Capital*, 6:2-3, 147-172

Cui Y., Zhang Y., Guo J., Hu H., Meng H. (2018) Top management team knowledge heterogeneity, ownership structure and financial performance:

Evidence from Chinese IT listed companies *Technological Forecasting & Social Change* 140 (2019) 14-21

Davidsson P. Honig B. (2002) The role of social and human capital among nascent entrepreneurs *Journal of Business Venturing* 18 (2003) 301-331

Eisenmann T, Ries E, Dillard S (2013) Hypothesis-driven entrepreneurship: The Lean Startup. *Harvard Business School* Note 90-812-095.

Foo M.D. (2009) Teams developing business ideas: how member characteristics and conflict affect member-rated team effectiveness University of Colorado, Boulder, USA. *Small Bus Econ* 36: 33-46

Foo M.D., Wong P. K., Ong A. (2005) Do others think you have a viable business idea? Team diversity and judges' evaluation of ideas in a business plan competition *Journal of Business Venturing* 20 (2005) 385-402

Guo B., Pang X., Li W. (2018) The role of top management team diversity in shaping the performance of business model innovation: a threshold effect, *Technology Analysis & Strategic Management*, 30:2, 241-253

Hamilton, B. H. Nickerson, J. A. and Owan, H., Diversity and Productivity in Production Teams (2004). Available at SSRN: https://ssrn.com/abstract=547963 or http://dx.doi.org/10.2139/ssrn.547963

Harrison D.A., Price K. H., Bell M. P. (1998) Beyond Relational Demography: Time and the Effects of Surface- and Deep-Level Diversity on Work Group Cohesion *The Academy of Management Journal,* Vol. 41, No. 1 (Feb., 1998), pp. 96-107

David A. Harrison, Kenneth H. Price, Joanne H. Gavin and Anna T. Florey (2002) Time, Teams, and Task Performance: Changing Effects of Surface- and Deep-

Level Diversity on Group Functioning *The Academy of Management Journal*, Vol. 45, No. 5 (Oct., 2002), pp. 1029-1045

Hmieleski K. M., Ensley, M. D.(2015) A contextual examination of new venture performance: Entrepreneur leadership behavior, top management team heterogeneity, and environmental dynamism. *Journal of Organizational Behavior*, 28 (7), pp. 865-889.

Hodgkinson, G.P., Sadler-Smith, E. (2018) The dinamics of intuition and analysis in managerial and organizational decision making. *Academy of Management Perspectives*, Vol. 32, No. 4, 473–492

Hoogendoorn, S., Oosterbeek, H., Van Praag, M. (2013) The Impact of Gender Diversity on the Performance of Business Teams: Evidence from a Field Experiment. *Management Science* 59(7):1514-1528. https://doi.org/10.1287/mnsc.1120.1674

Kaiser U., Müller B. (2015) Skill heterogeneity in startups and its development over time *Small Bus Econ* (2015) 45:787-804

Kerr S.P., Kerr W.R., Xu T. (2017) Personality Traits of Entrepreneurs: A Review of Recent Literature *Harward Business Review* Working Paper 18-047

Korunka C., Frank H. Lueger M. Mugler J. (2003) The Entrepreneurial Personality in the Context of Resources, Environment, and the Startup Process- A Configurational Approach *Entrepreneurship Theory and Practice* Vol 28, Issue 1, 2003

Lecher T. (2001) Social Interaction: A Determinant of Entrepreneurial Team Venture Success *Small Business Economics*, June 2011, Volume 16, Issue 4, pp 263-278

Manconi A., Rizzo A.E., Spalt O. (2017) Diversity. Available at SSRN: https://ssrn.com/abstract=2706550 or http://dx.doi.org/10.2139/ssrn.2706550

Nkomo, S. M., Cox, T. (1996). Diverse identities in organizations, Handbook of organization studies (pp. 338-356). Thousand Oaks, CA, US. *Sage Publications, Inc.*

Ruef M., Aldrich H.E., Carter N. M. (2003) The Structure of Founding Teams: Homophily, Strong Ties and Isolation among U.S. Entrepreneurs *American Sociological Review*, 2003, Vol. 68 (April: 195-222)

Steigertahl L., Mauer R., Say J.B. (2018) EU Startup Monitor

Terjesen S., Sealy R. Singh V. (2009) Women directors on Corporate Boards: A Review and research Agenda *Corporate Governance: An International Review*, 2009, 17(3):320-337

Zheng Y. (2011) Unlocking founding team prior shared experience: A transactive memory system perspective. *Journal of Business Venturing* 27 (2012) 577-591

SITOGRAPHY

https://hbr.org/2018/07/research-the-average-age-of-a-successful-startup-founder-is-45

https://www.forbes.com/sites/sophiamatveeva/2018/04/30/what-makes-great-start-up-teams-and-how-to-find-it/#178171d716f6

https://www.facebook.com/

http://www.thestartuplab.polito.it/

https://link.springer.com/article/10.1023/A:1011167519304

https://startupgenome.com/reports

RINGRAZIAMENTI

Ai miei genitori, cui devo metà di questa laurea per il loro supporto, l'ascolto e l'avermi insegnato a credere in me e a perseguire le cose importanti.

A Marco, che c'è ogni giorno con il suo buon umore e la sua dolcezza.

A Irene e Giulia, i miei esempi da sempre.

A Mattia, Sara, Silvia ed Elena, con cui ho condiviso così tante delle esperienze di questi anni.

Ad Angelica, Virginia, Giulia e Letizia, che da una vita mi conoscono e ricordano chi sono.

A JEToP, che è stata la mia seconda famiglia.

A tutti gli amici con cui ho avuto l'onore di condividere i migliori momenti.

Ai miei compagni di tesi, è stato molto più divertente affrontare il progetto con un team così.

Ad Andrea, senza il quale non so se questa tesi sarebbe mai stata conclusa.

Ed infine al professor Paolucci, che con la sua guida sicura e veloce è stato il miglior mentore che potessi desiderare.