POLITECNICO DI MILANO

Scuola di Ingegneria dei Sistemi

Corso di Laurea in Ingegneria Gestionale

Do crowd-funded projects attract angels and venture capitalists?

I progetti di crowd-funding attirano i business angels e i venture capitalists?

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Anno Accademico 2014 / 2015

"Crowdfunding has the potential to revolutionize the financing of small business, transforming millions of users of social media such as Facebook into overnight venture capitalists, and giving life to valuable business ideas that might otherwise go unfunded." - The Wall Street Journal

Summary

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Abstract

This thesis tracks down hardware crowdfunding campaigns to understand whether they manage to raise additional rounds of financing from angel investors and venture capital investors. I used a sample of 300 crowdfunding campaigns, involving 290 firms, in hardware industry launched in Kickstarter or Indiegogo since the foundation of these two platforms till the end of 2013 that raised at least USD 100,000. While I confirmed the path dependency of ventures in financing (i.e., receipt of follow-on financing is more likely for ventures with prior angel and VC-backing), I additionally hypothesize two signals that moderate this relationship, successful product delivery and success ratio. Shipping successfully a product after a crowdfunding campaign increases the likelihood of previous traditional funding on obtaining follow-on funding after the campaign. However, I fail to find empirical support for the moderating role of success ratio, which is defined as the ratio of pledged capital to target capital in the campaign. Finally, I found that the amount raised and at least a granted patent increases the likelihood of getting traditional funds after the campaign. Overall, my results are robust to inclusion of human capital of founders and suggest contingent evidence to the path dependency of follow-on financing for successful angel or VC-backed firms.

Keywords: crowdfunding, venture capital, business angel, signaling theory

Abstract (in Italian)

Questa tesi analizza campagne di crowdfunding relative a progetti hardware per capire se esse aiutino a raccogliere successivi round di finanziamenti da business angels e venture capitalists. Ho usato un campione di 300 campagne, per un totale di 290 aziende, all'interno di industrie di hardware, lanciate in Kickstarte o Indiegogo fra la nascita delle piattaforne stesse e la fine del 2013 che hanno raccolto almeno 100.000 dollari americani. Le mie analisi confermano l'interdipendenza fra diverse fasi di finanziamento (è più facile ottenere nuovi finanziamenti se già se ne ha ottenuto uno da business angels o venture capitalists in precedenza). Ho ipotizzato poi due segnali che moderano questo risultato: la consegna del reward stabilito e il *success ratio* di una campagna. La consegna che segue la campagna accresce l'effetto di finanziamenti tradizionali precedenti nell'ottenere finanziamenti successivi alla campagna stessa. Non ho invece trovato conferma empirica del ruolo del *success* ratio, definito come capitale raccolto diviso per il target della campagna. Infine, ho trovato che il capitale raccolto durante la campagna e l'aver almeno un brevetto approvato aumento la probabilità di ottenere successevi finanziamenti. In generale, i miei risultati sono robusti all'inclusione del capitale umano e suggeriscono la stretta dipendenza fra i diversi rounds di finanziamento.

Parole chiave: crowdfunding, venture capital, business angel, teoria dei segnali

Introduction

Crowdfunding is an emergent field of entrepreneurial financing. Along with its fast pace it has attracted the attention of stakeholders including entrepreneurs, venture capitalists, and angels. Figure 1 shows the growth of crowdfunding from a phenomenon applied only in creative fields with small amounts of money relatively on the order of a few thousands of USD per project to a phenomenon that raises billions of USD for a project. To further illustrate the scale of crowdfunding, I take the example of Kickstarter, the biggest crowdfunding platform in the world; this platform raised more than USD 1.6 billion since its creation[1].

With growing interesting among practitioners, likewise scholars have recently begun to investigate the determinant of success for crowdfunding campaigns, including the behaviors of crowdfunders as well as a set of project characteristics (Mollick, 2014; Colombo, Franzoni and Rossi 2014). Research yet lacks contributions on two fronts: (1) We know relatively little about the consequences of crowdfunding for firms using these platforms as more and more entrepreneurs choose this type of seed financing to bootstrap. For instance, does crowdfunded projects manage to deliver their promised products and/or raise additional funding from venture capitalists and angel investors? (2) We still relatively know if successful crowdfunding campaigns can serve incidentally as a quality signal to potential future investors and this residual signaling effect is a determinant of choice of entrepreneurs to engage in listing their projects on these platforms (selection into crowd-funding to provide information on pre-ordered products and demand). These two sets of questions

[1] https://www.kickstarter.com/help/stats?ref=footer

are inter-related as they try to shed light on selection and treatment effect of crowdfunding for ventures choosing to follow this strategy.

I take on the challenge of developing my thesis around the first question (e.g., consequences of crowdfunding for raising additional financing from VCs and angels) for the following reasons. Traditional investors such as venture capitalists and angels face problems stemming from information asymmetry with regards to ventures they screen to fund. Entrepreneurial ventures have limited track record of sales, often composed of high intangible assets (in the case of high-tech ventures). Furthermore, entrepreneurs might have incentives to exaggerate their prospects and misrepresent the information regarding their success likelihood or simply be overoptimistic. Information asymmetry has the consequence of adverse selection for investors and several solutions are proposed in the literature in general including warranties, information disclosure, signals and reputation (Dewally and Ederington, 2006). We focus on signaling as accessible solutions for entrepreneurs to alleviate such information concerns to investors (Dutta and Folta, 2015); signals are correlated positively with quality of ventures and have two features (1) they are observable and (2) more costly for low-quality types (i.e., signaler) to produce than for high-quality ones (e.g., Connelly, Certo, Ireland, and Reutzel, 2011). In the context of crowdfunding, we investigate whether there are particular types of signals arising in this context that attracts investors. More specifically, we find that conditional on previous traditional funding (i.e., before the start of the campaign), delivering a product can increase the likelihood of follow-on financing from traditional investors. This finding is in line with prior findings that prototypes and patents are quality signals to investors (e.g., Hsu and Zeiodenis, 2013; Audretsch and Bönte 2012). Our results uncover some of the unobserved heterogeneity regarding serial correlation of traditional financing of new ventures (Ozmel, Robinson, and Stuart 2013); in other words, ventures are

path dependent and manage to obtain additional financing in subsequent rounds from existing investors and new investors; however, certain signals during each milestone moderates the likelihood of continuation of investment from existing investors, the type of investors, and the valuation of company in a subsequent round of financing. For instance, Mohammadi, Shafi, and Johan (2014) find that withdrawal of an investment by one existing investor (especially, when they are reputable and generalist investors) conveys negative signals and decrease the valuation of company in the subsequent round of financing; results of my thesis further complements this investigation by suggesting that product delivery in a capital-intensive category of product-market (e.g., hardware) encourages follow-on investors to continue investment. We hope to shed more light on whether crowd-funding is an alternative or complementary to traditional sources of financing and if so, when.

The results are from the total population of hardware companies raising capital above USD 100,000 up to the end of 2013 in two of the largest U.S. crowdfunding platforms (Kickstarter and Indiegogo). In this thesis, I collected a strata of variables on each project as follows: (1) project-specific information such as the company behind the project. (2) Whether firms received financing any time before and after the campaign (3) human capital of founders (4) patent data for firms (5) product characteristics and delivery information. Chapter 4 explains in detail my strategy of data collection and the set of variables along with their detailed descriptions.

The thesis is organized as follows. Chapter 1 analyses the crowdfunding market, its components and a general description of the platforms used in my thesis. Chapter 2 gives an overview on venture capitalists and business angels, then focuses on the selection criteria they use to select their firms. Finally, it proposes the selection procedure used by these professional investors. Chapter 3 discusses information asymmetry in entrepreneurship and entrepreneurial

financing and offers signaling theory. Chapter 4 presents my dataset by explaining all the variables collected. Chapter 5 is about my research hypothesis and the empirical results including descriptive statistics of variables, and relevant regressions. I conclude with Chapter 6.

Chapter 1:
The Crowdfunding Market

In this first chapter I give a general overview on the crowdfunding market. Some definitions are proposed, some examples introduced. A deep description on Kickstarter and Indiegogo is presented. Finally, I explain advantages and disadvantages in starting a crowdfunding campaign for entrepreneurs and backers.

1. The Crowdfunding Market

Crowdfunding is a quite recent phenomenon. In this first chapter I will explain what crowd-funding is and I will provide some background on why there is a growing interest in understanding the details related to this phenomenon. Crowdfunding is becoming more and more important due to the size of the capital that the entrepreneurs are collecting in this way, consequently the topic started to attract the academic environment. Looking at figure 1, it is obvious the exponential growth of the crowdfunding investments just in Kickstarter, the biggest crowdfunding platform in the USA. Up to March 2015, they raised 1.6 billions of dollars.

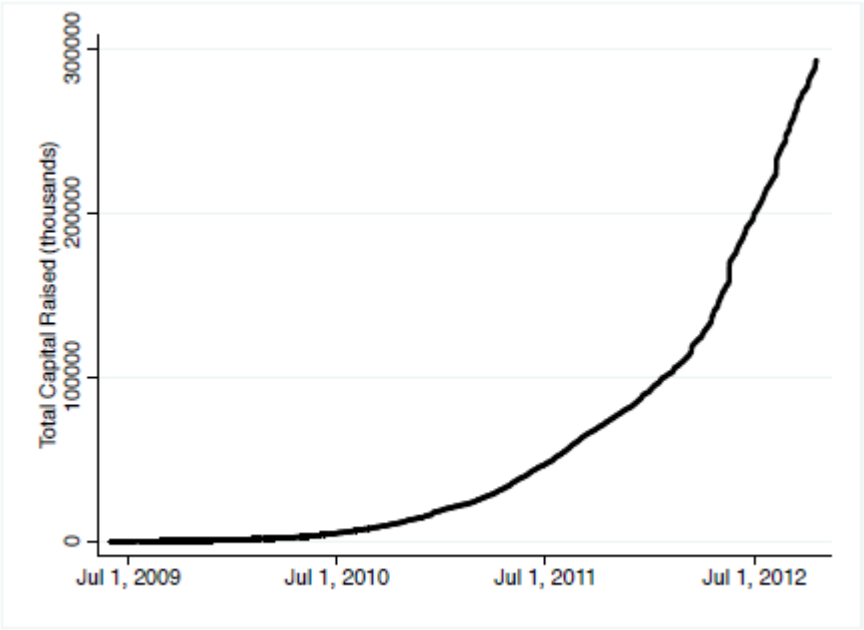

Figure 1: total capital raised (thousands) on Kickstarter by succesfull projects

Instead of collecting money from the traditional sources, such as venture capitalist or business angel, anyone who has a business idea can propose it on a crowdfunding platform and collect little amount of money from a very large number of people. This perspective radically changes the way of financing the earliest stage of a new venture: instead of spending lots of resources to convince a traditional funder to invest money to fund a new project, the ability of the

entrepreneur now became the capability of using the social network and all the resources available to convince many people with completely different skills, knowledge and availability of resources to finance, even in a very little part, the new project. I will start giving some definitions.

1.1 A definition

Crowdfunding is a new way of collecting external resources for entrepreneurs. Thanks to Internet, entrepreneurs can raise money on a crowdfunding platform. The process allows many individuals to contribute to the financing of the project by pledging little amount of money.

One of the first definition about crowdfunding, given in an overview study about the topic by Schwienbacher and Larralde (2010), is "*an open call, essentially through the Internet, for the provision of financial resources either in form of donation or in exchange for some form of reward and/or voting rights in order to support initiatives for specific purposes*". Additionally, Mollick (2014) proposed the following definition: "*crowdfunding refers to the efforts by entrepreneurial individuals and groups – cultural, social, and for-profit – to fund their ventures by drawing on relatively small contributions from a relatively large number of individuals using the Internet, without standard financial intermediaries".* This definition, compared to the previous one, doesn't give any detail about the goal of the crowdfunded effort and on the goal of the funders, and these are the two aspects that vary the most in crowdfunding. The magnitude and the goal of the founders can vary a lot, from a very little fund raising for an artistic or a cultural activity, to a research of hundreds of thousands of dollars (that can bring to a collection of a few millions). A third definition, by Schwienbacher and Larralde (2012), views the funders as the distinctive characteristics of crowdfunding compared to traditional sources of financing: crowdfunding is

"the financing of a project or a venture by a group of individuals instead of professional parties".

In the next paragraph I will provide several successful examples of crowdfunding.

1.2 Some examples of crowdfunding campaigns

The first example is *Star citizen*[2], a videogame that collected the largest amount of money of the crowdfunding history. Chris Roberts, the inventor of the videogame, raised almost 70 million of dollars from almost 600 thousand backers (i.e. an average of 100 dollars per backer). The creator of the project started programming the first edition of this videogame with his own his friends' money, but when he was ready to launch his videogame he was running out of money to build a professional website. He initially used Kickstarter to start raising money from the crowd (more than 2 millions) and afterwards, he continued crowdfunding using his own website. Now, he is continuing to raise money developing new editions of the game.

Another example is the innovative e-paper display "Pebble[3]" watch that enables users to interact with their Android or iOS device through a wrist interface. After collecting USD 375,000 from angel investors in the Silicon valley, Eric Magicovsky, the inventor, needed more money to pass from the prototype to a small production run. Despite having created other successful products before and being affiliated with a high-profile incubator, he was not able to find follow-on money to complete his ongoing project. So, he decided to start a Kickstarter campaign on April 11th, 2012. He set a goal of USD 100,000 which was surprisingly reached in only two hours from the beginning of the

[2] http://www.cnbc.com/id/102021804#., https://www.kickstarter.com/projects/cig/star-citizen
[3] https://www.kickstarter.com/projects/597507018/pebble-e-paper-watch-for-iphone-and-android

campaign. By the end of the campaign, he raised more than 10 million of dollars from 68,929 backers, which broke the record for the biggest platform crowdfunded campaign at the time. He started shipping the product in January 2013, with just a few months of delay. In May 2013, Pebble raised another USD 15 million from venture capitalists. The example demonstrates how a project that has been initially rejected by traditional funding sources, after a successful campaign, that works as a signal, can obtain money.

The third successful example is Oculus Rift[4], the first truly claimed immersive virtual reality headset for video games. After having raised more than two million of dollars from a Kickstarter campaign in September 2012, Oculus received 91 million of dollars from venture capitalists, and in March 2014 was acquired by Facebook, Inc. for approximately 2 billion US dollars. This example shows again how a crowdfunding success helps the entrepreneurs obtain follow-on money and even a successfully exit.

These examples provide many themes that will be further discussed and examined through this thesis.

1.3 Short story of crowdfunding platforms

It's difficult to say when the first crowdfunding platform was invented; however, the first area in which crowdfunding took off is the music industry (and similarly arts and creativity-based industries such as film, comics and videogames). Most likely the first example of crowdfunding is a British rock band called Marillion that funded a US tour by raising nearly USD 60,000 via online donations from fans in 1997[5] . This successful campaign led to the creation of ArtistShare in 2000 in the United States, one of the first platform

[4] https://www.kickstarter.com/projects/1523379957/oculus-rift-step-into-the-game
[5] https://fundrise.com/education/blog-posts/from-the-statue-of-liberty-to-potato-salad-a-brief-history-of-crowdfunding

entirely dedicated to crowdfunding. Another early platform is Sellaband. It is based in Amsterdam and helps the musicians to raise money to produce their album. SellaBand's business model works in the following way: artists can post songs (or demos) on the platform; website visitors then can listen to music for free and choose the artists they want to invest in; artists attempt to raise USD 50,000 by selling "Parts" at USD 10 each; during the fundraising stage, money is held in an escrow until the threshold of $50,000 is reached. The $50,000 is used to fund the artist's recording project; finally, investors (the "Believers") are compensated with 10% of the revenue from the album. Other followers are, for example, Akamusic in Belgium and MyMajorCompany in France. Another successful platform is Seedmatch, where the crowd can buy shares of the start-up being in that case equity investors. The platform funded many project collecting up to USD 100,000 within a few days from many different backers. In this case, backers had also many interactions with the founders and had updates on the development of the project; these features are now common on the most popular platforms such as Kickstarter. Not only music industry benefited from crowdfunding, but also other creative industries. Sandawe, another platform, was mainly used to create comic books. The crowd had the possibility to read a few page of the book and then to give some money to the creators. In this case, the backer had 60% of the revenues up to repay his investment, and after this amount, the backer got only 40%. In this platform, an essential part of crowdfunding emerged: the creation of a community behind the project. More than the economic value of the investment, the crowd feels to be part of a group with the same goal and feels good because of this.

Many other platform were born in early 2000, and the amount collected through crowdfunding grew rapidly. However, the term "crowdfunding" was coined in 2006 by entrepreneur Michael Sullivan. The idea of crowd-funding was so powerful and prevalent that in 2008, when Barack Obama started his campaign

to became the President of the United States, used the principles of crowdfunding financing himself with little amounts from millions of people in a crowdfunding campaign. In 2008 both Kickstarter and Indiegogo were launched. These are the most important platforms at the moment and are raising the largest amount of money each year for their total listed projects. Following this brief history, I will give some more details about the two platforms since the dataset of my work is based on data collected from these two important platforms.

1.4 Kickstarter and Indiegogo

1.4.1 Kickstarter

The story

Kickstarter was launched on April 28, 2009 by Perry Chen, Yancey Strickler and Charles Adler and has now 107 employees. It is based in USA (New York) and originally allowed only to American citizens to create projects. In October 2008 Kickstarter opened to project based in United Kingdom and in 2013 opened also to Canada, Australia, New Zealand and finally in 2014 also to Denmark, Ireland, Norway, and Sweden. Backers instead can pledge their money from all over the world.

The amount of money raised by Kickstarter is impressive. Backers pledged more than 1.6 billion of dollars in more than 80,000 successful projects from almost 8 million of total backers[6]. More than two millions are repetitive backers, showing the "*community effect*" of crowdfunding.

[6] https://www.kickstarter.com/help/stats?ref=footer

The model

Kickstarter (hereafter, KS) raises money from the public. Project creators have to choose a deadline and a minimum funding goal. If the goal is not reached before the deadline, creators don't get any money. This fixed-funding scheme is intended to protect the backers given the assumption that if creators don't reach their stated goal, they are not able to realize the project. Funders are sometimes promised to receive rewards if they pledge sufficient amount of money corresponding to offered rewards on the platform. For instance, if backers pledge just a few dollars they will just receive a "thank you" on the website, or backers can pledge the amount equal to the price for the product and in exchange receive early, often discounted, product. Creators choose the type of rewards at will and allow various rewards adjusted for amount pledged.

If the project reaches its goal, KS applies a 5% fee, and the payment processors apply another 3-5%. Kickstarter doesn't claim any ownership over the projects (i.e., after the campaign is finished, the creators will continue their adventure on their own). All the materials on KS will not be removed so that people can continue to see the project on the platform.

It is important to mention that there is no guarantees for the backers regarding the fact that the product will be delivered. The projects could fail because the entrepreneurs are not able to carry on the project for various reasons. It could be underestimation of costs by entrepreneur or simply cases of fraud. Fraud can be either regarding the infringement of a patent or real thefts made by fake entrepreneurs that disappear after having raised the money. This case is anyway very rare (Mollick, 2014).

The guidelines

To have some control over the projecs, Kickstarter put some rules that creators have to follow. Kickstarter has some categories and each project has to stay inside a category, and must abide by the site's prohibited uses (including charity and awareness campaigns).

For hardware technology projects, that is the area of my interest, Kickstarter put some other requirements:

- Just creative projects are allowed
- It requires a physical prototype
- It requires a manufacturing plan
- For each reward, there has to be an expected delivery date
- For each project, a video explaining the project has to be created

All this requirements are pretty strict, but they reduce the information asymmetry between creators and funders.

1.4.2 Indiegogo

"When people join forces around a common goal, dreams can be realized. Rewind to 2008: Danae Ringelmann was an MBA student trying to open an Off-Broadway play. Eric Schell searched for funds for a Chicago theater company in his spare time. Slava Rubin started a charity event for myeloma cancer research after losing his father to the disease. Their struggles to find funding revealed a fundamental flaw in the system: for centuries, access to funds has been controlled by a select few. Danae, Eric, and Slava started Indiegogo in order to revolutionize the flow of funding, so it can reach and grow the ideas that matter" [7].

[7] https://www.indiegogo.com/about/our-story

From 2008 to now, Indiegogo became one of the biggest crowdfunding platform in the world.

The story

Indiegogo (hereafter, IG) was founded in January 2008 (one year before Kickstarter) in San Francisco by Danae Ringelmann, Slava Rubin and Eric Schell. In the first three years, they raised more than 50 million of US dollars in venture capital, which allowed them to accelerate the growth. In September 2011, the company raised a USD1.5 million Series Seed financing round, led by Metamorphic Ventures, ff Venture Capital, MHS Capital and Steve Schoettler, Zynga's co-founder[8]. In February 2012, President Barack Obama's Startup America partnered with Indiegogo to offer crowdfunding to entrepreneurs in the U.S[9]. In June 2012, Indiegogo raised a USD 15 million Series A round from Insight Ventures, Khosla Ventures and Steve Schoettler, Zynga's co-founder[10]. In January 2014, a Series B round of funding added $40 million to bring the total venture capital raised to $56.5 million[11].

Model

The model is very similar to the Kickstarter one. The main difference is that IG offers two types of crowdfunding models. The first one is the fixed-funding model, as in KS. The second one instead is a flexible-funding model: the difference is that in this model the founder gets the money even if he doesn't reach the target. IG applies a different type of fee depending on the model: if it's

[8] http://www.xconomy.com/san-francisco/2011/09/07/wednesday-deals-roundup-indiegogo-project-frog-bluearc/
[9] http://blogs.wsj.com/in-charge/2011/04/22/%E2%80%98startup-america%E2%80%99-embraces-crowd-funding/
[10] http://techcrunch.com/2012/06/06/indiegogo-funding-15-million-crowdfunding/
[11] http://blogs.wsj.com/venturecapital/2014/01/28/indiegogo-raises-40m-in-largest-venture-investment-yet-for-crowdfunding-startup/

a fixed campaign or a flexible campaign reaching the goal, the fee is 4%, however, if it's a flexible campaign that doesn't reach the target goal, the fee is 9%. There is also a payment fee that is again 3% to 5%. A third model, recently introduced by IG, is called forever-funding model. In this model, the period of the campaign never ends, and a funder can pledge money whenever he wants after the launch of the campaign. These different types of campaign give to IG a competitive advantage over its competitors.

Guidelines

Unlike KS, IG' guidelines are not strict and due diligence on the quality of projects are not carefully performed. Thus it's easier to create a campaign in IG. For example, on this platform it is possible to create charitable projects (which KS does not allow).

Comparison of KS and IG

In this part, I will compare the two platforms and I will offer some ideas about which platform an entrepreneur should consider based on the characteristics of his project and the community of each platform.

As I anticipated before, KS has more restrictive rules. This fact is reflected in the statistics: 44% of the KS projects have been successfully funded, while just 9% in IG[12]: there is a prior projects screening.

KS community is about 6 times bigger than the IG community. It means there are a lot more people following the new projects on Kickstarter, that means having more visibility. It means that if a person has a creative idea and is sufficiently confident to get the threshold, he would be better to use KS. It seems also that press gives more attention to KS projects, and this could be another element in favor of KS. On the other side creators in KS has to be

[12] http://www.theverge.com/2013/8/7/4594824/less-than-10-percent-of-projects-on-indiegogo-get-fully-funded

citizens of one of the just few States allowed by the platform, while Indiegogo allows projects from more than 200 States all around the world. Furthermore, due to the flexible-model in IG, an entrepreneur can be at least sure that he will raise some money irrespective of reaching the target.

Overall, the decision about the platform is mostly influenced by the quality of the project and the trust the entrepreneur has in getting the target, but also by geographical factors.

1.5 Types of crowdfunding

There are four main model of crowdfunding (Mollick, 2014):

- Charity-based crowdfunding: this type of crowdfunding put the funders in a position of philanthropist, who do not expect any return. An example is a humanitarian project, like the construction of a hospital or a project that helps children in a third-world country.
- Lending model: the funds are offered as a loan, expecting a certain rate of return.
- Investor crowdfunding: after the JOBS act equity crowdfunding is permitted in the USA under certain rules and also in other countries. Funders have the possibility to have, for example, equity stakes in return to their funding. Anyway, this form is not very common yet and covers just a very small part of the total crowdfunded investments (Heminway and Hoffman, 2010). Investor model can include other forms such as shares of future profit or royalties or a portion of returns for a future IPO or acquisition.
- Reward-based crowdfunding: this is the most popular model. The creators promise to give a reward to the funders. This reward can be a product, in the case of a product-campaign, an access or a ticket to a movie or a show, the possibilities to meet the creators during the development of the project or a

mixture of the previous ones. Usually backers receive the product at a discounted price and have privileged information about the project. This is the type I am analyzing in my thesis.

1.6 Legal issues

In April 2012 , President Obama signed into law the Jump-start Our Business Startups (JOBS) act. The key point of the JOBS act is legalizing equity crowdfunding by relaxing various restrictions concerning the sales of securities. For example, it brought the number of shareholders from 500 to 2000 for a company that can still remain private. But this Act brings many problems that will have to be faced: the Security Act of 1933, that is the basis for most of the regulation in question, wanted to protect investors. It is clear that relaxing all this norms will expose backers to many risks, that can be caused by incompetence or fraud (Agrawal et Al., 2013). For this reason the Securities and Exchange Commission (SEC) is trying to put some rules and regulations. The risk otherwise is to transform crowdfunding into "crowdfleecing", as pointed out in a CFA conference in 2013.

1.7 Incentives and disincentives for entrepreneurs, backers and platforms

I will give a brief description of the reasons that drives the decision to enter in a crowdfunding campaign for the different stakeholders.

1.7.1 Incentives

Creators

To get capitals for early-stage ventures usually entrepreneurs use their personal savings, friends or family money or ask business angels or venture capitalists.

In some cases, crowdfunding gives the possibility to have capital at a lower cost, mainly for the three following reasons:

- Better match: Agrawal, Catalini, and Goldfarb (2011) show that in crowdfunding campaigns funders can be geographically far from the entrepreneurs' location, and this is in contrast to local distribution of angel and VC money as angels and VCs prefer to invest in local ventures.
- Receipt of information on price and product suggestions: it gives the possibility to mix the willingness of people to have a product before the others and to contribute to the creation of something new with the sense of belonging to a community.
- Visibility: it's a way to have a lot of free publicity, because during the campaign the firm is visible from all the crowdfunding community ando also because if the project raises a respectable amount of money, press will talk about it. So it increases the possibility of being noted by, for example, venture capitalist and is a signal that many people like the product.
- Information benefits: crowdfunding also gives access to diverse information on the project including marketing or technical research. By offering many different types of rewards or the possibility to customize the product, entrepreneurs can see if the product they made is appreciate by the market, and which model works best. Entrepreneurs can find a product/market fit before committing to mass production or further investments. Backers usually express their ideas and suggest advices to improve the product.
- Network-related benefits: furthermore, there are many forms of contact between the entrepreneurs and the backers.

Backers

A backer will help a campaign for various reasons:

- Access to investment opportunities: in case of equity crowdfunding, the platform democratizes access to deal flow.
- Early access to new products: in a product crowdfunding campaign, the backers are always the "early birds", testing the early version of a product.
- Community belonging feeling: crowdfunding creates a community participation. People feel to be part of a community, and they like to feel to be close to the entrepreneur, having preferred information on the development of the product.
- Support for a product, service, or idea: philanthropy very often plays an important role, and people fund a project even if they don't receive any reward.

Platform

Platforms always receive a fee that is always a proportion of the total amount raised. It means they have interests in the success of the projects. They also like when media talk about them, because it expands the crowdfunding community and consequently the total amount raised.

1.7.2 Disincentives

Creators

The biggest challenge that creators face when they start a campaign is the disclosure of information. This risk is bigger when an invention still doesn't have a patent, because it's very easy that someone else will copy the successful ideas. The worst period is after the campaign starts, but before the product starts to be commercialized. During these months, if someone else copies the idea and get faster to the market, the entrepreneur loses the rents of its innovation. Relatedly, another point is the bargaining power with the potential suppliers; as the entrepreneurs reveals their industrial plans, the suppliers could use this information such as the structure of the cost to increase their bargaining power. Furthermore, even if backers provide advice, they will never

be able to provide strategic support, the industry knowledge, and the relationships with industry experts a business angel or a venture capital could bring. Finally, receipt of financing by so many people can be complex because having so many supporters means not having the possibility to know who they are, and it can create some problems in follow-on financing, in the case of equity crowdfunding. Furthermore, a lot of time is spent to answer to their questions on the platform, and sometimes it distracts the entrepreneurs from their operative activities.

Backers

There are mainly three disincentives for the funders, mostly due to information asymmetry between funders and creators.

- **Entrepreneur's incompetence**: funders can be too optimistic over the promises of the entrepreneurs. Creators in fact may find many difficulties during the production processes, problems varying from logistics to technical issues. For this reason, platforms require more disclosure of information related to the risks of the projects. More than 50% of products are delayed and even more when the projects exceeds the goal by a huge amount (Mollick, 2014), because entrepreneurs have to face problems that they didn't expect.
- **Fraud:** it is the situation when the creators don't only delivery late, but organize an outright fraud. These criminals, for example, can create a fraudulent page that look like a crowdfunding campaign or start a campaign on a famous platform, but then they don't respect their commitment. It's becoming harder and hardersince crowdfunding platforms are imposing stricter rules to the creators. Since backers have little time to dedicate to perform due diligence on the projects, this issue has to be carried on by the platform.
- **Project risk:** early stage projects are always risky. There is a very high rate of start-up failure in the initial stages and this is not related to incompetence or fraud.

Chapter 2:

Traditional entrepreneurial financing

In the he first part there is a general presentation of the two main actors involved in the traditional funding: venture capitalists and business angels. The second part focuses on the selection criteria general used by traditional funders. Finally the selection process for venture capitalists and business angel is presented.

2. Traditional entrepreneurial financing

One of the most important issues facing entrepreneurs in technology startups is access to capital (Cable and Shane, 2002).

In this section I will describe the two main actors in the market of entrepreneurial financing: venture capitalists and business angels. Then, I will focus on their selection criteria of the new ventures. It will be interesting to see if these criteria are applied in the same way when traditional funders finance a crowdfunded company, or if the information produced through a campaign will weaken the importance of those selection criteria.

2.1 Venture capitalists

"By VC we mean the professional asset management activity that invests funds raised from institutional investors, or wealthy individuals, into promising new ventures with a high growth potential. We therefore exclude other forms of investments in these companies by not professional investors like business angels, and other forms of financial intermediation" (Rin, Hellman, and Puri, 2011, pag 3).

In the last years there has been an incredible growth of money collected through venture capital. In 1980 VC in USA collected $610 million, in 1990 $2.3 billion and in 2010 about $30 millions. USA is still dominating the market, but now Europe and Asia has about half of the total investment flow (Rin, Hellman, and Puri, 2011). Following figure 2, I will explain the venture capital model.

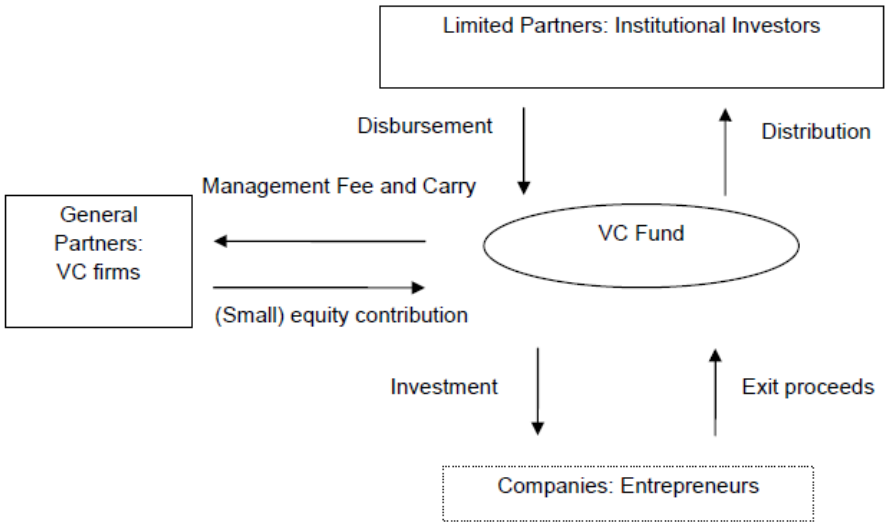

Figure 2: the venture capital model

Venture investors are organized in small partnerships of about maximum ten people. To make their investments, VCs raise money from institutional investors and wealthy people through vehicles called funds. "The contract that underlies a fund is traditionally a partnership, where the VC firm exerts active management, and therefore assumes unlimited liability, whereas the investors retain unlimited liability by not interfering with the fund's operations. Institutional investors and wealthy people are called Limited Partners (LPs) while the VC firms are called General Partner (GPs). During the time of the fund, GPs make a selection of the companies to fund, monitor, mentor, and provide value added services"(Rin, Hellman, and Puri, 2011, pag 4) and at the end they exit from these investee companies and distribute the money from exiting these investments to the LPs. GPs gets their compensation through a fixed management fee called *hurdle rate* and through a performance-based fee called *carried interest*. This compensation structure is designed to provide strong incentive on the performance of the firm.

After the investment, VCs always continue to follow the company they invest in by giving advice, social contacts, and related industry experience. VCs usually exert some form of control over the companies they fund; for example they take

board seats and might change some key employees of the start-up, like the CEO (Wasserman, 2014) . Of course, it can create a conflict of interest between the funded company and the VCs, because founders usually want to maintain the operative control of the firm while VCs want to maximize the profit even if it means firing one of the founders .

We can see from the figure 2 that there are two main fields of research: the first one is the relation between the venture capital firm and his investors, concerning mainly the compensation structure and the distribution of the returns to the VC. The second, that mainly interests us, is related to the relationship between the entrepreneurs and the VC firm. The main issues in the latter are the selection criteria of the VCs, value-added services provided by the entrepreneur and the VCs and exit strategies of portfolio companies.

The most important aspect of the organizational structure of VC firms concerns their type of ownership. Independent VCs invest on behalf of institutional investors and wealthy individuals. Captive VCs have alternative ownership structures that affect their funding and strategic directions. Corporation, banks and goverments are the three main types of captive VC firms.

Corporate venture capital(CVC): this term it is used for companies that make venture capital investments. The literature finds important differences in CVCs playing a complementary or a competitive role. In the first case the company wants to invest in another one to have an easier access to the complementary resources. In the second instead the company wants to invest in a company that could became dangerous being a competitor. Anyway, it is not clear if CVCs benefits more the parent company financially or strategically.

Bank-owned venture capital (BVC): this type of venture capital attracts less attention than the first, even if it plays an important part in the VC market. In

this case there is no competition between the BVC and portfolio companies. Banks try to invest to obtain the maximum financial return from the investment.

Government-sponsored venture capital firm: governments can operate wholly-owned venture capital funds, typically through a development bank (e.g., "Business Development Bank of Canada") or alternatively government can provide capital through a variety of indirect programs (e.g., Australia's "Innovation Investment Fund program").

Captive VC represent a substantial part of VC investment, and there are a few venture capital associations (NVCA, EVCA, etc…) that provide detailed statistics about their work.

2.2 Business angels

Many observers consider angel investments to be one of the key drivers behind the startup and the growth of new businesses (Council on Competitiveness, 2007). There is less academic studies on angel investments compared to VCs majorly because researchers have difficulty to identify the population of business angels and create representative sample necessary for proper conclusions (Shane, 2008). Given the private nature of angel investment data, getting exact investment numbers is difficult. Recent research in the US estimates the amount of capital provided by angels is nearly equal to the money provided by venture capital firms (Sohl, 2005). Worldwide, researchers estimate that angel investors provide up to 11 times the amount of funding provided by venture capitalists (Reynolds, Bygrave and Autio, 2003). In any case, these data shows that BAs are the other big actor in entrepreneur financing. Considering that BAs are more involved in seed funding than VCs, their role in financing start up is even more predominant. I will start giving some definitions.

"*An angel investor is a person who provides capital, in the form of debt or equity, from his own funds to a private business owned and operated by someone else who is neither a friend nor a family member*" (Shane, 2008). Friends and family investors, instead, are people who use their own money to provide capital to a private business owned and operated by a family member, work colleague, friend, or neighbor. Both angel investors and friends and family investors are called "informal investors", to be distinguished from institutional investors (a corporation, a financial institutions or other organizations, e.g. venture capital firm).

Business angel experience can vary a lot: there are business angels that makes just a single investment, that in some occasion can also be very consistent (e.g. Andy Bechtolscheim, who made hundreds of millions of dollars from his investment in Google), and others who are "serial" angel investors that made tens of investments in their life. So the selection criteria used by the first group are less structured than for the second one. They can also invest in high technology or low technology businesses. According to Ian Sobieski, the managing member of the Band of Angels, just a very little part of their investments go to high technology industry because this sector is often occupied by venture capitals.

We can classify angel investors in many ways:

-*Active versus passive angel investors*: some angels are passive investors, conducting little, if any, due diligence of potential investments, and having little involvement with the companies or founders after they invest, while others undertake more detailed due diligence and get actively involved with the companies that they finance.

-*Equity versus debt angel investors*.: angels can and do invest using a very wide range of financial instruments, from pure debt to pure equity. Many

sophisticated angels affiliated with angel investors make use of convertible debt, when investing in seed stage companies.

-*Accredited versus unaccredited angel investors*: an accredited investor must respect the SEC requirements. The federal securities laws define the term "accredited investor" as a person whose household net worth exceeds $1 million, or whose income exceeds $200,000 in the two previous years if single (or $300,000 if married) and reasonably expects to maintain the same income level.

-*Individual angel versus angel group*: whether an angel invests by himself or in a group.

Angels invest in a very wide range of industries. They can vary from manufacturing, to professional, scientific and technical services to accommodation food and assistance or finance and insurance. The data from Kuffman Fundation Survey (KFS) shows that their focus is definitely not just on technology sectors. For VCs it is very different: from 1980 to 2004, 81% of all venture capital dollars were invested in just five industries: computer hardware, computer software (including the Internet), semiconductors and other electronics, communications and biotechnology.

Another interesting element is that business angel do not invest just in start-up companies, on the contrary it seems that 64.6% of their investment are cash-flow-positive, and half of the companies they invest in are "established" companies (EUSA data).

Generally talking, it seems that angel backed company performs better than the average of US start-up. Anyway, even if many observers argue that a company need to have a proprietary advantage to receive an angel investment, only one every five founders of a business angels backed company believes to have a competitive advantage (KFS). Also the data over proprietary assets are very low: only 14.1% of the business that received external equity investments had a

patent and only 15,5% had a copyright (KFS). The typical owner of a business angel funded company is a white male. Only 11% of the young companies that received external funds had a female primary owner, and only 5.2% had an Hispanic or a Black owner[13].

2.3 Selection criteria and process for Venture Capitalists

The environment where technological start-up live it is very dynamic because technologies vary very rapidly, creating very uncertain conditions. Furthermore, an early-stage company doesn't have any previous results to show its performance. It means that companies founders have to do the best effort to show and provide signals of their quality.

Literature about VC selection criteria usually refers to three broad type of signals: social, intellectual and human capital. I will go through all this signals in the next paragraphs.

2.3.1 Social capital

Social capital refers to capital embodied in the relationship among persons (Coleman, 1988) or firms. On the firm-level, many researchers have examined the benefits of this ties for organizations in general and specifically for new organization (Dyer and Singh, 1998). Alliances provide many advantages mainly connected with the direct or indirect access to complementary resources (Chung et al, 2000) and to knowledge (Liebeskind et al., 1996). Alliances also confer an aura of legitimacy (Baum and Oliver, 1991) and are particularly important when timely access to knowledge or resources is essential (Teece, 1992). Other researches show how links with municipal government and community agencies can help young firm (Baum and Oliver, 1991). Relatedly,

[13] http://www.census.gov/prod/ec02/sb0200cscbt.pdf

Baum et al. (2000) find that biotechnology startups able to establish upstream alliances with universities and other organizations with scientific and technological expertise and downstream alliances with pharmaceutical, chemical, or marketing companies at the time of their founding exhibit significantly higher performance growth during their early years. Thus, startup's alliances provide signals for both access to valuable resources and knowledge critical to early performance as well as serving as external support by suggesting that the startup has earned positive evaluations from other knowledgeable actors.

On a personal level, social capital is "a person's social characteristics – including social skills, charisma, and the size of his Rolodex – which enables him to reap market and non-market returns from interactions with others" (Glaser et al., 2002). Network contacts can be important for new ventures to recruit talented executive officers and technical staff (Bygrave and Timmons, 1992), and to establish contacts with VC (Shane and Stuart, 2012). Hsu (2007) finds, using executive recruiting via founders' own social network as a measure of the consequences of social capital (a reflection of prior investments in building social capital, that such capital yields financial benefits through higher VC valuations), that a high founder ability to recruit is associated with a higher venture valuation.

2.3.2 Intellectual capital

Two reasons may underlie why new ventures backed or seeking VC financing use patent-based appropriability strategy. First, not only patents provide protection in the product market against competitors but they also protect the contributions of the new venture from expropriation by the investors such as corporate investors (Mann and Sager, 2007; Kortum and Lerner, 2000; Dushnitsky and Shaver, 2009). Second, apart from isolating/appropriability

mechanisms in the product market, patents may serve as a signaling device of quality (Häussler et al., 2012; Long, 2002); they signal the quality of new ventures' technical capability because there is critical information asymmetry and it is difficult to discern the quality of new ventures lacking an extensive history of sales and other reliable information available for larger (and public) firms (Hsu and Ziedonis, 2013). Thus, patents alleviate information asymmetry that new ventures face about underlying quality of their R&D staff. Conditional on operating in industries with effective appropriability environment such as biotechnology and pharmaceuticals, patents are viewed as valuable resources. Mann and Sager (2007) finds that the VC-backed software firm's receipt of at least one patent (granted patent) is positively associated with a number of firm's financial measures such as total investment, exit status and longevity. Patents not only increase the likelihood of obtaining external financing (Engel and Keilbach, 2007), but also reducing the time it takes to obtain initial VC (Haussler, Harhoff, and Muller, 2009; Hellman and Puri , 2000). Furthermore, patents increase the valuation (round amount of VC financing) of new venture (Baum and Silverman, 2004) and also attract high-quality VCs (Hsu and Ziedonis, 2008). Conti, Thurby, and Rothaermel (2011) did an empirical study about founders, friends, and family (i.e., FFF) money and patents as signals to VC. FFF shows the commitment of the founders, while patents show the technology quality. They found a positive correlation with both signals.

Also patent pending can be a good signal of technological validity (Silverman and Baum, 2012): they found a positive correlation between the number of pending patent and the probability of survival of a new venture.

2.3.3 Human capital

Human capital is an important consideration for VCs (Kaplan, Sensoy, and Stromberg, 2009). MacMillan, Siegel, and Narasimha (1985) created a questionnaire that was administered to one hundred venture capitalists to determine the most important criteria that they use to decide on funding new ventures. The most important finding from the study is that is the quality of the entrepreneur that ultimately determines the funding decision. Five of the top ten most important criteria had to do with the entrepreneur's experience or personality. Zacharakis and Meyer (2000) found that that top management experience and skills are the most frequent selection criteria self-reported by VCs. Burton et al. (2002) find, for example, that prominence of the prior employers of a startup's founding management team increases the likelihood that the startup will obtain external financing at the time of its founding. Zucker et al. (1998) find that the founding of new biotechnology firms depends importantly on the number of ''star scientists,'' corroborating that human capital is a key factor in biotechnology. Thus, the identity and background of top management are widely regarded as important signals of a startup's future potential, increasing its chances of obtaining VC financing. Hsu (2007), using data from a survey of 149 early stage technology-based start-up firms, found several notable results. First, prior founding experience (especially financially successful experience) increases both the likelihood of VC funding via a direct tie and venture valuation. Finally, in the emerging (at the time) Internet industry, founding teams with a doctoral degree holder are more likely to be funded via a direct VC tie and receive higher valuations, suggesting a signaling effect.

Using a random sample of 193 high-technology start-ups, all participants in the Israeli Technology Incubator Program, Gimmon and Levie (2010) found out

that founder's business management expertise and academic status attract external investment.

A paper by Colombo and Grilli (2005) about human capital and its role in influencing the growth of new technology-based firm shows how economic and management first, but also technical education positively influence the growth of a new firm. This paper will be discussed also in chapter 4.

Given the amount of attention in the literature to this topic, studies have mixed results to the effect of human capital to the performance and therefore, these studies question the relevance of this criteria for VC-backed firms' success.

Baum and Silvermann (2004) investigated whether VC *select* or *couch* the ventures they fund and which factor explains the performance of VC-backed firms. They suggest that both "scouting" strong technology and relationships and "coaching" with injection of managerial skills play an important role in the outcome of VC-backed firms. They find that VCs very often seem to overemphasize human capital as they tend to explain the selection by VCs but seem to be uncorrelated to final success outcome. It's important to remember that VCs very often change the management team, so the importance of the founders must not be overestimated.

Kaplan, Sensoy, and Stromberg (2009) investigated the importance of the business (market in which a company operates, type of product) compared to the human capital of the company. Using a sample of fifty VC-financed company that end-up with an IPO, they found out that while alienable assets, customers and competitors remain relatively constant, the human capital changes more rapidly. Only 44% of the CEOs at the business plan were CEO at the annual report (36 months after the IPO). It's even worse for the founders: only 50% of the four top executives at the IPO were top executives at the business plan. Their conclusion is that traditional investors should give more

weight to the business (the Horse) compared to the management team (the Jockey).

2.3.5 Venture capital selection process

I will explore the process through which a VC firms go through to select a company to finance. In the literature many model have been proposed (e.g., Fried and Hisrich, 1994, MacMillan, Siegel, and Subbanarasimha, 1985, Tyebjee and Bruno, 1984). Fried and Hisrich (1994) focuse on the way a venture capitalist makes the investment decision, using a sample of eighteen VCs in three different regions of the United States where VCs activity is high (e.g., Silicon Valley, Boston/Cambridge, and the Southwest United States). The decision to invest in a company is very critical because the success is highly dependent on the work of a little group of managers and founders and it is subject to adverse selection and moral hazard risks. So VCs has to screen the companies through various steps to have the most information they can, at least to try to reduce the adverse selection problem. They report that VCs identify some common criteria which are divided into three categories (of course they are aligned with the ones explained in my precedent paragraphs):

- Concept: a significant potential for growth, the idea can be brought to the market in two or three years, a substantial competitive advantage, reasonable overall capital requirements
- Management: managers personal integrity, having done well in previous jobs, managers have to be realistic in valuating risks and business plan, hard workers, flexible and exhibit leadership, management experience.
- Returns: the investment must provide an exit opportunity in 3-10 years, a high rate of return expected, a high absolute return

In the questionnaire they sent to VC, they asked how often a VCs engage in a certain activities. The results is that more that 90% of the times they interview members of management team, they make tour facilities, they contact entrepreneur's former business associates, they contact existing outside investors, current customers potential customers, they investigate the market value of comparable companies.

They propose a six-stage model shown in Figure 3. The process is time consuming and labor-intensive. A project takes an average of 97 days to pass through all the phases and 129 hours of VC's time.

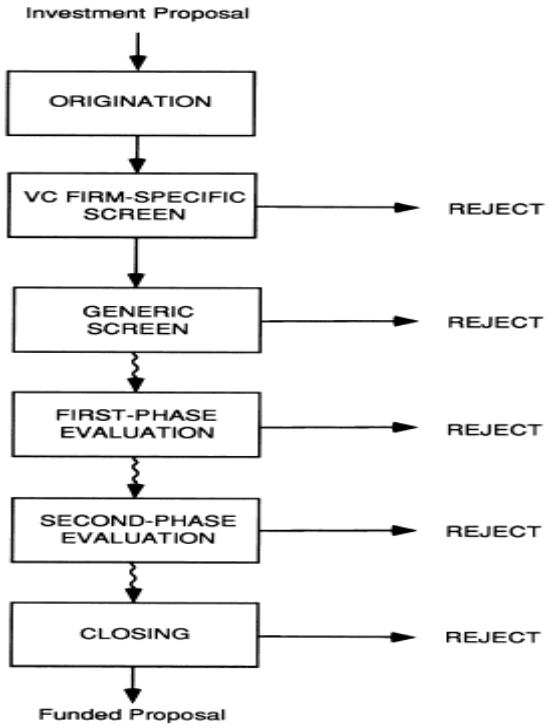

Figure 3: Fried and Hisrich (1994) model of VCs

Origination: the first phase is origination. Most funded proposals come from referring. Occasionally VCs already met the founders because of some work they did together before or from a consultancy relationship. Usually entrepreneurs are introduced by someone else: investment bankers, investors in

the VCs' fund, commercial bankers, management of firms in the VCs' portfolio, consultants who had worked for the VC in the past, and family friends.

VC Firm-Specific Screen: Many VCs have firm-specific criteria on investment size, industries in which they invest, geographic location of the investment, and stage of financing. The firm-specific screen eliminates proposals that clearly do not meet these criteria. At most, the firm specific-screen involves a cursory glance at the business plan without any analysis of the proposal**.**

Generic Screen: many proposals pass through the firm-specific screen only to be rejected without extensive review when the VC analyzes the proposed investment in terms of the generic criteria. Most deals that pass through the firm-specific screen are rejected at the generic screen based upon a reading of the business plan coupled with any existing knowledge the VC may have relevant to the proposal. The generic screen will be less rigorously applied when the quality of the referrer is high. At this point only few projects are still in, and the amount of time spent is still very little.

First-Phase Evaluation: in this phase additional information are collected by the VCs. It usually starts with a meeting with the top management of the company in order to know better who they are and what they did and to better understand the business. One VC even wanted to visit an entrepreneur's home and meet the family. He explained: "I like to go out and meet the spouse and the kids and try to see if their home is in chaos or if it's pretty orderly. Rather than me passing judgment on how they live, what I want to understand is what kind of environment that entrepreneur's coming out of". VCs also want to see how entrepreneurs react under pressure, so some sessions are prepared. They also do some reference checks. Some technical studies on the product are also done, especially for early-stage investors. Sometimes VCs also ask information to key people of their portfolio company, or talk to other VCs investors to have

more information. They make a very detailed analyses of financial projections made by the entrepreneurs to be able to compare different proposals.

Second-Phase Evaluation: at one point the VC has an "emotional commitment" with the proposal, and starts a new phase. All the activities that were made before continue, but a lot more time is spent on a single project. The deal now it is not to see if there is a serious interest, but to find the obstacles to the investment and to try to overcome them. Usually, at this time VCs already have an idea about the price, because otherwise they would incur in the risk of spending a lot of time and then being obliged to refuse the investment due to a too high price.

Closing: after progressing through the second-phase evaluation, the proposal enters into the closing stage, where the details of the structure are finalized and legal documents negotiated. It seems that about 20% of companies that arrive at this stage don't pass this last phase, even if an enormous amount of time has already been spent.

2.4 Selection criteria and process for Business Angels

In this paragraph, following the structure of the previous one, I will go through the selection criteria and the process used by the BAs. There are some common elements, but also some differences, that will be highlighted in the last part.

2.4.1 Selection criteria

Business angels spend less time in due diligence compared to VCs; the average due diligence time is over 40 hours, which does dispel some of the perception that angel investors jump into deals without doing meaningful investigation,

but is significantly fewer hours than is typically spent on due diligence by formal venture capitalists (Wiltbank, 2005).

Additionally, angels usually invest more in seed financing, which require less amount of money. Angels often take less control rights than VCs; they do less post-investment control activities since the interests of the entrepreneurs are more aligned with their own interests (Wong, Bhatra, Freeman, 2009) and they also change the management team very rarely. For that reason, angels prefer to fund companies that have proven track record of good management team (e.g., prior successful activities).

The selection criteria angels use are less detailed than VCs, and usually are connected to referrals by other angels or institutions. A geographical constraint is significant, since angels always want to be able to stay close to the entrepreneur. In some cases angels invest just in a regional area, but even if they extend their area of investment they do it just in an industry-specific sector (Sorheim, 2003).

In the next paragraph I'll go more deeply in the angel selection screening. As already pointed out, this process is generally faster than for VCs..

2.4.2 Business angel selection process

Even though the interest about angel investment activity has grown in the last few years by both academics and policy makers, there is still a research gap with respect to the business angel selection process, which is different from VCs selection process, as compared later in this report. I present here the model of Paul, Whittam and Wyper (2007). The model shown in Figure 4 consists of five stages: familiarization, screening, bargaining, managing and harvesting as. The

time from first contact between an angel and entrepreneur and investment being made ranged from 3 to 18 months.

Iteration is a defining characteristic of the process, especially in the first three stages. The impact of formal and informal networks is explicitly recognized in the model: the former includes communities of practice that actively support angel activity such as business angel network (BAN) syndicates and economic development agencies while the latter is comprised of the informal personal networks to which an angel may turn for advice and support such as friends, co-investors, and business associates. The model also acknowledges the importance of an angel's personal investment objectives on the process. These may be financial such as income and capital growth but can include personal goals such as finding a part-time interest. Finally, the general environment plays an important role: this includes, for example, economic, socio-cultural, political or technological influences.

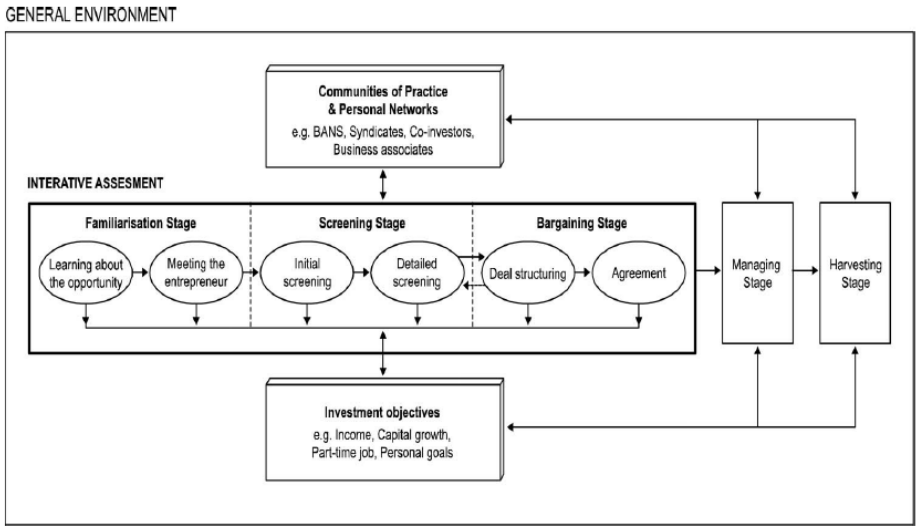

Figure 4: Paul, Whittam and Wyper model of angel investors

I will explain each of the five stages briefly.

Familiarization Stage: this stage of the investment process comprises two main activities, learning about the opportunity and meeting the entrepreneur. The

investment opportunities originate from several sources: business associates, BANs and investment syndicates. In this phase some angels might ask fora document with 2-3 pages, or a more detailed business plan. The second activity relates to meeting of an angel with the entrepreneur. Angels value highly the feeling of being "attracted" to the entrepreneur as well as the project.

Screening Stage: as in the model by Fried and Hisrich (1994), previously presented, a lot of controls over the founders are done, and the business plan is carefully examined and revised.

Bargaining stage: in this stage due diligence is completed and negotiations are also finalized on the value of financial investment in equity terms**.** How much an angel should expect to receive for varying levels of investment is a key issue**.** The conclusion of the bargaining stage is a formal agreement between the entrepreneurs and angels setting out the detail of the agreement reached.

Managing stage: almost all investors asserted that they put all their effort and knowledge to help the company they invested in. This activity is time consuming, and time is definitely a limited resource angels has to face when they choose their companies.

Harvesting Stage: angels seek exiting their investments as VCs do. They consider IPOs and acquisitions as successful exit outcomes.

2.5 A comparison between VCs and BAs selection process

The main difference between VCs and BAs process is the importance they give to personal factors. Both in the first and in the second phase BAs are more interested in the relationship they can create with the entrepreneur (Paul, Whittam and Wyper, 2007). An interesting parallel can be done with job selection interviews, where the first impression makes a very big difference.

This can also be due to the fact that in the managing stage usually BAs want to have a strategic and operational role, while VCs has just a strategic role. The close relation an angel establishes has to have a strong personal and emotional feeling. This emotional feeling is supported also by a research made by Clark (2008) that using a sample of Brazilian oral pitch presentations demonstrate how BAs give a great importance to the quality of the presentation (and so to the first impression of the founder), instead of the content. In the bargaining stage the main difference is that a BA has limited resources compared to a VC, and for this reason his bargaining power will be less than for a VC.

Regarding social, intellectual and social capital, the criteria are almost the same for VCs and BAs, even if VCs usually have more instruments to control the source of the entrepreneur statements. An exception can be a large angel group, that can have more resources compared to an individual angel.

Chapter 3: Information asymmetry and signaling theory

In this chapter it is presented a literature review about information asymmetry in an entrepreneur context and its consequences. Some solutions are showed and finally a model of signaling theory is proposed.

3. Information asymmetry and signaling theory

In this third chapter, the last in my literature review, I will give a general view on information asymmetry and signaling theory. Since information asymmetry can create a market failure, I will then talk about some solutions proposed by scholars, mostly explaining how signaling resolves some information problems.

This topic is really connected to my work, since my thesis lays the foundations on the fact that signals can influence a crowdfunding campaign and, above all, signals created by a crowdfunding campaign are used by traditional funders to evaluate the quality of a project.

This chapter is divided in two parts: the first part gives a general introduction about information asymmetry, reviews some examples, and gives some solutions, the second part discusses about signaling theory in the context of entrepreneurial financing.

3.1 Information asymmetry

The first paragraph is about information asymmetry and its implications such as adverse selection and moral hazard, and finally proposes some solutions.

3.1.1 Information asymmetry and its consequences

For more than a century, formal economics model of decision-making processes were based on the assumptions of perfect information, and information asymmetries were ignored. Despite the evidences that in the market there are some information imperfections, most of the scholars used to assume that a market with little imperfections behave substantially as a market with perfect information. However, recent scholars paid attention to the differences between a perfect information market and a market with information asymmetries and trying to find solutions to overtake this problem. As George Akerlof pointed out in 1970, information asymmetries can lead to market failure, and because this failure involves a loss in the social welfare, it should be avoided. George

Akerlof, Michael Spence, and Joseph Stiglitz received the 2001 Nobel Price for their work about this topic, just to remark the importance that these topics have in modern time.

Information asymmetry deals with the study of decision in transactions where one party has more or better information than the other. Stiglitz (2002) explained that information asymmetries occur when "different people know different things". Because some information are private, information asymmetries arise between who have all the information and who could make better decisions if he had that information.

A starting point to understanding information asymmetry are some considerations made by Simon (1997). He said that individuals are not always *objectively rational*, but most of the times they are *subjectively rational*. It means they make decisions based on their actual knowledge of the decision. March and Simon (1958) affirmed that decision-makers are bounded not only by the information they have, but also by the limit of their minds and by the limited time they have to make a decision. Since agents can be subjectively or boundedly rational, it opens the question that different actors can have different information about projects and their feasibility.

Lots of scholars highlighted how having privileged information gives an information advantage. Knight (1921) said that when an entrepreneur is in an uncertain environment, the first problem the entrepreneur has to face is deciding what to do and how to do it, and to decide he has to use his judgement and foresight. Schumpeter (1942) stated that an entrepreneur uses the privileged information he has to creatively destroy old ways of competing using new ideas, creating new technologies or entering into new markets. Hayek (1952) and Kirzner (1973) defined entrepreneurs as those individuals that discover opportunities missed by others and so, create their business in this new roads.

Information asymmetry between entrepreneur and capital providers are almost always present. This could be because the entrepreneur could be reluctant to disclose information or capabilities (Shane and Cable, 2002; Dushnitsky and Shaver, 2009), because they could be stolen if they are not sufficiently protected. Furthermore even if the entrepreneur wants to disclose information, the funders could not appreciate the idea because they are not enough prepared on that topic or because they do not believe in the ability of the entrepreneur to realize it (Barry, 1994). This is particularly true in new ventures involving high research and development investments, as these companies with high intangible assets in which the ability of founders is critical to realize the returns on these assets.

Information asymmetry between entrepreneurs and funders creates two different problems: adverse selection and moral hazard.

Adverse selection

Adverse selection is important when a party is not fully aware of the characteristics of the other party. It is connected to the quality of the product or of the person (in the job market) taken into consideration.

Akerlof in his paper (1970) imagines a car market where there are two types of used cars: good ones and bad ones. Anyone who wants to buy a new car doesn't know if the car is in good conditions or if it is a "lemon" (a bad quality cars). But because a potential buyer has not enough information to make a judgement about the quality of the car he is going to buy, all the used cars have to be sold at the same price, that will be the average between the two prices (good and bad). It suggests a market failure: only bad quality car holders will sell used cars, because anyone who owns a good car doesn't want to sell it for a price that is lower than its value. The result is that only bad quality cars stay in the market. Continuing with this logic we can conclude that buyers will finally

pay a lower price, because they know that only lemons remain on the market. To avoid this market failure, it's fundamental to introduce some remedies.

Another classical example of adverse selection is in the insurance field. Because the insurance price is calculated according to an average risk client (without considering different insurance classes), a low profile risk potential customer has no incentives to stipulate the contract. It means that only high profile risk people will use the insurance. Again, the insurances companies, knowing it, will have to raise the price, but in this case less and less people will use the insurance, causing the price to be higher. It is evident that this mechanism can't work without any regulations. The demonstration of what I've just said is that insurance companies do not stipulate life insurance to people over 65 years old. The risk of death would be too high, the price consequently, causing that just very unhealthy people would sign the contract.

A third interesting example is the adverse selection for a technology entrepreneur seeking capital from external investors: since in the first phase of a technology start-up most of the value is in the founders "minds", for the funders is very difficult to distinguish (unless there are some signals) between an excellent and a normal project, and so they will tend to evaluate all firms as average. In this case only bad quality firm will accept the contract, because the high quality ones can't accept to be undervalued, causing again an adverse selection.

The last example is about the job market (Spence,1973). In his paper he presents a world where there are just two types of workers: good and bad ones. He assumes that the employee signaling cost (not measured only by the monetary cost, but also by the intellectual cost) of signaling their abilities (through the level of education) to employers is negatively correlated with the productivity. Given this assumption, the model proves that education can be considered as a

good signal for employers, because even if education doesn't seem to affect their productivity, good employees "buy" more education than the others.

Moral hazard

Moral hazard is a post-contractual opportunism. In general, a potential principal is unable to tell what action the agent has taken (Arrow, 1985). Folta and Janey (2004) have pointed out that in an entrepreneurial contest "investors may not be able to discern how hard the firm's employees have worked or what they have done. Clearly, agents and principals may have different objectives. For example, the investors may want to maximize profits, while managers may seek to minimize chances that they will lose their jobs, take fewer risks than investors might prefer, or minimize effort. A biotechnology company founder may invest in research that brings private benefits, such as recognition in the scientific community, but provides less return for investors than other projects".

Again in the insurance field, it is interesting the moral hazard problem. Do people with a car theft-insurance pay less attention to their car than the others? If this is true (and it is connected with the impossibility to control the behavior of an agent after the contract), then we are in front of a problem of moral hazard.

When adverse selection and moral hazard occur, firms have to manage this problems to be able to survive. In the next paragraph I will talk about some possible remedies.

Some possible solutions to information asymmetry

There are many possible solutions. I will divide them into four main categories: creation of an institution, the incentive mechanism, social network and market signals.

Creation of an institution: institutions handle the potential for adverse selection. For example some institutions could impose insurance companies to use a mean price, so that not only high risk customer will stipulate the contract, but also some others that have a risk even a little bit under the average. This remedy however doesn't help fight moral hazard: how can we be sure that an individual will not leave his car opened in the streets? Another example is the existence of venture capitalists or professional hiring agencies. Venture capitalists act as intermediaries between entrepreneurs and funders, reducing information asymmetries through intense due diligence facilitated by their deep knowledge in certain specific technology fields. Entrepreneurs able to get funds from VCs communicate to the market that a professional investor "believed" in them, and usually obtain higher return than not venture-backed firms and are also facilitated in obtaining new rounds of fund. In the same way, a professional hiring agency is supposed to mitigate the information asymmetry between an employer and an employee, using the experience maturated during years of activity.

Incentive mechanism: in this case the aim is to prevent moral hazard. The scope is trying to align the objectives of different parties. In the entrepreneur field, it usually means aligning management and shareholders' interests; for example giving stock-options to the managers or in the case of a venture capital, giving funds to an entrepreneur at different stages (related to certain milestone). In that way there is also a certain form of control.

Social networks: As already widely discussed in the previous chapter, both VCs and BAs consider referrals from their social networks as important when selecting new ventures. Empirical analyses from Shane and Cable (2002) show that social ties play a crucial role especially in seed-stage finance decision. Reputation (i.e., incentives to keep future business) encourages firms not to

behave opportunistically as the information of supposed bad behaviour can diffuse in the social network.

Market signal: the fourth type of remedy is the production of signals to give to the counterpart a "certification" of good quality. This mostly prevents adverse selection, but some signals could also be a guarantee for post-contractual behaviors. A signal, for example, can be the education, the prior work experience or the number of granted patents, all elements that, as shown in chapter 2, are carefully taken into consideration by venture capitalists. An interesting example about signaling is offered by Lewis (2011) talking about the used cars in E-Bay. He shows that the number and the qualities of photos and text posted by the sellers strongly influenced the car prices. If a seller doesn't post any pictures, for example, a buyer is induced to think that the car is in bad conditions and will offer a lower price. The information disclosure can substitute for the need for costly signals as verifiable disclosures reduce the information asymmetry between the buyer and the seller. Lewis (2011) also shows that disclosure costs affect how much information the seller decides to post, and therefore the price he obtains.

A paper by Dewally and Ederington, 2006) show how signaling strategies in the online comic book market that a seller can follow are 1) the development of a reputation for quality, 2) a third-party certification, 3)warranties and 4) information disclosure. All this four elements are signals.

Since my work is strictly connected with the production of signals and disclosures of information (a successful crowdfunding campaign can be seen as a signal of quality for traditional funders such as angel investors and venture capitalists, and in a crowdfunding campaign there is a big amount of information disclosure (mostly available on the platform of crowd-funding), next paragraph is dedicated to explore the key points of signaling theory.

3.2 Signaling theory

Signaling theory is very useful when two actors (individuals or organizations) have different information availability. One party, the sender, has to choose whether and how to communicate (or signal) information, and the other party, the receiver, must choose how to interpret the signal. Accordingly, signaling theory has a big importance in many management fields, like strategic management, entrepreneurship, and human resource management.

When top executives increase the stakes they have in their firms, they communicate that they believe in the growth of their companies (Goranova, Alessandri, Brandes and Dharwadkar, 2007). The management team (or the founders) of a young firm in an initial public offering put in their board a diverse group of prestigious directors to send a message to potential investors about the firm's legitimacy (Certo, 2003; Filatotchev and Bishop, 2002). These examples show how a party can try to signal its quality to the other party.

3.2.1 A model for signaling

In this paragraph, I will describe the main actors involved in the signaling theory, referring to figure 5 (Connelly, Certo, Ireland and Reutzel, 2011)

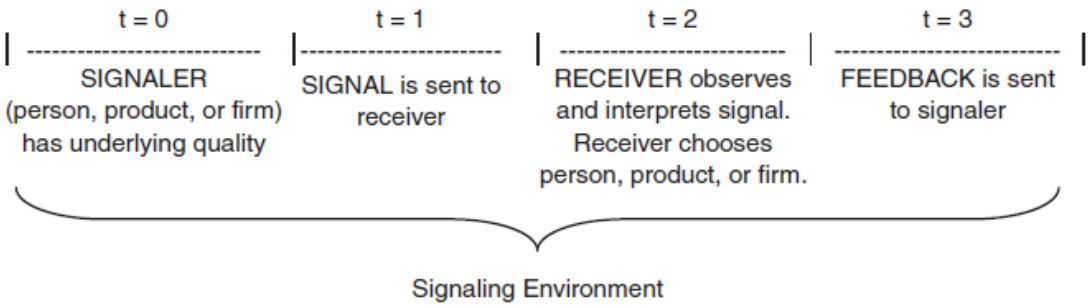

Figure 5: Connelly, Certo, Ire land and Reutzel signaling model

The two actors involved are the signaler and the receiver, plus the signal itself. Sometimes there is also a feedback that the receiver gives back to the signaler, and all this model has to be contextualized in a signaling environment.

Signaler: signalers are insiders who have information that are not available to outsiders. Generally talking, they have some information, either positive or negative, that can be useful for the receiver. It is a signaler's decision to disclose this information or not. In the management theory, signalers are usually represented by a person (a manager, a founder), a product, or a firm.

Receiver: according to signaling models, receivers are people who don't have some information but would like to have them. At the same time, there can be a conflict of interests between the signaler and the receiver, so that a false signal benefits the signaler at the expanses of the receiver. Signaling has a strategic effect: when a signal is received, the receiver does something that otherwise wouldn't have done. It gives him some more information that allows him to take better decisions. For example, some disclosures about a new product allow a customer to do a more informed choice, or new information about a company gives potential shareholders information for better action.

In management literature, receivers are usually individuals, groups of individuals, or firms. In the entrepreneurial field, the receivers are often potential investors, but also stakeholders in general (consumers, competitors, employees). The effectiveness of the signaling is determined by the characteristics of the receiver. *Receiver's attention* is in fact the grade at which the receiver is scanning the environment. If the attention of the receivers is very low, even a big effort by the signaler will be vane. Another important element to take in consideration is the *receiver's interpretation*, that may condition the effectiveness of signaling.

Signal: insiders (signalers) obtain positive or negative information. Signaling theory primarily refers to positive information that shows positive organization or individual qualities. When they send negative signals, it is usually an unintended consequence of their action. An insider can send a very big numbers of information, but not all of these are useful as signals. There are

mainly two characteristics for a signal to be efficacious: *signal observability*, which refers to the extent to which the receivers are able to observe the signal. Of course, if the outsiders are not able to observe the actions of the insider, these signals are completely useless. Observability is a necessary but not sufficient condition of a signal; *signal cost* is the second characteristic of efficacious signals. It is important to note that different signalers have different costs to produce and transmit the same signal. If we imagine the same product created by two different companies, a high quality and a bad quality one, that want to obtain a certification of quality, for the high quality one the costs to have that certification will be definitely lower than for the other one, because the good one is already working with high standards and probably only few details will have to be fixed. When producing a signal is too expansive but the importance of the signal is well recognized, many people will be tempted to cheat. For this reason, the cost of signals should be organized in the way that fake signals do not pay any return.

In the management field, scholars have identified different signals relevant for the setting at hand; for instance, prestigious board of directors (Certo et al., 2001) and prestigious top managers (Lester et al., 2006) show the quality of company to investors. Signals are classified in many ways. *Signal fit* is referred to how a signal is correlated with unobservable quality. *Signal frequency* is connected to the frequency at which the signals are sent. If there is a high frequency, usually the signaling value is higher, as far as they respect *signal consistency*, defined as the agreement between multiple signal from one source (Gao et al., 2008). Without signal consistency, conflicting signals could create confusion.

Feedback: a feedback occurs when a receiver gives back information to the signaler about the effectiveness of the signal itself. The assumption in this case is that information asymmetry works in two directions: receivers, obviously,

want to have some information, but also signalers want a feedback from the receivers. This way also the signaling effectiveness improves since signalers will try to produce signals in the most effective way (Gulati and Higgins, 2003).

Environment: the importance of the environment is related to the conditions at which the signaling takes place. In countries where the means of communication are limited, signaling will be harder and more costly. Case in point, a country where censorship is strict, it is easy to assume that it is costly to produce certain signals of quality related to the effectiveness of politicians. But also in a democratic State, where there is press freedom, if the disclosure of the signal is left to the media solely, there could be distortion due to the fact that the receivers don't observe directly the signal, but through an intermediary.

Chapter 4:

The dataset

In this chapter I explain all the variables I collected. A short explanation for each variable is given and also the sources used to get the data are discussed.

4. The dataset

In this chapter I will give a list of all the variables and how I collected them, while in the next chapter I will provide descriptive statistics.

In this paragraph I will describe how I built the dataset, what sources I used, the meaning of different variables and how I collected the information both in Kickstarter (KS) and in Indiegogo (IG).

My datasets contains all the hardware projects funded both in KS and IG (from the launch of the websites to the 31st of December 2013) that collected more than USD 100,000. The first KS campaign of the population expires the 15th of May, 2011, the first in IG the 28th of June, 2011. The projects are not uniformly distributed over our temporal window of about two and a half years: in fact in the early time KS and IG were definitely less popular and so the total number of project was definitely smaller.

The dataset is made of two main parts, the first related to the projects and the second related to the human capital that created the projects (these variables have been used as controls). Part of data collection was done writing some codes to accelerate the job, but another part was "handmade" because there were no patterns to follow. It means that I visited each project website and platform webpage and I collected all the information available. This work was about three months of full day work.

All data were collected between October 2014 and January 2015. When it was possible to have information at the time of the campaign we used them, otherwise we used the information at the time of the campaign.

4.1 The projects

I collected all the 300 projects which finished their campaign from 15th of May, 2011 to 31s of December 2013 that raised more than USD 100,000 in KS and in IG. The interesting thing is that this is the entire population of the hardware projects, not just a sample, and it means that the results will be very accurate.

I will divide these variables in four groups.

1) The first group is composed of information easy to find in KS and IG:

- ID: for every project I created an ID, that is the key of the dataset
- Name: it's a short name of the project
- Raised USD: amount pledged in USD
- Source: Kickstarter (KS) or Indiegogo (IG)
- Category: categories proposed by an 11-year hardware expert (3D Printing, Accessory, Connectivity, Entertainment, Flying, Home, Kids, Medical, Tools, Visual, Wearable)
- Subcategory: subcategories proposed by a hardware expert
- Funding type: whether the campaign is fixed or flexible funded (note: in KS I have only fixed funding, in IG I have also a few "forever funding campaign")
- Title: the full title of the project in the campaign
- City: city of the project
- Country: country of the project
- Presentation date: the date at which the campaign starts
- Expiration date: the date at which the campaign finishes
- Rewards count: the number of reward levels for each project
- Minimum reward: the minimum amount of money a backer can pledge
- Maximum reward: the maximum amount of money a backer can pledge
- Videos: number of videos listed for a project embedded in the project story
- Images: number of images listed for a project embedded in the project story
- Pledged capital: amount pledged in the country currency
- Target capital: the threshold the campaign has to reach to get the money in a fixed campaign in the country currency. Also in a flexible campaign there is a threshold; it just influence the fee the entrepreneur pays to the platform.
- Currency: the currency in which the campaign has been proposed.
- Platform category and subcategory: category and subcategory assigned by KS and IG

2) The second group is related to company information:

- Incorporated: a dummy variable that is one if the company launching the project is incorporated and zero otherwise
- Status: it's the status of the company if it is incorporated at the time of collecting the data (from October to January). It can be operating, closed, acquired, merger or IPO
- When acquired, merged, IPO or closed: the date when a company has been, merged IPO or closed and from whom
- Founded at: date for foundation of the company
- Company name: name of the company
- Homepage URL: campaign product website. When this website is not the same as the company (because a company can have various websites), the company website is in found in notes
- Company size: numbers of people working in the company from LinkedIn. the number is usually expressed in a range format (up to 10 (10), up to 20 (20), up to 50 (50), up to 200 (200), over 200 (no company had more than 200). The data represents the size of company at the time of data collection (and not at foundation)
- Patents: a dummy equals to (1) if the company has at least one patent granted, (0) otherwise. The data are collected using Thomson Reuters database.

3) The third group is about platform details and company products, but more complex to find. They were "handmade" collected.

- Presale unit: since each backer can pre-order more than just one unit, we count the number of units of products sold on the platform (for a proxy of market size). We sum the number of backers shown in the reward window (that will obtain a product) multiplied by the numbers of units from each reward window. This column is the best proxy for the potential market
- Product minimum price: it's the minimum price a backer can obtain a presale unit. I do not consider as a presale unit all the gadgets or a part of a product, but only an entire product. Very often in fact the cheapest rewards do not offer the product itself, but just some gadgets or part of the product

- Estimated delivery of the product: the estimation delivery date that founders are obliged to put at the time of the campaign. I always used the earliest one, including the very frequent beta-units
- Updates after campaign before shipping: number of updates during the interval after the end of the campaigns and before shipping the product. In this sense, the last update clearly tells the backers that they are starting shipping their pre-ordered product
- Shipped at: start of product shipping
- Shipped: categorical variable that tells if they have actually shipped the product (1) or not yet (2) or never will (-1) at the time of data collection (Oct 2014, Jan 2015)
- Previous product: dummy variable that tells if the company sold other products before the launch of campaign (1) or not (0)
- Traditional funding after: dummy variable that tells if the company got traditional funding after the end of the campaign

4) In this last group, there are all the information about traditional funding after and before the campaign. They have been collected using the Crunchbase database (7 October 2014), searching on "angel.co". and double checking using VentureXpert database. Then for each company a Google research was done to check the information or to find other information if not found in the previous resources.

- Funding after: the dependent variable equals to (1) if the company got traditional funding afer the end of the campaign, (0) otherwise.
- First funding after: when the company got traditional funding after the campaign for the first time
- First funding after amount: the first amount of money they got after the campaign
- First funding after type: the type of the first traditional funding they got. It can be: venture, angel, seed, undisclosed, equity crowdfunding, grant or debt financing
- Funding rounds: number of rounds of financing
- Permalink Crunchbase: it's the permalink of the excel file of Crunchbase used to see if the company got traditional funding
- Angellist: it's the link of angel.co page of the company, when available

- Previous traditional funding: dummy variable that tells if the company got traditional funding (1) or not (0) before the end of the campaign

4.2 The human capital

For each project I collected the human capital. More specifically, I decided to collect names and information about the founders of the company that backed the project, and in the case the CEO of the company is not one of the founders (it happened very rarely), also information about him, because he has a prominent position. I found 578 founders on 300 projects, that means an average of 1.93 founders per project.

Following Colombo and Grilli (2005) who investigate how human capital impacts growth of new technology-based firms, we collect additional set of variables. Since they show "that the nature of the education and of the prior work experience of founders" exerts a key influence on growth, we collect founders' years of university education in economic and managerial fields. Following this evidences, I collected all these variables to see if these results can be applied also to our dataset.

I will divide the information collected in four parts.

1) Social information about the founders: following many papers working about the same topic, I collected many information to see the importance an individual has in the social network.

- Facebook(FB) friends: FB account of the project founder. In KS, there is just one FB account for project (if there is), however, for IG, each founder can have his Facebook page connected
- Previous project backed: the number of project backed by founder(s) before the end of the campaign
- Total project backed: the number of project backed up to data collection time (October, 2014,-January, 2015)

- Previous project created: the number of project the founders created before the focal project expired. In KS this information is available per project, so all the founders of the same project will have the same number of previous projects created; however, in IG, the information is available per founder
- Total project created: the total number of projects created by founders up to the data collection time .In KS this information is available per project, so all the founders of the same project will have the same number of previous projects created; however, in IG, the information is available per founder
- Linkedin connections: number of LinkedIn connections a founder has (it is capped in LinkedIn).

2) Position in the company and location of the founder

- Position: it's the position a founder has in the company. It's CEO, CTO, CFO, CPO, President, Vice President. If it's not a top role it is not collected
- CEO is founder: dummy variable to see if CEO is also a founder (1) or not (0).
- Location city: city of founder
- Location country: country of founder

3) Education information and patent. For education, I've been conservative: in the case when there is not detailed information, I used the minimum value (e.g. if only the name of the university a founder attended is found, I assumed he did a bachelor of 3 years).

- Education: number of years spent in university
- Technological education: number of years spent in university in technical fields such as engineering, math, physics, medicine, biology and chemistry
- Economic education: number of years spent in university in economic and management fields such as economics, political sciences, management, and MBA
- Design education: number of years spent in university in design fields
- University: name of the university in which the founder got his last degree
- University last degree: the last degree of a founder (bachelor, master, MBA or PHD)
- Patents: number of patents up to the end of the campaign (only from LinkedIn

4) Working experience: information about the working experience

- Work experience: total number of years spent in industry gaining work experience (it is usually the number of years after the end of University before the campaign, but sometimes some people significantly worked also during University)
- Tech-hardware industry work experience: number of years in a technical position in the hardware industry
- Economic-hardware industry work experience: number of years in commercial position in a hardware industry. These non-technical jobs include sales, marketing or strategy position.
- Prior management position: the number of years in management position. The following positions are considered managerial: (CEO, CTO, CFO…) president or vice-president. This variable is not industry specific.
- Prior entrepreneurial experience: the number of companies founded by the founder (before the end of the campaign year)
- Name and status of prior companies: outcome of prior companies (operating, acquired, IPO, merger or closed)

Chapter 5: Hypothesis, analysis and results

In this chapter I propose and discuss the research hypothesis. Then I will give same descriptive statistics of the variables, and finally I present the analysis and the results.

5. Analysis and results

In the first part of this chapter I will first introduce my research hypothesis, then I will give some descriptive statistics of the variables and finally, I will present the results of the regressions.

5.1 Research hypotheses

I formulated four research hypotheses, that are all based on the theoretical concept of the signaling theory. As widely argued in the previous chapters, many signals are used by traditional funders to screen the prospective companies for investment. Since the importance of having previous traditional funding and granted patents is well established in Chapter 2, I skip supporting explanations and refer the reader to that chapter for past literature information. However, to summarize, the overall evidence suggest that (1) angels and VCs are very selective and only fund less than one percent of businesses they review; therefore, it is no surprise that having been selected by an angel or VC sends a strong signal of quality to potential investors and (2) given that VCs or angels add value to their investee companies, these companies relative to non-invested firms are attractive investment targets and not surprisingly these invested companies manage to exit successfully via IPOs or acquisitions (Ragozzino and Blevins, 2014). Following the large literature about VCs and BAs selection criteria, I formulated the following hypothesis:

H1: Previous traditional funding increases the likelihood to obtain venture capital funding after the campaign.

As discussed in decision criteria for VC and angels, patents are valuable resources that also signal the quality of research staff and technologies of high-tech companies (Hsu and Zieodenis, 2013); contrary to prior literature, we particularly focus our attention to first-time patenting of firms as initial patent application (as well as stock of patents) is associated with real changes in size of

firms (Balasubramanian and Sivadasan, 2011; Andrews Criscuolo, and Menon, 2014). This evidence would further suggest initiation of innovation commercialization, which often requires complementary assets including capital of investors.

H2: The presence of at least one patent granted increases the likelihood to obtain venture capital funding after the campaign.

Moderators of previous traditional funding

Whereas patents are likely views as successful outputs of research and development, commercialization and development of successful products based on patented technologies yet remain uncertain, expensive, and might take a lot of time and effort to realize. Shipping the first product (or products in general) can be seen by traditional funders as a signal that the firm has reached the commercialization milestone. Prototypes have been shown to attract investors in addition to patents (Audretsch, Bönte, and Mahagaonkar, 2012). Therefore, shipping a product similar to prototype not only shows the feasibility of the product but also it shows its quality and possibly can be used to pinpoint the demand. Product in this sense reduces the information asymmetry between the new company and funders as it is a manifestation of the capabilities of the company. In our context, shipping brings additional information such as product reviews by customers (and backers). This information is valuable to potential investors. Thus, we view shipping a product as a factor that increases the likelihood of receiving VC or angel funding conditional on prior funding.

H3: Shipping a product after a crowdfunding campaign increases the effect of previous traditional funding on getting funding after the campaign.

We further argue that the ratio of amount raised over the amount of target is a proxy for the success of the campaign. Success ratio is a proxy for market demand over demand estimated by entrepreneur himself. Entrepreneurs are cautious in setting the target capital as high amounts if not reached would render their campaigns unsuccessful in the case of fixed funding schemes and low amounts would not be sufficient for them to deliver the product. Therefore, given the estimations of entrepreneurs about their capital needs, we believe that this success ratio is influencing the opinion of investors conditional on prior funding.

H4: Success ratio after a crowdfunding campaign increases the effect of previous traditional funding on getting funding after the campaign.

5.2 Descriptive statistics

Our sample is all the hardware projects which raised a minimum amount of 100 thousand USD from 2011 to 2013 in two platforms of Kickstarter and Indiegogo. The size of our sample is 300 projects. In terms of yearly distribution, in 2011, there are 17 projects, and 2012, this number grows to 82, and 2013 to 201 projects.

In table 1 there are the descriptive statistics of the variables I will use in my analysis. I will explain the variables in detail.

	Variables	Mean	S.D.	Min	Max
1	funding_after	0.29	0.455	0	1
2	shipped	0.833	0.373	0	1
3	log of pledged capital	12.451	0.79	11.518	16.144
4	log of success ratio	1.748	0.833	0.616	4.641
5	log of 1+ age in years	1.075	0.765	-0.149	4.61
6	previous traditional funding	0.207	0.406	0	1
7	patent dummy	0.25	0.434	0	1
8	m_education	5.604	2.104	0	13
9	m_work_experience	12.67	7.42	0	37
10	m_prior_management_position	4.564	5.538	0	32
11	m_prior_entrepr_exp	0.645	0.854	0	4.5

Table 1: descriptive statistics

Dependent variable

Funding after denotes whether a company receives traditional funding after the expiration date of the campaign from three groups of investors (i.e., angels, VCs, and equity crowdfunding) as verified by the end of 2014). This variable is equal to one for companies that manage to raise funding and zero otherwise. 29% of the 300 projects (87 in absolute term) got traditional funding after end of their campaign.

Independent variables

Shipped is the number of projects that managed to deliver on their promise of shipping the product. 83.3% of the projects shipped the products at the time of data collection. Mollick (2014) found that 35% of his sample of Design and Technology Kickstarter categories?? hadn't already shipped at the time of the data analysis (the time that passed between the collection of the data and the analyses is comparable with mine)showing that in hardware sector probably

the commitment is higher, since the business opportunities are very high. Only 5 projects over 300 (less than 2%) failed or gave back money to the backers(4% in Mollick paper). It appears that large target projects in this sector are more reliable as these projects are most likely to be screened carefully by the platform and this due diligence increases the quality of the projects.

Log of pledged capital: pledged capital is the amount of money raised during the campaign. This variable is logged to remove the skewness.

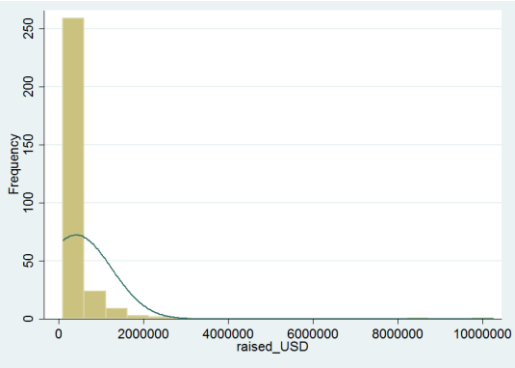

Figure 6: raised USD

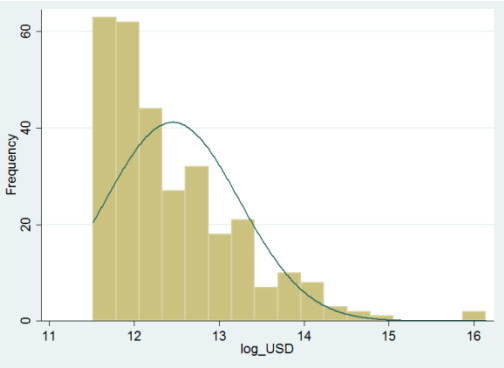

Figure 7: log of raise USD

The mean of pledged capital is USD 408,602, the minimum USD 100,490, and the maximum more than USD 10 million, with a very high standard deviation. We can see from the graphs, that even if a right asymmetry remains, the situation improves significantly. From figure 6, it's evident that a high frequency on the lowest amount raised.

Log of success ratio: success ratio is defined as the ratio of raised capital to the target. The log of this variable is used to reduce concerns of skewness. The mean success ratio is 7.89, the minimum 0.85 for a flexible project, the maximum 102.67. It is noteworthy that the median is 4.05, showing that a lot of projects were really overfunded.

Log of age in years: this variable is the log of the time that passed from the foundation of the company up to the presentation date of the campaign

calculated in years. The oldest companies had almost one hundred years (which is a established corporation), while the youngest are even founded after the presentation date of the campaign (their value will be negative); for this reason I add one to the age and log this variable. The median is 1.48, and 75% of the companies has less than 3.45 years, confirming that start-ups have a dominant position in the crowdfunding campaigns.

Previous traditional funding: this variable is equal to one when the company has received funding from VCs or angels before the campaign started. 20.7% of our sample got previous traditional funding.

Patent dummy: 25% of our sample got at least one patent. It's interesting that of the 75 companies that had patents, 57 had one or two granted patents, 11 had 3 or 4, and only a few had a significant amount of patents.

Mean education is the mean of the education of the founders in years of university. The mean is 5.60 (on a subset of available information of 567 founders), showing a very high grade of education– this average corresponds to a master degree on average. 132 have a master's degree, 48 have MBA, and 38 even a PhD. The most frequent field of study was the technologic one, followed by the economic field.

Mean work experience: This is the mean of working experience of the founders. A mean of 12.67, a median of 11.33 years. Figure 8 shows that even if the companies are very young the founders usually have a significant work experience.

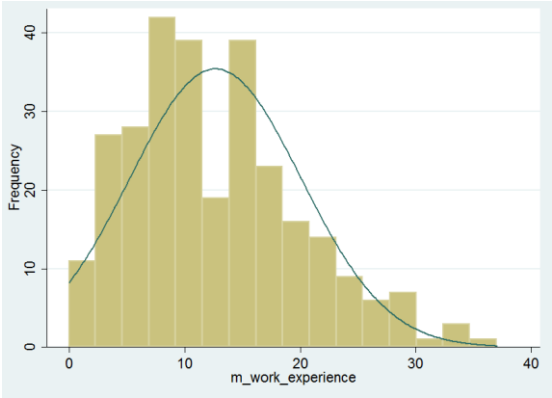

Figure 8: mean work experience

An important amount of prior work experience is in the technological and the economic field.

Mean prior management position: this is the mean of management experience of the founders in years. The median is 2.5 and a mean of 4.6.

Mean prior entrepreneur experience: it is the mean of the number of the previous companies founded by the entrepreneurs. Of the 578 founders, 247 (43%) have founded a previous company, and 31 (5%) can be considered as serial entrepreneurs with multiple founded companies (at least 3 companies including the current one).

Correlation matrix

Table 2 shows the correlation between the variables explained above.

I show this table to discuss possible issues arising from multi-collinearity; when two or more of the variables are highly correlated and inflate the standard errors in the regressions. There is high correlation between *log_pledged capital* and *log of success ratio.* Figure 9 show the scatter plot; in order to verify issues of multicollinearity, we introduce these variables separately in our analysis and results don't change. Additionally, the condition index number is below 50, which is a rule of thumb suggesting issues of collinearity.

		1	2	3	4	5	6	7	8	9	10	11
1	funding_after	1										
2	shipped	-0.09	1									
3	log of pled. capital	0.21	0,01	1								
4	log of success ratio	0.01	0.17	0.50	1							
5	log of age in years	-0.12	0.04	-0.05	-0.09	1						
6	prev. trad funding	0.33	0.07	0.16	0.00	0.08	1					
7	patent dummy	0.19	-0.07	0.14	-0.07	0.20	0.28	1				
8	m_education	0.13	-0.08	0.08	0.04	-0.02	0.03	0.13	1			
9	m_work_exp	-0.08	0.01	-0.04	-0.14	0.28	-0.08	0.15	0.04	1		
10	m_prior_mngm	0.00	0.01	0.00	-0.14	0.38	-0.01	0.14	0.09	0.65	1	
11	m_prior_entr_exp	0.03	-0.05	0.07	-0.03	0.00	0.00	0.11	-0.01	0.43	0.44	1

Table 2: correlation matrix of the regression variables

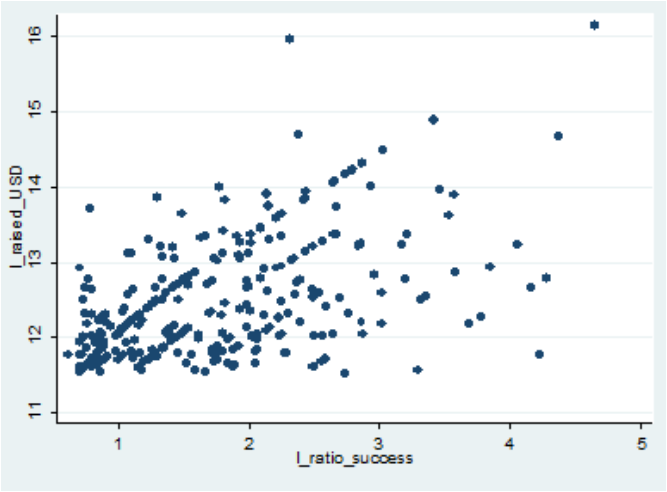

Figure 9: scatter plot of l_raisedUSD and l_ratio_success

Other quite high values are the correlation between some human capital variables, but this is not a problem since they were used as control variables.

5.3 Analysis and results

Since my dependent variable is a dummy, I decided to use a logit model for the regressions. I created ten different regressions; three without control variables while the other seven also include the control variables. The results explore for the first time the relationship between a crowdfunding campaign and traditional venture funding. The dependent variable is *funding after* for all the regressions.

In table 3 are shown the results of the regressions without the control variables.

In the first model we can see that the coefficient of *log of pledged capital* is positive and very significant. It means that a project that raises more money in a crowdfunding campaign has more likelihood to receive additional traditional funding after. It is very reasonable, since VCs first, but also business angel are attracted by absolute high value projects.

The coefficient of *log age of presentation* is also very significant, but with a negative coefficient. It means that young firms obtain more traditional funding than older ones. It seems that a successful crowdfunding campaign works really well as a signal for the traditional funders, and gives the possibility to grow to young firms that attract a significant amount of backers since after they obtain a significant amount from crowdfunding they also increase the likelihood to obtain additional funding.

Previous traditional funding is significant and positive. It confirms our first research hypothesis, showing that if a firm had already connections with traditional funders, it is more likely to obtain follow-on funding.

The coefficient of the dummy variable *patents* is significant and positive, giving analytic support also to our second hypothesis. As expected, a granted patent is a good signal for venture capitalists and business angels.

In the second model an interaction term has been added: *shipped X previous traditional funding*. The coefficient is significant and positive, confirming my third hypothesis. The fact that a firm shipped his product has a positive effect on previous traditional funding in obtaining funding after.

In the third model another interaction term has been added: *success ratio X previous traditional funding*. The fourth hypothesis doesn't find an empirical support since the coefficient is not significant.

In table 4 and table 5 there are the econometric results adding the control variables. In table 4 control variables are introduced one by one, while in table 5 they are altogether, also adding the interaction terms one by one. Overall, the results are robust to the inclusion of human capital.

In the fourth model it's possible to see that also *mean education* is significant and positive, showing that more mean education in the funding team increases the possibilities to get traditional funding. The same result is in model 9. In all the other models there are no significant coefficients, but in all of them the inclusion of these control variables doesn't change significantly my main results.

Further analyses

The reason why I collected so many variables from the crowdfunding campaign (mostly following the strategy of Mollick, 2014) is that I expected that the more information are produced in a crowdfunding campaign, the more traditional funders are attracted to the project. Furthermore, I originally thought that the production of information in the campaign could have mitigated the traditional signals. Mollick shows that the success of a crowdfunding campaign is influenced by the quantity of information produced during the campaign:

images, videos, updates, comments are all elements that positively affects the rate of success. I collected even more information than him from the platform: the exact number of product they pre-sold, to have the best proxy for market interest, the number of updates after campaign but before shipping, to actually measure the effort a creator gives to communicate the progress of his work even after the campaign itself. The collection of these variable was very time-consuming (some information had to be calculated manually for each project), but also very accurate: nevertheless, these variables didn't result in improvement of the above results. Probably, while backers really rely on this information because they are the only ones they have, traditional founders don't have time or just prefer to use traditional signals. As discussed before, anyway, they screen crowdfunding campaign using only the variables that actually show the results (shipping, amount raised) and are not interested in the commitment of the entrepreneur (number of videos, images or updates). It does remark the big differences between backers and professional investors: backer do have less time to take the decision about the investment, and also less resources.

	(1)	(2)	(3)
	funding_after	funding_after	funding_after
shipped	-0.547 (0.381)	-0.777** (0.385)	-0.547 (0.381)
log of pledged capital	0.570*** (0.203)	0.571*** (0.208)	0.568*** (0.203)
log of success ratio	-0.248 (0.241)	-0.259 (0.251)	-0.251 (0.265)
log of age at presentation day in years	-0.651*** (0.216)	-0.704*** (0.226)	-0.650*** (0.217)
previous traditional funding	1.590*** (0.354)	0.257 (0.791)	1.560* (0.804)
patent dummy	0.616* (0.329)	0.698** (0.327)	0.617* (0.327)
shipped X previous traditional funding		1.523* (0.862)	
success ratio X previous trad. funding			0.017 (0.418)
mean education			
mean work_experience			
mean prior_management_position			
mean prior_entrepr_exp			
constant	-7.048*** (2.341)	-6.848*** (2.371)	-7.028*** (2.350)
number of projects	300	300	300
number of companies	290	290	290
log likelihood	-153.454	-152.194	-153.453
chi squared	46.259	47.945	46.231
p-value	0.000	0.000	0.000

Table 3: logit regressions. Standard errors are robust and clustered around companies.

* p<0.10 ** p<0.05 *** p<0.01

	(4)	(5)	(6)	(7)
	fund_after	funding_after	fund_after	funding_after
shipped	-0.523 (0.406)	-0.583 (0.387)	-0.601 (0.387)	-0.592 (0.387)
log of pledged capital	0.502** (0.207)	0.563*** (0.207)	0.556*** (0.208)	0.549*** (0.207)
log of success ratio	-0.156 (0.235)	-0.210 (0.249)	-0.164 (0.245)	-0.181 (0.242)
log of age at presentation day in years	-0.560** (0.231)	-0.639*** (0.221)	-0.772*** (0.231)	-0.647*** (0.216)
previous traditional funding	1.495*** (0.357)	1.510*** (0.357)	1.565*** (0.354)	1.492*** (0.359)
patent dummy	0.468 (0.333)	0.582* (0.328)	0.531 (0.331)	0.578* (0.330)
shipped X previous traditional funding				
success ratio X previous traditional funding				
mean education	0.110* (0.062)			
mean work_experience		-0.009 (0.022)		
mean prior_management_position			0.032 (0.032)	
mean prior_entrepr_exp				0.002 (0.166)
constant	-6.913*** (2.454)	-6.806*** (2.377)	-6.901*** (2.398)	-6.770*** (2.378)
Number of projects	263	285	284	283
Number of companies	256	275	274	273
Log likelihood	-142.127	-149.829	-148.749	-149.268
Chi squared	39.213	43.082	47.465	42.461
p-value	0.000	0.000	0.000	0.000

Table 4: logit regression with inclusion of human capital variables. Standard errors are robust and clustered around companies.

* p<0.10 ** p<0.05 *** p<0.01

	(8)	(9)	(10)
	fund_after	fund_after	fund_after
shipped	-0.588 (0.404)	-0.843** (0.416)	-0.588 (0.406)
log of pledged capital	0.498** (0.215)	0.492** (0.219)	0.502** (0.215)
log of success ratio	-0.152 (0.260)	-0.159 (0.270)	-0.141 (0.284)
log of age at presentation_day in years	-0.658*** (0.250)	-0.708*** (0.258)	-0.661*** (0.251)
previous traditional funding	1.459*** (0.365)	0.144 (0.835)	1.548* (0.820)
patent dummy	0.467 (0.337)	0.551 (0.336)	0.464 (0.335)
shipped X previous traditional funding		1.504* (0.896)	
success ratio X previous traditional funding			-0.051 (0.429)
mean education	0.102 (0.066)	0.105* (0.064)	0.101 (0.066)
mean work_experience	-0.051 (0.032)	-0.051 (0.032)	-0.051 (0.032)
mean prior_management_position	0.079 (0.050)	0.079 (0.051)	0.079 (0.050)
mean prior_entrepr_exp	-0.021 (0.191)	-0.038 (0.194)	-0.021 (0.192)
constant	-6.367** (2.531)	-6.071** (2.574)	-6.431** (2.555)
Number of project	260	260	260
Number of companies	253	253	253
log likelihood	-138.907	-137.744	-138.899
chi squared	44.125	45.940	44.394
p-value	0.000	0.000	0.000

Table 5: logit regressions adding all the control variables Standard errors are robust and clustered around companies.

* p<0.10 ** p<0.05 *** p<0.01

Chapter 6:

Conclusion

In this chapter are resumed and commented all the results of the econometric analysis. Some hints for future research are presented.

6. Discussion and conclusion

between a successful crowdfunding campaign and the probability to obtain follow-on funding from traditional investors. This relationship has never been studied before, and my hope is that my work will provide insights into factors that drive the decision of entrepreneurs and investors.

For this reason, I selected hardware projects that raised at least USD 100,000 in the two biggest USA platforms, Kickstarter and Indiegogo. I did so for two reasons. Hardware is capital intensive and the projects should be large enough to attract traditional investors with larger growth expectation for investment criteria. I collected a dataset with several strata of information on projects, firms, founders' human capital. My empirical results suggest that:

The results show that 1) It is more likely to obtain post-campaign traditional funding once a firm obtains at least one granted patent. Patent in fact signal the innovative content of a product and the quality of technical founders' research capabilities (Hsu and Zieodenis, 2014).

, and also act as a protection against potential competitors; 2) If a firm had previous traditional funding before the campaign, it has more probability to get traditional funding also after the campaign.

3) The amount raised during campaign positively influences the likelihood of post-campaign traditional funding.

4) Delivering products (promised as rewards on the platform) increases the likelihood of additional financing conditional on prior financing from this set of investors.

contribute to a few emerging topics in entrepreneurial financing. First, crowdfunding is nascent and alternative source of capital for entrepreneurs; however, it so far was left unknown whether crowdfunding will crowd out or

complement those of traditional entrepreneurial financing. I take on this challenge and show that the result of the campaign can become a significant decision parameter for investors as they are evaluating the projects. Because campaigns not only provide information on market demand, but also allow entrepreneurs to demonstrate their abilities in delivering on their promise with constrained resources. I further show the relevance of signals in the market for entrepreneurial financing as the theory of signaling is mute regarding the content of signal; however, it stipulates the necessary conditions of signals. Signals should be observable and costly, both of which apply to shipment of products and success ratio. To my knowledge, this is the first study to explore the role of these signals in facilitating the production of information on market demand and founder's capabilities.

further research, one could enlarge the sample to more recent years. I collected the projects up to the end of 2013, but since the phenomenon is growing really fast, it would be interesting to include data in 2014. It would be equally interesting to collect data on software companies; for instance gaming industry is using these platforms to create a community of user base as well as raising money to develop the game. With regarding to my methodology, a more sophisticated methodology such as proportional hazard models seem more appropriate for the task at hand. This model would allow for right-censoring of observations and takes into account the duration till the follow-on financing occurs.

My work can have some implications for policy makers. Crowd-funding seems to increase the efficiency in allocation of resources by enabling entrepreneurs to raise money from crowd and showcase their initial success and attract investors.

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Acknowledgments

I would like to thank all the people who contributed to the work described in this thesis either directly or indirectly.

First, I want to thank Doctor Kourosh Shafi, that helped and advised me day by day during the progress of the work. He was very collaborative and helpful, and was my guide for these months of work.

My sincere thanks goes to Professor Massimo Colombo, that offered me the possibility to work in his research team in a very interesting field and gave me the right advices at the right time.

I thank my parents that during my academic studies always supported and helped me to find the proper motivation and my brother who I shared all my life and home with up to now.

I would like to thank my friends, that always helped me to overtook the obstacles I ran into in these years at Politecnico di Milano. Arianna, who was always by my side in each exam session and during my thesis writing. Matteo, who I studied with so many days during my undergraduate course and my cousin Matteo, who I prepared so many exam with. And, in general, all the other friends who I shared my study (and not only the study) with who gave me the strength to get this final academic goal.