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SCUOLA DI INGEGNERIA INDUSTRIALE
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EXECUTIVE SUMMARY OF THE THESIS

Drone startups: a research on the international ecosystem and on the determinants for attracting external funding

TESI MAGISTRALE IN MANAGEMENT ENGINEERING – INGEGNERIA GESTIONALE

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1. Introduction

All the industries are living a fast-changing economic scenario even sped up by the one-of-a-kind consequences linked to the COVID-19 pandemic. Incumbents must be flexible and innovative to maintain their position, and new ventures require exceptional managerial and technical skills to enter new markets. However, the latter aptitudes are not enough if not properly supported by adequate resources. For this reason, one of the most important themes considered by academic literature is the startups' funding. However, scientific knowledge needs time to be produced, and an adequate theoretical backbone often does not support emerging technologies. It is the case of drones, one of the most promising technologies at the moment.

This thesis, developed in collaboration with the Drone Observatory of Politecnico di Milano, aims at studying the global industry of drones to discover its key features and explore if and how specific organization's traits could impact the total funding raised from external investors. The focus is on the most diffused drones category: Unmanned Aerial Vehicles (UAVs). Drones are devices of various sizes, capable of performing several activities by flying in the sky without the need of a pilot on board, who remains on the ground or an adjacent vehicle which drives the drone employing a control tool.

Thanks to a quantitative methodology, this research maps the UAVs industry, integrating the most reliable sources available and exploiting the data collected also using two econometric models. The first one is set to understand if any startups' traits could affect the amount of the funding collected, while the second one eventually determines startups' characteristics that could influence Venture Capital's or other investors' decision to fund or not a startup in the drone industry.

To better describe the above researches, this thesis is divided into five chapters. The first centres on a

comprehensive literature review on startups, drones and new ventures funding, summarizing the main theories on these three concepts and setting the base for the subsequent study. The second section presents the objectives of the thesis and the quantitative methodology followed to answer the three main research questions. Then, the following division exhibits the results of the analysis. The fourth section gives some reflections stemming from a careful examination of the results from the previous analysis. Finally, to conclude, a recap of the key takeaways, a description of the limits faced, and possible future research pathways for extending the knowledge about the industry of drone startups and their funding is performed.

2. Literature Review

The literature on startups, particularly when focusing on the collection of funds from external investors, is extensive and scattered. Many studies affirm new ventures' importance to spur innovation and smart economic growth. Although startups' enormous potential, they are very predisposed to fail. One of the most foundational issues for launching high-growth ventures is probably the shortage of financial resources (Colombo, 2016). Moreover, industries in which private equity funds invest in expand faster in total production and employment and tend to be more resilient to eventual aggregate shocks (Bernstein, 2017). So, understanding the main motivations that move external investors to finance a startup is essential. The current literature reports many factors influencing the decision-making process of investors, which could be startup-endogenous (Block, 2019), like the age or the number of founders; exogenous as the appropriability regime or the level of market activity, and contingent, mainly related to the negotiation process (Bronzini, 2020).

3. Objectives and methodology

Although there is a wideness of academic literature on startups and new ventures funding, there is still a lack of papers deepening these themes on one of the most promising emerging technologies: drones. As a consequence, this research aims at enriching the academic literature on the drone industry and set the base for further research by answering three main research questions:

- RQ1) How many startups are currently operating in the drone industry at an international level, and how is their offer structured in relation to the funding received?
- RQ2) What major factors influence the amount of funding received by a startup in the drone industry?
- RQ3) Are there any specific startups' characteristics that could influence Venture Capital or other investor types to fund or not a startup in the drone industry?

In response to the first research inquiry, this study maps the current international drone startups' industry and explores the characteristics of companies populating it in terms of geographical location, target market, funding collected, application fields, and client sectors served. The companies acknowledged base their value proposition on drone-related products or services and were founded in the last decade. Choosing such a time interval for the analysis is fundamental due to the notable span that UAVs need to be conceptualized, prototyped and launched in the market for technical and legal reasons. A structured data collection process involving four databases is followed to cope with the lack of a proper classification of this industry which still misses unique NACE and ATECO codes.

After the census creation and its data analysis, a first econometric model is designed to discover if any drone startups' trait could impact the total funding amount collected from external investors employing a linear regression. The analysis is based on eight different explaining characteristics: age, geographical location of the headquarters, the number and the typology of investors engaged, the number of founders, the type of the startup's offering, the availability of any supplementary service, and the client sector. The Total funding amount collected by each startup is set as dependent variable.

Then, a second statistical analysis is defined to discover if some UAV startups' characteristics among age, geographical location of the headquarters, the number of investors engaged, the number of founders, the type of the startup's offering, the availability of any supplementary

service, and the client sector influence the decision of the four investors' class shown in Table 3.1 to fund or not a startup in the drone industry.

Investor Class	Investor types included
Venture Capital	Venture Capital, Micro VC, Corporate Venture Capital, Government Office, Private Equity Firms, Fund Of Funds, Investment Partner
Business Angel	Individual/Angel, Angel Group
Funds and banks	Investment Bank, Family Investment Office, Hedge Fund, Venture Debt

Table 3.1: Investors' class composition

4. Analysis and discussion of results

The research produced many insightful results. The starting point is an initial census of 5,283 startups selected as proper for the following study since they are operating in the drone industry. 2017 is the year that records the greatest number of drone startups founded; though with a 39.60 per cent rise in the number of organizations created compared to the previous year, 2015 had the greatest relative growth in new organizations. The historical trend on the number of drones startups founded is positive, although the last three years presented a soft contraction. The legal form most diffused in the drone industry is the Limited Liability Company (LLC), probably for its flexible and fiscal nature. UAVs startups are mainly headquartered in Europe, followed by North America, Central-South America, and Asia. However, only 8% of the European drone startups received funding, while North America, with 44.2 per cent, has the highest proportion of companies that have successfully raised funds. The total amount of funding received by the drone startups in the last ten years is $7.067 B, and as supposed, the United States leads the list of the nations with the highest funding collected, collectively with Germany ($ 466 M funding received) and China ($ 229 M funding received).

Considering startups' offering, the percentage of organizations providing products or services not directly to consumers amounts to 93.25% of the sample and the vast majority of startups (73.11%) is specialized exclusively in the drone's industry, demonstrating the relevant effort that needs to be put in order to have a successful startup in this business.

Moreover, the startups supplying only products have received more than half of the total funding amount (55%). The remaining funds are almost equally distributed between organizations offering only services or a combination of both products and services, respectively 25% and 20% of the total funding. An interesting insight is that the geographical areas where the technology is mature seem to have largely startups whose offer includes products. Going deeper into the characteristics of products produced, the distribution between organizations offering hardware or software is fairly homogeneous. However, the average funding collected by startups offering these two product typologies are acutely different since organizations marketing software could attract $1.6 M more than businesses providing hardware. Furthermore, most startups marketing hardware are specialized in platforms, and the majority of them sells rotating wing drones.

Startups specializing in UAVs' software primarily sell applications related to communication, namely related to ground activities as data and information transmission. Still, the businesses which received the highest amount of funding offer Digital Modelling software. This result could also be associated with this program typology's extensive use in site inspection activities, the most spread drones' product application field, including $ 1.68 B raised in funds. Considering the startups' targeted client sector, the most diffused is Infrastructure and Buildings, although the most founded is the Public one with $ 3.00 B raised.

Moreover, compared to Blockchain and Language AI, drone technology gained the highest funds in total and on average, confirming its top caliber.

For what concerns the statistical analysis, the first econometric model also generated meaningful outcomes. In particular, a greater number of founders could increase the likelihood of receiving external funding. Besides, the number of investors appears to have a relevant positive impact as well. This last result is more than logical since each backer is expected to contribute with more than

zero dollars, so it is logical that extra external backers will increase the financial support gained. Funds and Banks are the investor category which seem to have the most positive impact on the total funding collected by a drone startup. However, the other variables considered in the econometric model used to produce the above results did not present a statistical significance. Consequently, nothing could be concluded on the impact that a drone startup's age, headquarters' location, offer typology, client sector, and application field could have on the total funding amount collected by a startup operating in the drone industry.

The key finding of the second econometric model is that the same startups' traits could play reverse parts according to the type of investor deemed. For instance, investments from Funds and Banks and Venture Capitals appear to be negatively related to startups offering additional services or targeting clients operating in the Insurance sector. On the other hand, the opposite result regards Business Angels, who tend to invest in drone startups like the one described in the previous sentence.
Moreover, Funds & Banks and Innovation Dedicated programs are the only ones that seem to give attention to the number of founders and the startups' headquarters location, both preferring organizations with fewer entrepreneurs and based in Europe. However, they diverge when considering the Entertainment and media application field, since F&Bs' occurrence is negatively related to this offerings' employment context, while the opposite concerns Innovation Dedicated Programs. The latter is the only investor that seems to give importance to the drone startup's age; in particular, the higher the seniority, the higher the probability that these entities are present in the investors' pool. Moreover, Innovation Dedicated Programs seem to positively assess the startups whose offers target clients operating in the Healthcare & Pharmaceutical or Entertainment and Media sectors. For what concerns Business Angels, it is the only investor category to significantly evaluate the Utility client sector, tending to avoid investing in startups with that characteristic. Other relevant outcomes related to Funds and Banks are associated with their positive consideration of startups whose clients portfolio is focused on the Automotive, Art & Culture or Logistic & Transport industry. Moreover, F&Bs tend not to be the first to invest in a drone startup, presumably depicting the presence of other backer typologies as a positive signal of the startup's quality. Finally, other traits that could positively influence Venture Capital's investment decision probably are startups offering products or services whose application field is related to the Maintenance or the release of substances, while targeting clients in the Infrastructure and Building sector could dissuade VCs from investing in a drone startup.

5. Conclusions and future developments

Thanks to a quantitative approach, this thesis answered the three research questions and contributed to the scientific literature about the drone industry in multiple ways. First, setting the base with an exhaustive census of the worldwide drone industry and providing valuable insights into its main features. Secondly, providing statistical evidence of the factors that more than others can probably impact the total funding amount collected by a drone startup, and thirdly by specifying which key drivers could influence the investment decision of four investor categories. Although the huge effort put into building the most comprehensive possible census, it is not excludable that some organizations are missing, mainly because of two main reasons. Firstly, due to the delay between the fast-changing nature of the drone industry and the periodical sources update. Secondly, owing to the lack of a NACE or ATECO code that univocally defines the organizations working in this emerging domain. Moreover, the startups' definition is still a broader concept, and along with this research, some assumptions on this notion had to be made. As a consequence, changing these basic conjectures reshapes the final results: different hypotheses determine different conclusions. Given the above reflections, there is space for the development of further research. It would be interesting to go deeper into the consequences that each investors' type has on the startups, not only in terms of total funding provided but also for what concerns the managerial and operational activities carried out by the backed organization. Such a study could be crucial to thoroughly appreciate the influences that different external investors could have on drones' organizations and provide reliable advice to founders in order to enhance the probability of

success of their organizations. Finally, continuing to investigate the drone industry keeping the census updated is fundamental to fully comprehend the characteristics of this fascinating technology and exploit its countless potentialities at most.

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Drone startups: a research on the international ecosystem and on the determinants for attracting external funding

TESI DI LAUREA MAGISTRALE IN MANAGEMENT ENGINEERING-INGEGNERIA GESTIONALE

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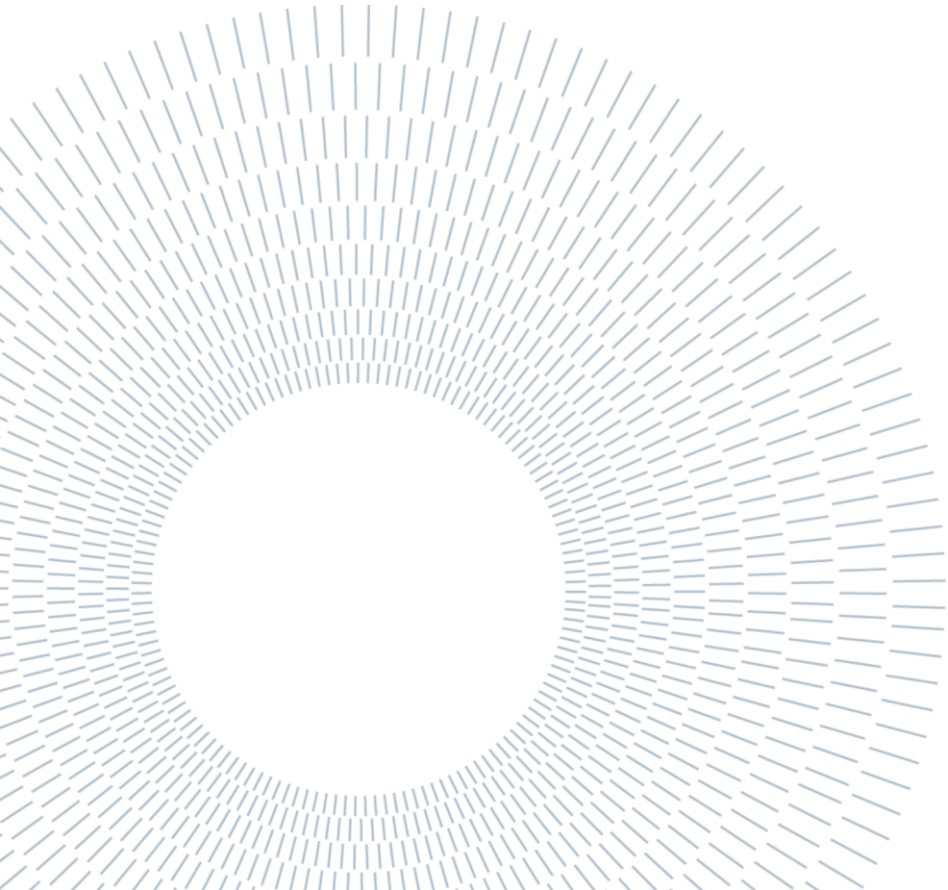


Abstract

This thesis, developed in collaboration with the Drone Observatory of Politecnico di Milano, has two main purposes. The first is mapping the current worldwide drone industry. The second is filling the knowledge gap, which affects the scientific literature when narrowing the notions of startups and their funding collection in the Unmanned Aerial Vehicle (UAV) sector.

In order to accomplish the first objective, a database containing the worldwide organizations founded in the last ten years and potentially operating in the drone industry was created, blending the information from four different databases: Crunchbase, Orbis, Aida and the Registro delle imprese Italiane. So, the starting point is an initial census of 41,865 startups; 5,283 are then elected as proper for the following study. Therefore, an extensive examination is run explaining the main features of this emergent sector, which cumulated $7.067 B in funding across the last ten years.

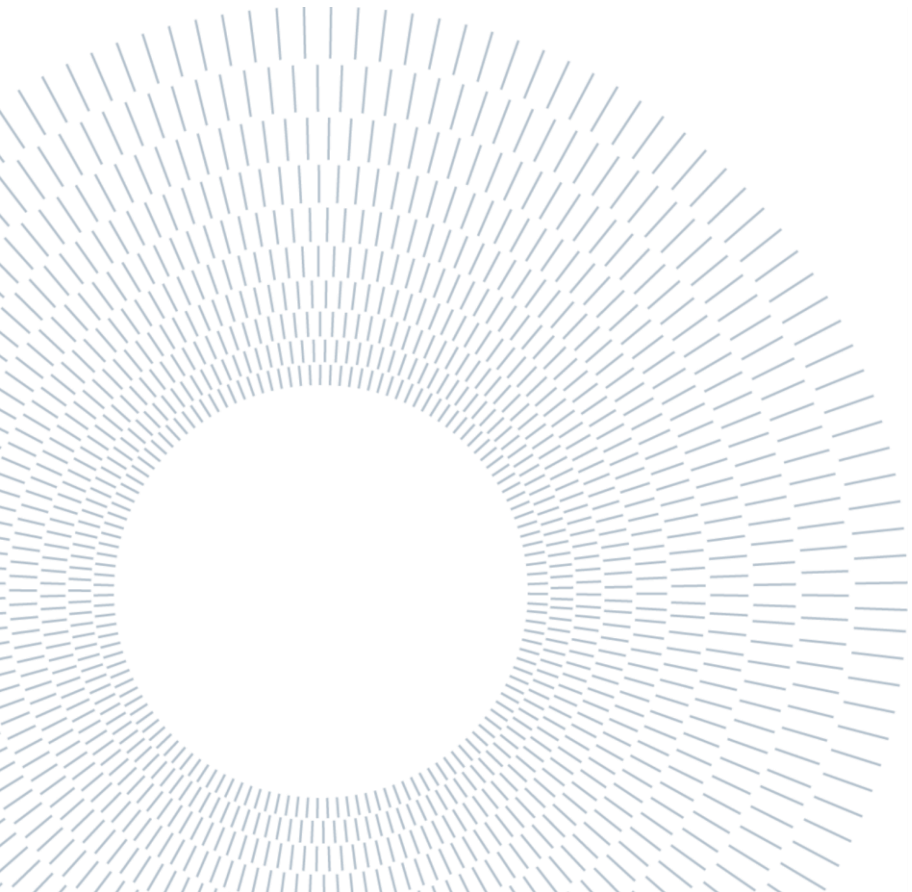
Next, two different econometric models were set in order to achieve the second aim of this thesis. The first statistical analysis found that the drone startups with more founders tend to collect larger funding than those with fewer initial entrepreneurs. The same is true for startups that can attract Funds and Banks as investors. The second model focused on the startups' properties affecting four investors' categories when deciding whether to invest in a new venture working in the UAVs industry. The classes considered are Venture Capitals, Business Angels, Funds & Banks and Innovation dedicated programs. The second examination proved how different investors' typologies look at different startups' traits among the headquarter location, products' and services' application field, clients' sector, startups' age and the number of founders.

Key-words: Venture Capital, startup, drone, funding, emerging industry.

Abstract in lingua italiana

Questa tesi ha due principali obiettivi. Il primo è la mappatura dell'attuale situazione globale del settore dei droni. Il secondo è colmare la scarsità che assoggetta la letteratura scientifica quando si approfonsiscono i temi di startups e la loro raccolta di fondi nel settore degli Unmanned Aerial Vehicle (UAV). Per realizzare il primo fine è stato creato un database contenente le organizzazioni fondate negli ultimi dieci anni in tutti i paesi del mondo e potenzialmente operanti nel settore dei droni, integrando le informazioni di quattro diversi database: Crunchbase, Orbis, AIDA ed il Registro delle imprese Italiane. Il punto di partenza della ricerca è un censimento iniziale costituito da 41.865 startups; di queste 5.283 sono successivamente ritenute parte del settore d'interesse e selezionate per le successive analisi. Viene dunque eseguita una valutazione approfondita al fine di delineare le caratteristiche principali del settore dei droni, che ha cumulato 7,067 miliardi di dollari di finanziamenti negli ultimi dieci anni. Successivamente, sono stati costruiti due diversi modelli econometrici per adempiere al secondo intento di questa tesi. La prima analisi statistica ha dimostrato come le startups di droni con più fondatori tendano a raccogliere maggiori finanziamenti rispetto a quelle con meno imprenditori nella prima fase di vita dell'azienda. Lo stesso vale per le startups in grado di attrarre Fondi e Banche come investitori. Il secondo modello si concentra sulle proprietà delle startups che influenzano quattro diverse categorie di investitori nel momento in cui valutano l'opportunità di investire in una giovane impresa che lavora nel settore degli UAVs. Le classi di investitori considerate sono Venture Capitals, Business Angels, Fondi e Banche e Programmi Dedicati all'Innovazione come acceleratori ed incubatori. Questo secondo modello ha dimostrato come differenti tipologie di investitori considerino diversi tratti delle startup tra la sede, il campo di applicazione dei prodotti e dei servizi, il settore dei clienti, l'età della startup e il numero di fondatori. Questa ricerca è stata sviluppata in collaborazione con l'Osservatorio Drone del Politecnico di Milano.

Parole chiave: Venture Capital, startup, droni, finanziamenti, settore economico emergente.



Contents

Introduction

Drones, alternatively referred to as Unmanned Aerial Vehicles (UAVs), are flying machines that can be remotely piloted or autonomous. Their primary components are an hardware and software parts. The physical component consists of a platform, various pieces such as the engine or batteries, and, eventually, one or more payloads. The first may take various forms, such as fixed or rotating wings, while payloads are essentially the objects that drones can carry, being them goods or, in some cases, people. The second critical component of drones is their software, which acts as the aircraft's brain, collecting, storing, and processing data. This emerging technology's greatest strength is its extreme adaptability. Drones can be used in several fields, from agriculture to emergency management, since they enable access also to the most remote areas.

Unmanned Aerial Vehicles will surely play a consistent role in humanity's future, as they are a highly adaptable and disruptive technology that facilitates individuals and businesses to accomplish goals previously considered impracticable due to economic or practical constraints. However, such emerging technology must be backed up by an adequate business structure to maintain its innovative and adaptable nature. In this sense, startups are critical to the future development of drones. As a result, it is crucial to understand the factors that foster startups centred on Unmanned Aerial Vehicles.

Moreover, as drones are an innovative and relatively novel technology, they currently lack an adequate scientific literature foundation. Thus, the final affirmation is even more accurate when the perimeter is narrowed to include funding for UAV startups.

This thesis adds to the existing body of knowledge by providing an overview of the entire drone industry and a more in-depth examination of organizations' funding and investors. The first chapter establishes the theoretical foundation for the subsequent research by providing a detailed overview of the current state of the art in the literature on startups and investors, with a particular emphasis on Venture Capital, in general, and drone-specific terms. The second chapter summarizes the work's objectives and presents the three research questions. The census and econometric model results are presented in Chapter three. The fourth section summarizes and discusses the previous

chapter's findings. The concluding chapter of the thesis is dedicated to illustrating its contribution to academic literature, its limitations, and future research directions.

1. Literature review

The first chapter points out the state of the art of the academic literature focused on startups, drones and new ventures funding, with a particular focus on the relationships between Venture Capital (VC) firms, other investors' typologies and startups, both in general and drone specific terms in order to identify the eventual knowledge gaps that this research could potentially fulfil.

The chapter is divided into two macro-sections:

1. The first explains the methodology applied to choose relevant scientific papers. Then, it describes why researches were chosen or rejected, step by step, to achieve the maximum possible coherence with the topics selected to avoid including documents that would have merely added complexity to the forthcoming investigation.
2. The second section describes the contents of the selected papers, the key patterns and findings that can be drawn from the existing state of the art on the notions of startups, types of investors, with a focus on VCs, drone industry, and their junction point. Due to a scarcity of publications on the Unmanned Aerial Vehicle industry, a contextualization effort was undertaken to narrow down the current literature on this burgeoning business sector.

1.1 Methodology of the literature review

The literature on startups, particularly when considering how these young organizations collect funds from external investors, is extensive and scattered. As a result, following a systematic approach to finding, categorizing, and analyzing all publications relating to these themes is critical.

Scopus is the primary database used to perform this literature review, with access supplied by Politecnico di Milano. A series of eight queries have been created, considering the combination of the keywords below:

- ("Drone*" OR "piloted aircraft system*" OR "UAV*" OR "unmanned aerial vehicle*" OR "unmanned" OR "aircraft*" OR "VTOL" OR "vertical take-off and landing" OR "unmanned aerial*")
- "Business model*";
- ("Venture*" OR "New venture*" OR "New firm*");
- ("Startup*" OR "start-up*" OR "emerging industr*");
- ("VC*" OR "Venture capital*");
- "Entrepreneur*";
- "Business Angel*";
- "Innovati*";
- "Unicorn*".

The detail of each query, namely its ID number, keyword composition and the number of paers found is reported in Table 1.1: Queries' detail.

ID	**Query**	**# Papers found**
1	("Drone*" OR "piloted aircraft system*" OR "UAV*" OR "unmanned aerial vehicle* OR "unmmaned" OR "aircraft*"")AND ("Business model*" OR "Venture*" OR "New venture*" OR "New firm*" OR "Unicorn*" OR "VC*" OR "Venture capital*" OR "Startup*" OR "start-up*" OR "emerging industr*" "Entrepreneur*" OR "business angel*")	4
2	("Drone*" OR "piloted aircraft system*" OR "UAV*" OR "unmanned aerial vehicle*" OR "unmmaned" OR "aircraft*" OR "VTOL" OR "vertical take-off and landing"OR "unmanned aerial*") AND "Business model*" OR ("Venture*" OR "New venture*" OR "New firm*") OR ("Startup*" OR "start-up*" OR "emerging industr*") OR ("VC*" OR "Venture capital*") OR "Entrepreneur*" "business angel*" OR "innovati*"	11
3	Business model* AND (("Venture*" OR "New venture*" OR "New firm*") OR ("Startup*" OR "start-up*" OR "emerging industr*") AND ("VC*" OR "Venture capital*") OR "Entrepreneur*" OR"business angel*" AND "innovati*")	150
4	("Business model*" AND ("Venture*" OR "New venture*" OR "New firm*" OR "Startup*" OR "start-up*" OR "emerging industr*"OR "innovati*") AND ("VC*" OR "Venture capital*" OR"business angel*"))	66
5	("Drone*" OR "piloted aircraft system*" OR "UAV*" OR "unmanned aerial vehicle*" OR "unmmaned" OR "aircraft*" OR "VTOL" OR "vertical take-off and landing"OR "unmanned aerial*") AND "Business model*" OR ("Venture*" OR "New venture*" OR "New firm*") OR ("Startup*" OR	29

	"start-up*" OR "emerging industr*") OR ("VC*" OR "Venture capital*") OR "Entrepreneur*" "business angel*" OR "innovati*"	
6	("Drone*" OR "piloted aircraft system*" OR "UAV*" OR "unmanned aerial vehicle*" OR "unmmaned" OR "aircraft*" OR "VTOL" OR "vertical take-off and landing"OR "unmanned aerial*") AND "Business model*" OR ("Venture*" OR "New venture*" OR "New firm*") OR ("Startup*" OR "start-up*" OR "emerging industr*") OR ("VC*" OR "Venture capital*") OR "Entrepreneur*" "business angel*" OR "innovati*"	47
7	(("Drone*" OR "piloted aircraft system*" OR "UAV*" OR "unmanned aerial vehicle*" OR "unmmaned" OR "aircraft*" OR "VTOL" OR "vertical take-off and landing" OR "unmanned aerial*") OR "Business model*" OR ("Venture*" OR "New venture*" OR "New firm*") OR ("VC*" OR "Venture capital*") OR "Entrepreneur*" "business angel*" OR "innovati*") AND "classification*" AND ("Startup*" OR "start-up*" OR "emerging industr*")	8
8	(("Drone*" OR "piloted aircraft system*" OR "UAV*" OR "unmanned aerial vehicle*" OR "unmmaned" OR "aircraft*" OR "VTOL" OR "vertical take-off and landing" OR "unmanned aerial*") OR "Business model*" OR ("Venture*" OR "New venture*" OR "New firm*") OR "Entrepreneur*" "business angel*" OR "innovati*") AND ("Startup*" OR "start-up*" OR "emerging industr*") AND ("VC*" OR "Venture capital*")	181

Table 1.1: Queries' detail.

The "*" put at the end of some keywords is needed to consider also derived terms. For instance, writing a query on Scopus seeking "Innovati*" instead of "Innovation" enables the researcher to include in the study all the possible terms that present the same initial spelling but differ in the last word's part, such as "Innovation" or "Innovative."

The constraints that were taken into account when picking the papers are related to the typology of the document since, for the current thesis, the perimeter is mainly bound to articles and reviews produced by Journals. Moreover, the subjects that limit the literature research on Scopus are "Business", "Economics", and "Social". There is also a time constraint that takes into account only the documents published in the last ten years, i.e. from 2011 to 2021, 2011 included. Moreover, a further limitation was put when considering the publication stage to only evaluate final documents or articles in press (AIP). Finally, the last filter put during the research on the papers' database is the language only to deem English-written papers.

The result of all the queries is a total of 496 papers. After the query formulation, the identified studies' list is downloaded, exported, and grouped in an Excel sheet with

all the relevant information (Author, Document title, Year, Source title, Volume, issue, pages, source & documentation type, Abstract, Author keywords).
The articles are then picked following a one-by-one examination of the content of each paper, beginning with the abstract. The documents that pass the second screening phase are then downloaded using Scopus or Google Scholar and read in their entirety. A final collection of 65 articles is chosen after multiple selection rounds with a panel of experts from Politecnico di Milano's Drone Observatory. Many different sources are analyzed, in particular: *Small Business Economics, Journal of Business Venturing, Journal of Financial Economics, Venture Capital, Management Decision, Industrial and Corporate Change, Strategic Entrepreneurship Journal, Management Science, Journal of Technology Transfer, Research Policy, Technology Analysis and Strategic Management, Strategic Management Journal, Journal of Corporate Finance, Sustainability, Journal of Management, Journal of Cleaner Production, Organization & Environment, Review of Economics and Statistics, Transportation Research Part A: Policy and Practice, Technological Forecasting and Social Change, Review of Financial Studies, Journal of Economics and Management Strategy, Information Processing and Management, Journal of Industrial and Business Economics, Journal of Small Business Management, International Journal of Entrepreneurial Behaviour and Research, Journal of Management in Engineering, Journal of Social Entrepreneurship, Research Technology Management, Sustainability (Switzerland), International Entrepreneurship and Management Journal, SAGE Open, Chinese Economy, Journal of Small Business and Entrepreneurship, American Economic Review, Geoforum, Journal of Enterprising Communities, Academy of Entrepreneurship Journal, IEEE/ACM 1st International Workshop on Software Engineering for Start-ups, Harvard Business Review, Financial Innovation and Technology in Society.*
According to the Scimago Journal & Country Rank[1], the overall quality of the sources evaluated is high. This portal categorizes journals and other sources of scientific information using a four-tiered scale: Q1, Q2, Q3, Q4. Q1 is assigned to the most credible sources, while Q4 is given to the least trustable. Because 71.4 per cent of the articles reviewed are classified as Q1, the overall quality of the papers considered is excellent. Further information is available in Figure 1.1: Scimago classification of papers in the literature review.

[1] https://www.scimagojr.com/

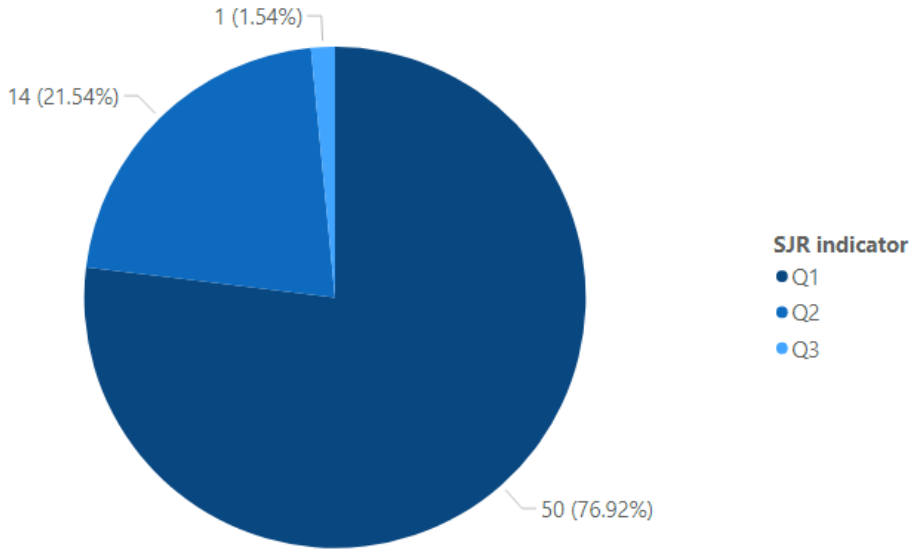


Figure 1.1: Scimago classification of papers in the literature review.

The overall great quality of the researches examined is additionally strengthened by the presence of 6 papers published by sources of the prestigious ranking of *"FT50"*, which details the 50 journals used by the Financial Times in compiling the FT Research rank[2]. Josh Lerner is the author who gave the most significant contribution with six papers selected for this literature review. He is one of the most influential economists in the field of Venture capital and Entrepreneurship. More than 53% of the total number of papers were published in the last five years. The significant contribution of very recent studies is yet another indication of how this topic is highly debated and still evolving, as demonstrated by the large number of papers selected published in 2019.

[2] https://www.ft.com/content/3405a512-5cbb-11e1-8f1f-00144feabdc0

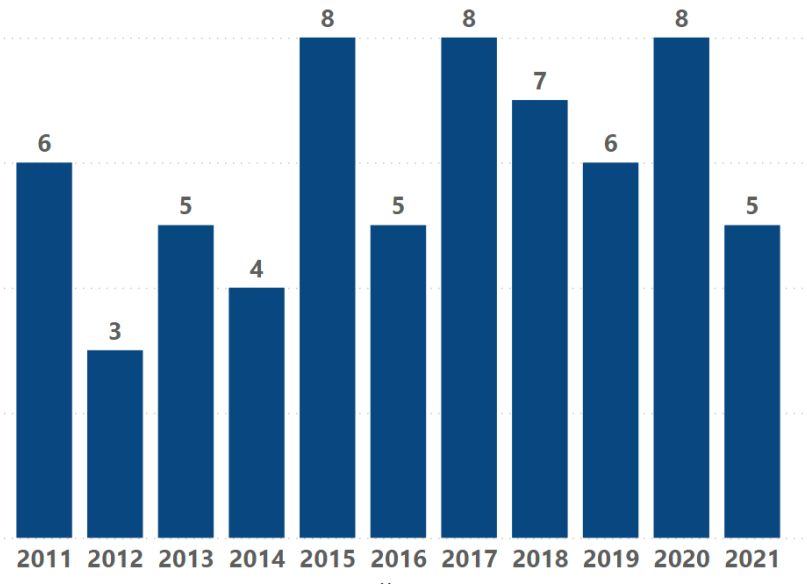


Figure 1.2: Papers collocation over time.

A final summary of the process followed in selecting the scientific papers is shown in Figure 1.3: Literature review process..

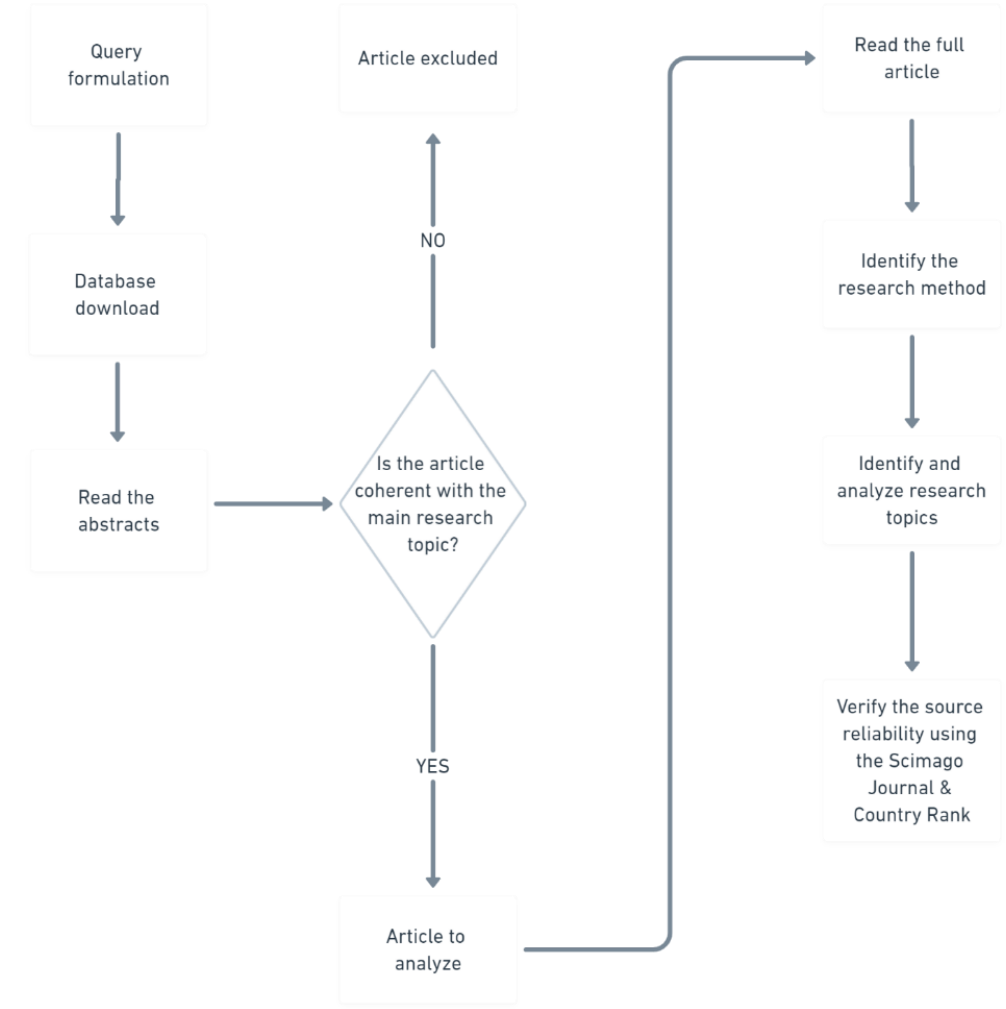


Figure 1.3: Literature review process.

1.2 Content of the literature review

This chapter aims to set the base of the further analysis, considering the present literature's content on the research topics to identify the knowledge gaps addressed in the following characters of this thesis.

The current literature on startups and their funding collection is quite wide but also very fragmented.

Many papers express different opinions on these complex yet fundamental topics. There is still not a one and fully accepted definition of a startup. Many studies take this concept for granted, not recognizing that future researches will lack a solid foundation if a sharp definition is not established at the outset. For this reason, this chapter starts with a subsection dedicated to explaining what a startup is, highlighting

the main motivations that move so many different authors to study this economic entity. After that, there is an analysis of the current literature about the problems and issues that the most potentially successful new ventures experience, bringing them to failure most times. After establishing a solid base and motivation, this section continues with a list of possible actors in the entrepreneurial ecosystem that could support new ventures to solve their troubles before they become too deep to be fought. Then, there is a focus on Venture Capitalists (VCs), highlighting their characteristics, direct role in new ventures development and the indirect yet relevant contribution they bring to the whole economic system, spurring innovation and economic growth.

In the final part, there is a focus on the relationship between startups and investors, with a focus on VCs, in the drone industry, highlighting the knowledge gap found in the intersection of these three topics mainly due to the relative youth of the Unmanned Aerial Vehicles industry.

1.2.1 Start-up definition and relevance

First of all, it is fundamental to determine the study's perimeter to select and consider only those entities, which are authentic startups.
In this regard, the contemporary literature does not submit a unique definition of a startup. Instead, there are many different forms to define this entity. The most diffused among the papers read are the followings:

- A startup is "a human institution designed to create a new product or service under conditions of extreme uncertainty" (Ries, 2011);
- "Startups are companies set up to test business models developed around new ideas, typically proposed by several co-founders or team members". (Salamzadeh, 2017);
- "A startup is a temporary organization that is searching for a sustainable and repeatable business model. When this organization finds its business model, it is no longer a startup; it is a company". (R. Chanin et al., 2017).

It is clear how the above definitions are not mutually exclusive. On the contrary, they complement each other, contributing collectively to a broader startup description. Forbes published in 2013 an interesting article on this topic that explains the key features that an organization needs to have in order to be classified as a startup, and specifically, it should have the following characteristics:

- Independent company;
- Far from the initial public offering (IPO);
- Single office revenue lower than 20 mln $;
- Less than 80 employees and less than five people on the board;

- Founders who have not personally sold shares yet;
- High ability to achieve unconstrained growth (Robehmed, 2013).

After explaining what a startup is, the review focuses on why studying such an economic entity is important. Many studies show how new ventures are fundamental for economic growth and positively contribute to overcoming societal challenges (Van Rijnsoever, F. J., 2020).
The positive contribution that startups give to the whole economic system is furtherly confirmed by Acemoglu et al. (2018), who demonstrated how young firms devote disproportionately more resources to innovation if compared to their elder peers. Consequently, the high growth of young firms is particularly important for the increase of aggregate productivity. However, the downside of the high-reward strategy of these organizations is the significant failure rate and the low ratio of successful startups (Cantamessa et Al., 2018). For instance, Blank S. estimates that 75% of all startups fail (2013).

1.2.2 Why startups fail

After defining the scope of the literature review and explaining why startups are as important as they are prone to failure, the logical flow advances to focus on the main motivations that explain why new ventures tend to be unsuccessful.
According to Armanios et al. (2017), the main matter lies in the entrepreneurs' capabilities, as they usually have great technical skills which are not supported by adequate managerial expertise. This deficiency could be fatal also for founders who acknowledge very profoundly the context where they operate.
Furthermore, the entrepreneurs' tendency to fall in love with their product and services could enhance this negative effect, building a solution looking for a bounded personal problem instead of targeting a real market need. The latter viewpoint is further supported by Kuntze et al. (2016), who highlighted how some people are so blinded by their surfeit of success desire that they do not consider the real competencies needed to offer something meaningful to customers. So, there is a risk that poorly prepared entrepreneurial candidates may receive low returns and employ resources that could be used more productively elsewhere.
The importance of entrepreneurs' expertise in the complex route to startups' realization is further supported by Reichenbach et al. (2021), who find a positive pattern toward success for ventures which state that their CEO holds a university degree. Besides, a higher number of business-related updates also improves this trend toward success. However, conversely, the number of updates on external certification, promotions, and the team are associated with a higher risk of failure.

Another typical failure pattern is related to the Business Development process. It consists of a too direct focus on the product/service sales' improvement, neglecting the design of a reliable, measurable and engineered Business Development phase. This attitude could be the first piece of a domino that can cause consequent and increasing issues which a young enterprise like a startup can difficultly overcome, like running out of cash. (Cantamessa et Al.,2018).
However, probably the biggest constraint limiting new ventures' growth and scalability is the shortage of financial resources (Colombo et al., 2016). In particular, the capitalization of new ventures is one of the most foundational issues for entrepreneurship and the launch of high-growth ventures. (Drover et al., 2017).
In conclusion, entrepreneurial development's benefits to the economic system might be accentuated if the previously mentioned bounds for failure were discouraged from taking the plunge.

1.2.3 Startup funding

As stated in the previous chapter, the issues described for startups are mainly related to the CEO's weak business expertise and scarcity of financial resources.
So, how can a startup overcome all these concerns and be victorious?
To cope with these problems, over the years, many actors emerged. Their overall motivation is investing in something very risky (considering the high failure rate) but with enormous potential, helping startups and making a profit out of them.
As shown in Figure 1.4: Cumming, D. J., & Johan, S. A. (2014), every actor plays a specific role according to its characteristics along startups' development stages. According to Cumming, D. J., & Johan, S. A. (2014), it is possible to individuate mainly:

- FFF - Friends, family and Fools
- Angels
- VCs

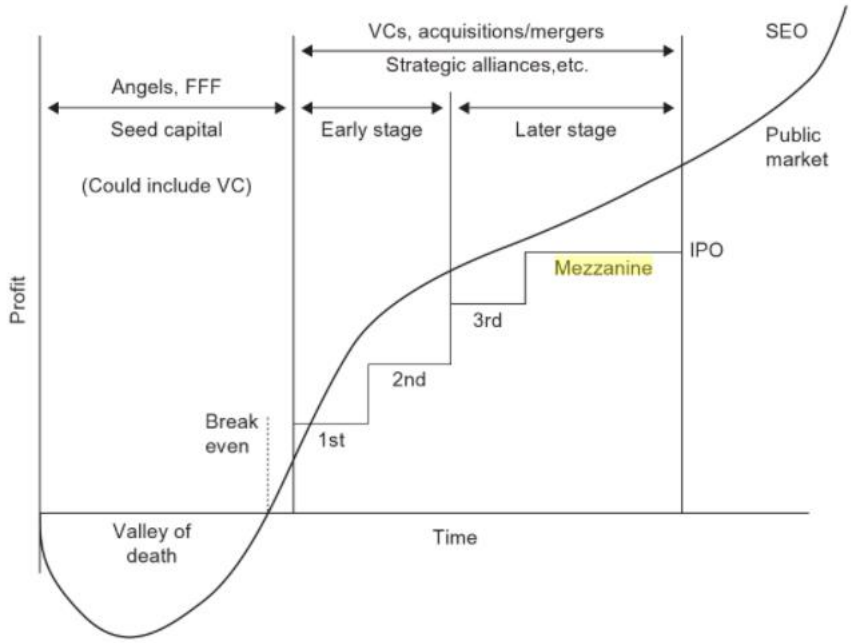


Figure 1.4: Cumming, D. J., & Johan, S. A. (2014).

1.2.3.1 *FFF - Friends, family and Fools*

FFF, namely "Friends, family and fools", is the first group of external investors who believe in the new startup's success. All the closely related people to the founder/s who provide little/medium money are part of this group. It is important to specify that people belonging to this investors' cluster usually are not professional investors. (Reddi Kotha et al., 2012)

1.2.3.2 *Angel investors*

Angel investors or Business Angels (BAs) are high-net-worth individuals that make private investments in new ventures with their own money. In the mid-1990s, these investors started to group themselves, creating the so-called "Angel Groups" to collectively share the risks related to startup investments and evaluate entrepreneurial ventures. (Kerr et al.,2011).

It is demonstrated that angels positively impact the growth, performance, and survival of the firms they fund. Moreover, BAs in early-stage investments are positively associated with additional receipt on follow-on financing rounds and sequential capital injections from venture capitalists. (Hellmann et al., 2015; Croce et al., 2018).

1.2.4 Venture Capital definition and relevance

Venture Capitalists are professional investors that create portfolios of potentially high-growth ventures and use funds to finance them at various stages of their development.

Hence, they influence the decisions made by their portfolio companies, providing more than just money to technology entrepreneurs (Drover et al., 2017; Cannice et al.,2015; Dutta et al., 2016). Thus, VCs assist enterprises with their industry experience and social connection in overcoming difficulties and enhancing corporate value while providing additional beneficial support (Gu et al., 2017). In particular, networking has become a major source for new ventures' success and survival as it helps firms access new resources needed for development and growth (Muhammad Anwar et al.,2018).
Furthermore, entrepreneurial ventures are frequently forced to adapt their initial business plan because of mistaken assumptions in the original one or significant changes in the external context. VCs also play a fundamental role in this circumstance as they can counterbalance the ventures' shortage of resources and trustworthiness. It is demonstrated that the greater the number of domains of Venture Capital involvement, the better the performance of startups. (Gerasymenko et al., 2015).
There is enough evidence to show that the commercial success rates of startup businesses that receive support from VCs far outweigh those that do not hold any supports from them. (Eric Afful et al., 2016). Moreover, Venture Capitalists provide a strong signal of the firm's high quality compared to other funding sources (Kleinert et al., 2020). Therefore, the ability to attract VC funding can be used as a proxy to judge spin-offs' quality (Munari et al., 2011). So, Venture capital firms are useful also in solving moral hazards and asymmetric information difficulties (Lerner et al., 2013).
However, the relationship between startups and VCs is very complex and requires "guts, brains, and integrity" to be fruitful (Bayraktar et al., 2013).
The outcome of this interconnection highly depends on Venture Capital's motivation and characteristics, i.e., on VC's type. Therefore, the next section will go through the main typologies of this highly relevant investor, highlighting the principal features that characterize each of them.

1.2.4 Venture Capital types

The VC industry is populated by an increasingly diverse set of investors, with different objectives, risk propensities, expected returns, and investment strategies. According to these differences, Venture Capitals have been clustered in several categories, namely independent VC, corporate VC, bank-affiliated VC and governmental VC. (Bertoni et al., 2015).
The iconic type of Venture Capital is represented by the independent VC (IVC). It has a particular kind of governance since it comprises general partners responsible for managing and investing the money provided by a limited partner pool. Therefore, it is important to specify that only management partners can decide whether to invest in a potential new venture.

On the opposite side, there are non-independent or captive VC investors. This type of VC is quite low diffused in the US, probably since it was not born on American soil. Captive VCs are investment vehicles or business units owned by a parent company, which—contrary to limited partners in IVC—retains a substantial influence on the fund's management. The parent company may be a non-financial firm in the case of a corporate VC (CVC), a financial intermediary in the case of a bank-affiliated VC (BVC), or a governmental body in the case of a governmental VC (GVC). Different types of Venture Capital investors diverge remarkably in their investment patterns, coherently with their different market roles. (Bertoni et al., 2019). The analysis proceeds with a further description of the main types of Venture Capital identified.

1.2.4.1 CVCs - Corporate Venture Capitals

CVCs play an ambidextrous role in startup development. They support the startup financially, but they also provide to new ventures strategic benefits, such as mentoring and complementary assets that allow and enhance the commercialization of new venture technologies (Rossi et al., 2017; Park et al., 2012).
However, being supported by a CVC can bring not only positive influences to the company. So, deciding to be backed by a Corporate Venture Capital is a strategic decision many startups need to make, considering the so-called "sharks dilemma". Indeed, CVC firms, the 'sharks', may play a dual role in investment relationships with startups. On the one hand, corporates are attractive resource providers. However, on the other hand, they are likely to steal startups' resources, such as valuable ideas and novel technological know-how. So, it is recommended that startups entrepreneurs receive other types of investment first (e.g. IVC funding) and later CVC support. Also, if startups are supposed to receive assets from this type of Venture Capital, they should better do it when they have no patents than when they have them, according to Ji-Hoon Park et al. (2017).

1.2.4.2 GVCs - Governmental Venture Capitals

In the case of Governmental Venture Capital, funds are provided directly by the governmental bodies through means that can go from direct injection of money to taxation policies aimed at favouring the engagement of private investors. (Colombo et al.,2016). GVCs' impact is particularly relevant in industries like biotechnology and pharmaceuticals or for new ventures that have been considered unattractive to private VC and consequently play the role to fill the gap created by this market failure (Bertoni et al., 2015). However, the likelihood of success is even smaller in the government-run venture capital scheme. This dilemma is in part due to :

1. The selection of unmerited startup businesses as a result of political interferences

2. The lack of models that explicitly consider qualitative factors such as leadership experiences and product qualities in the selection process (Eric Afful et al., 2016).

1.2.4.3 BVC - Bank-affiliated venture capitals

Bank-affiliated venture capitals provide funds through financial institutions, mostly banks. This type of VC shows an inclination for backing the new venture with financial resources. Nevertheless, at the same time, it is not very powerful for giving startups other kinds of support like mentoring or strategic coaching (Croce et al., 2015). The primary objective of BVC investors is to support the establishment of profitable bank relationships with investee companies (Bertoni et al., 2019).

1.2.4.4 Venture Capital's importance for the economy

VCs provide a wide range of positive externalities that are not limited to the benefits enjoyed by new ventures, but they assertively impact the whole economic system. This beneficial influence is principally related to an inherent virtuous cycle in venture capital activities. Once a critical level of activities has been established, it is much easier to keep the industry going and growing. It is simpler because structures and experiences have been set, peers and intermediaries such as lawyers and accountants are available, and investors and entrepreneurs have obtained expertise and confidence in the manners in which the industry works (Lerner et al., 2013). This argument is furtherly sustained by Samila et al. (2011). Their study demonstrates how an increase in the supply of venture capital in a metropolitan statistical area stimulates the production of new firms in the region. This result derives from two main drivers. Firstly, the would-be entrepreneurs in need of capital may incorporate its availability when deciding whether to start their firms. Secondly, the firms already backed by VCs may work as inspiration and training for future entrepreneurs providing a "garden of opportunity for partnerships, collaborations, and acquisitions" (Jerome S. Engel, 2011). Besides, Venture capital investment significantly spur innovation (Khan et al., 2021). Consequently, the VCs' industry represents a perfect tool and a necessary condition to reach smart and sustainable economic growth (Grilli et al., 2014), leveraging on all the types of resources that Venture Capitals can provide to startups and enabling these organizations to exploit their resources more efficiently (Pan et al., 2018).

1.2.5 Startups that receive VCs funding characteristics – Why a startup receives funds and why not

Acknowledging VCs' tremendous impact on startups, it is important to recognize the drivers that guide these investors in picking startups to finance. However, understanding which new venture is profitable is a very challenging task also for experienced VC funds (Harris et al., 2014). Therefore, many studies have tried to solve this dilemma, concluding that VCs' decision is influenced by endogenous factors, external ones that the new venture cannot control, and contingencies related to the negotiation process. The endogenous indicators that Venture Capitals consider during the decision-making process on whether backing or not a startup are venture revenue growth, profitability, business model and current investors (Block et al., 2019). The typology of the startup itself also plays a fundamental part since organizations operating in different industries have distinct needs in terms of the quantity of money and managerial support required (König et al., 2019).

Moreover, another important factor considered along the investors' decision-making process on funding a startup is the number of founders. It is demonstrated that it has a significant impact, but the entity and the related effect's positivity or negativity strictly depend on the industry's peculiarities (Prohorov et al., 2018).

One of the proxies considered in the current literature is the startup's ownership of Intellectual Property Rights (IPRs). The discussion on the positive or negative impact that IPRs could have on VC investments is still ongoing. On the one hand, a strong technological portfolio is one of the factors positively related to the likelihood of receiving VC financing (Munari et al.,2011). On the other hand, according to Islam et al. (2018), startups with fewer or even no patents are likely to benefit from additional VC funding compared to startups with more patents. Caviggioli et al. (2020) studied this topic deeper, highlighting how IPRs can positively or negatively impact VCs investments according to the startup's sector and the development stage that the new venture is experiencing at a specific moment.

Firstly, they found that, if the industry presents:

- Tight appropriability regime, so firms can successfully defend their inventions by leveraging legal and strategic measures: the number of patents is a good signal of the startup's quality. Consequently, a higher number of patents increases the probability to attract Venture Capital investors.
- Weak appropriability regime regimes, namely, the organizations cannot effectively protect their innovation from imitation due to knowledge spillovers: only

qualitative metrics like collaborativeness (i.e. the number of assignees) have a good signalling power. So, the presence of patented inventions is not associated with attracting more VC funding.

Moreover, in industries with a higher patent intensity, the patent portfolio matters more than the quality to create a sufficiently high fence to protect technology.

Secondly, considering startup's development stages:

- Early stages, namely A-series (with high information asymmetries): the amount financed is higher if the protected inventions have fewer geographical scopes (proxy of quality and market potential).
- Later stages: size and characteristics of the patent portfolio matter

In terms of external factors, it has been proven that Venture Capitalists, particularly the more experienced ones, place much importance on the level of market activity. For instance, it has been demonstrated that VCs invest in riskier and more innovative businesses in hot markets. This phenomenon occurs mostly because the overall tendency to invest more reduces the cost of experimenting for early-stage investors, enabling them to make riskier and more innovative investments. In conclusion, the higher the overall economic activity in the market, the larger the probability of being backed by an external investor, considering the same startup (Nanda et al., 2013).

The decision of financing a startup can also be viewed as a negotiation, and not all negotiations have a positive outcome. For instance, an interesting study adopting the Diff-in-diff approach has found that one of the main reasons the deal is not closed in the final stages is often linked to the final agreement on the firm's evaluation and the terms of the contract (Bronzini et al., 2020). So, it is something apparently independent of the startups' and markets' characteristics.

Considering the high complexity of the topic, Żbikowski et al. (2021) developed a machine learning, bias-free approach for predicting business success and supporting VCs in new ventures' selection. However, this study has a huge limitation since venture capitalists, defined as rational decision-makers, seem to behave more as intuitive ones. (Mateu et al., 2016).

1.2.6 Venture Capitals, startups and drones

Now, it is the moment to connect all the previous notions to the drones industry. These devices are defined as Unmanned Air Vehicles that do not need to be driven by a

human onboard operator to fly. UAVs are considered a solution in the emerging technological trajectory of autonomous driving with startups and small firms that are mostly involved in both developments of autonomous cars prototypes and related components (Cassetta et al., 2017). As an emerging industry, it is characterized by a fast growth and evolution process which is happening and is not still complete (Nelson et al., 2019).

The relative infancy of this innovative industry is also reflected in the related scientific literature, which is very scarce. Consequently, it is necessary to fill this knowledge gap to exploit this fascinating technology at the full of its capabilities. For this reason, this thesis aims to deepen into a punctual study on the drones' sector, focusing on one of the main aspects that could impact drone startups across their all life: their capacity to collect financial resources.

As pointed out in the previous sub-sections, one of the pillars for success is a solid financial base, which mainly derives from external investors' support and it is demonstrated that industries in which private equity funds invest expand faster in terms of total production and employment and tend to be more resilient to eventual aggregate shocks (Bernstein et al., 2017). So, it would be insightful to deepen this information. Furthermore, given the current literature situation, this thesis has various still complementary goals for filling a basic knowledge vacuum in the drone startup ecosystem that does not have a unique integrated database for all its organizations. The latter lack is a direct consequence of the absence of a dedicated categorization code for firms in this industry. For instance, drone startups are not identified with a NACE[3] or ATECO[4] code. Therefore, after producing a complete census, this thesis' further study can start concentrating on the real matter: understanding any drone startup characteristics that could significantly contribute positively or negatively to the total funding collected, with a further investigation on the typologies of investors that could contribute to the new ventures operating in the UAVs industry financing achievement.

[3] A four-digit numbers defined by the European Union to classify each company operating inside the EU according to its core activity.
[4] ATECO is an Italian classification of economic activities consisting of an alpha-numeric code.

2. Objectives and Methodology

The following chapter presents the paper's main objectives and research questions. It also describes in detail the approach followed for the analysis, which is made of:

- A census of startups in the national and international drone industry and deep analysis on how their relevant features are associated with the level of funding collected by external investors;
- An econometric model to ultimately identify the major factors that impact the total funding amount collected by a startup in the drone industry;
- An econometric model to eventually determine startups' characteristics that could influence Venture Capital or other investors' types to fund or not a startup in the drone industry?

2.1 Objectives, research questions and methodology

As stated in the literature review, VCs' impact on startup growth and success is a very debated topic. Moreover, many scientific pieces of research highlight how Venture Capitals play a primary role in startups' success as they provide financial and managerial support to new ventures.

The fast-developing business conditions that the worldwide economy is living exacerbate VCs' importance. Startups live in an ecosystem distinguished by the constant creation of new disruptive technologies which radically innovate industries. Teams' competencies and financial resources availability are must-haves to survive in difficult environments and lay the groundwork for future success. The speed of innovation and change has been even enhanced by the recent COVID-19 pandemic, which furtherly boosted the digitalization trend across all businesses. Only flexible companies can survive in this fast-changing environment, and startups have a great potential to grow and bring their innovations to market, primarily by displacing incumbents, creating new market segments, or accessing businesses that previously appeared to have insurmountable barriers to entry.

Thus, the relationship between startups and VCs is a very hot topic that is only destined to grow in relevance. New technologies that have not been fully investigated and harnessed have the greatest growth opportunities in this scenario.

Drones fit into this category due to their high innovation level, relative newness, and growth prospects.

However, there is a distinct shortage of scientific research about the influence of venture capitalists on startups and enterprises whose value proposition revolves around drones. In particular, there is currently almost no qualitative or quantitative data on this topic. As a result, it is hard to discover new insights and fully exploit this fascinating technology's potentialities.

This thesis seeks to bridge the knowledge vacuum that presently exists throughout nearly all stages of the interactions between drone startups and external investors, specifically by answering the following research questions:

- RQ1) How many startups are currently operating in the drone industry at an international level, and how is their offer structured in relation to the funding received?
- RQ2) What major factors influence the amount of funding received by a startup in the drone industry?
- RQ3) Are there any specific startups' characteristics that could influence Venture Capital or other investor's types to fund or not a startup in the drone industry?

A structured quantitative methodology consisting of the following phases is used to answer the above questions:

- **Step 1: Census creation.** A census of companies operating in the drone's sector is built by combining four major databases: Crunchbase and Orbis, which gather mostly international startups, AIDA and the Registro Imprese Italiane to take a complete snapshot of the current situation in the drone industry also considering Italian ventures.
- **Step 2: Census analysis.** A comprehensive investigation is carried out in order to define the main drone organizations' characteristics. The dimensions considered include the firms' age, geographical location, target market, funding received, value proposition, application fields, and covered client sectors.
- **Step 3: Econometric model development to answer RQ2).** A statistical analysis is run, setting the total funding amount as the dependent variable and several explaining variables, namely the age, headquarters' geographical location, the number and types of investors attracted, the number of founders, offer typology, presence of any additional service, client sector and application field.
- **Step 4: Quantitative analysis with econometric model development to answer RQ3).** A new econometric model is defined, mainly consisting of a multinomial logistic regression run considering the investors' typology as dependent

variable according to four main categories: Venture Capitals, Business Angels, Funds & Banks, and Innovation dedicated programs. In this case, the explaining variables investigated are the age, headquarters' geographical location, types of investors attracted, the number of founders, offer typology, presence of any additional service, client sector and application field.

2.1.1. The census and the analysis of the industry

The starting point of the whole analysis is creating a census of organizations that operate in the drone industry. Through such a quantitative study, it is possible to identify and highlight the main features that characterize most companies in the UAVs industry and relate them to the quantity of funding collected. Therefore, the first step of the census production is defining the main organization's characteristics that could limit the research results only to potentially relevant firms for the scope of this thesis. Then, after a deep discussion supported by a panel of experts from the Drone Observatory of Politecnico di Milano, the constraints that businesses must respect are defined. In particular:

1. The organization is active; the analysis considers only the firms currently delivering their value proposition to their target customers. This point is essential to consider only successful independent companies, i.e. not acquired by larger firms. After the first trials, this constraint is removed to give a more exhaustive analysis and avoid the study's limitations derived by the so-called survivorship bias (Stephen J. Brown et al., 1992).
2. The organization was founded less than ten years ago, which means that any business founded in 2011 or the following years is taken into account. This parameter is designed to offer a comprehensive overview of the drone industry, considering the enterprises participating in the UAVs sector for an appropriate amount of time. In addition, this choice seeks to provide consistent additional insights to provide detailed responses to RQ1 and create the basis for the last two research questions. Furthermore, assuming a period of ten years is reasonable for high-tech sectors like drones for two primary reasons. Firstly, many policies and legal concerns require adjusting to the unique characteristics of emerging disruptive technologies. Secondly, highly innovative technologies require a significant amount of time to be conceptualized, prototyped and launched in the market. So, considering a period shorter than ten years would have caused a not comprehensive analysis due to the high innovativeness of this industry.

2.1.1.1 Data extraction sources

It is fundamental to find, collect and exploit data from multiple yet complementary sources of information considering the variety of data typology this thesis requires. So, the extraction process consists of the use of four main sources of information:

Figure 2.1: Crunchbase logo.

- Crunchbase

  Crunchbase (CB) is an online platform founded in 2007 with the initial objective of aggregating all startup-related information. It is now one of the most trustworthy databases for public and private enterprises, provides essential information on firms' milestones such as founding date, investments, teams, and mergers and acquisitions. The massive data is gathered via three major channels: the *Crunchbase community & venture programme*, a machine learning algorithm, and a specialized data team. Crunchbase is utilized in its "pro" edition for this research, ensuring access to all accessible information on the selected firms. The main focus of this information source is US-based companies. The most precise way to research data in this platform is to use the query builder. This tool contains three main components: the field, which refers to a company's specific detail, the desired value related to the field and the operator, which connects the two previous elements defining their relation.

Figure 2.2: Orbis logo.

- Orbis

  Orbis is a Bureau van Dijk-Moody's Analytics database which as well as Orbis collects businesses' information. It is a database that has been collecting companies' information since 1986, the data of its foundation, through the use of specific software which can exploit more than 50 different technologies, including HTML5, Google Analytics and jQuery. The result of all these years of

work is a list of information made up of over 375 million companies that operate around the world. Orbis's main focus is on private companies.

- Registro delle imprese – Innovative Startups Section

Figure 2.3: Registro delle imprese logo.

The Registro delle imprese is an online public database created and updated by the *Ministero dello Sviluppo Economico*, with information about all Italian companies. It is maintained by area-specific Chambers of Commerce and includes over 6 million entities. Furthermore, because all Italian businesses are required by law to register there part of their information, it is a highly reliable source of information. For this thesis, only the Innovative Startups Section is considered.

Figure 2.4: Analisi Informatizzata delle Aziende Italiane (AIDA)logo.

- Analisi Informatizzata delle Aziende Italiane (AIDA)

AIDA furtherly integrates data about Italian enterprises. It was created and is now distributed by Bureau van Dijk-Moody's Analytics and comprehends all the private companies' main qualitative and quantitative information, excluding banks and insurance firms.

2.1.1.2 Data collection strategy and gathering process

The study base lies on quantitative data on startups in the drone sector to collect information on them and the industry these organizations operate in. The first data source to be analyzed is Crunchbase through three steps to create the most complete and accurate database possible. In practice, the extractions are made by applying

specific filters with the query builder into each Crunchbase research, picking only the relevant information above all the firms available. Finally, the results are exported into an Excel sheet and analyzed.

2.1.1.2.1 Data collection from Crunchbase: Part I

The first extraction is the result of the application of the following filters:

1. "Operating status" equals "*active*";
2. "Founded date" after the 1st of January 2011;
3. "Industry" (which defines the possible industries in which the company operates) includes the words "drones" and/or "drone management"[5].

It is reasonable to limit the research to companies that respect the above characteristics according to the scope of this research. However, restricting the real data to these findings could be not exhausting. The main reason this occurs is related to the imprecision that could derive from the third filter. While "Founded date" and "Operating status" are usually accurate, the "Industry" tag could present some issues mainly derived from the flexible nature of startups that may have undergone a pivot after the last Crunchbase update and may have led to an entry or exit from the drone industry. This lack of precision could also result from a human error, namely a misunderstanding during the classification of Crunchbase's data team. The data generated from this extraction consists of 1,605 startups.

2.1.1.2.2 Data collection from Crunchbase: Part II

The issue with the "Industry" tag must be resolved. As a result, another Crunchbase extraction is carried out. Because of their correctness, the two filters relating to "Operating Status" and "Funding Date" are retained this time, while the third is replaced with "Full description". This field in Crunchbase is critically important since it summarises the activities undertaken by each firm. Therefore, a list of sixteen keywords carefully picked by a panel of experts from Politecnico di Milano's Drone Observatory was used to choose promising enterprises for this research. In this type of study, attention to detail is critical. Consequently, when utilizing keywords to construct filters, both singular and plural names are included, and in the case of

[5]Among the fixed options given by Crunchbase, these are the most appropriate options that recall the drone field.

acronyms, the full name is also evaluated to ensure that all potentially relevant companies are included. More information about the keywords and results of Crunchbase's second data-gathering phase is available in Table 2.1: Keywords consideredTable 2.1.

#	Keyword	Result of the extraction
1	UAS (unmanned aircraft system)	142
2	DRONE	1279
3	DRONES	1921
4	UNMANNED	522
5	VERTIPORT	1
6	ENAC (Ente Nazionale per l'Aviazione Civile)	1
7	ENAV (Ente Nazionale per l'Assistenza al Volo)	0
8	EASA (European Aviation Safety Agency)	8
9	FAA (Federal Aviation Administration)	97
10	UAV (unmanned aerial vehicle)	375
11	DAAS (drone as a service)	74
12	SAPR (sistema aeromobile a pilotaggio remoto)	3
13	RPA (remotely piloted aircraft)	252
14	ROA (remotely operated aircraft)	6
15	UVS (unmanned vechicle system)	4
16	UAVS (unmanned aircraft vehicle system)	119

Table 2.1: Keywords considered

The outputs of each keyword research are then combined to form a single database.

The results of the first two data collecting processes are then consolidated, and all duplicates are removed using the ad hoc Microsoft Excel tool. At this stage, the database has 3,653 startups. Finally, to guarantee that all of the extracted firms are operating in the drone sector, a rigorous one-by-one examination is carried out, basically reviewing the "Full description" data and other accessible information such as the website or social media profiles.

Again, the generated database has certain limitations since the section "Full description" does not always provide a thorough explanation of the company's activities in terms of clarity and content. As a result, there is a risk of eliminating from the Crunchbase research companies in the drone sector lacking a well-written description that does not include any of the keywords reviewed. So, a third data extraction is being conducted in an attempt to resolve this issue.

2.1.1.2.3 Data collection from Crunchbase: Part III

Another data gathering phase is carried out to increase the quality of the research outcomes even more. This third extraction always keeps the first two filters relating to "Operational status" and "Founded date" and limits the "Industry" field as explained below:

3. Tag "Industry" must be equal to one of the following: "Robotics", "Aerospace", "Autonomous Vehicles", "Air Transportation", "Sensor".

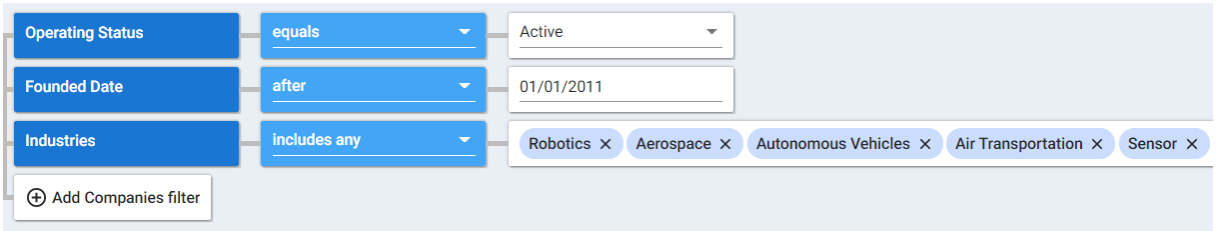


Figure 2.5: Crunchbase filter on Industry tag.

The above tags were chosen as a logical consequence of a frequency analysis of the firms in the database produced at the end of the last data collecting phase, to consider the sectors that most likely explain the companies selected as part of the drone industry.

This third query yields 7,790 businesses, which are added to the data gathering findings from the previous two phases on Crunchbase. Following that, 1,547

duplicates are removed, and a subsequent one-by-one check is run, always verifying the complete description and the LinkedIn, Facebook, Instagram, and Twitter profiles of the new firms added to the primary database.

The ultimate database produced from all of Crunchbase's analysis has a total of 2,416 organizations.

2.1.1.2.4 The integration of data with Orbis

The database available at this stage may appear to be adequate to begin the analysis. Crunchbase, on the other hand, cannot give an exhaustive list of firms involved in the drone sector. The primary drawback of this platform is its focus on firms based in the United States. To tackle incompleteness concerns, the research collects additional data using a new source of information: the Bureau van Dijk database Orbis. The two databases listed before have similar data-gathering techniques and nearly the same main objective: collecting all relevant, consistent, and comparable data on companies in one place. Nonetheless, the relevant businesses' properties in Orbis and Crunchbase differ not only for a mere geographical scope.

For instance, the Bureau van Dijk database provides the NACE code while this element is not present in Crunchbase. Although the above and further differences, it is feasible to combine the results obtained by the two sources leveraging on their common data, in this case mainly the organization name and the headquarters' country. This matching process is run automatically thanks to an Orbis tool named "Batch research". Thanks to this instrument, it is possible to pair the companies present in both databases and obtain a complete information set.

The approach described above also seeks to extract a list of NACE codes associated with businesses already identified in Crunchbase that are expected to represent best the developing drone sector, which will be necessary for the subsequent phases of database integration and completeness.

The description above is the overview of the process, below are present all the relevant details.

2.1.1.2.4.1 Crunchbase database preparation and matching process with Orbis

The primary step in the Orbis integration procedure is to adapt the database gained from prior Crunchbase extractions. It is in the form of an Excel sheet with several columns, each dedicated to a particular aspect of a firm. It is necessary to adjust this database to achieve the best possible matching result, forming a new one, only with the information required to allow Orbis' and Crunchbase's outputs to "communicate" with each other. In this circumstance, the only two parameters necessary are the

organization's name and the country of headquarters. In addition, each extraction may only be done on a maximum of 1,000 firms at a time. As a consequence, three separate research waves are required to examine all 2,416 companies.

2.1.1.2.5 Data collection from Orbis: Part I

Once adapted the current database, it is possible to upload it in Orbis. Then, three columns of information are added for the extraction:

1. NACE code Rev. 2, core code (4 figures)
2. NACE Rev. 2, principal section
3. NACE Rev. 2, core code – description

The output is then displayed, and it consists of a list of firms complete with basic information such as the company name and the "score", which quantifies the accuracy of the match between the company in Crunchbase and the potentially correspondent firm in Orbis. The score is on a range from "A" to "E," with "A" indicating that the two firms discovered in the two data sources are likely to be the same. For this study, only matches evaluated as "A" are considered.

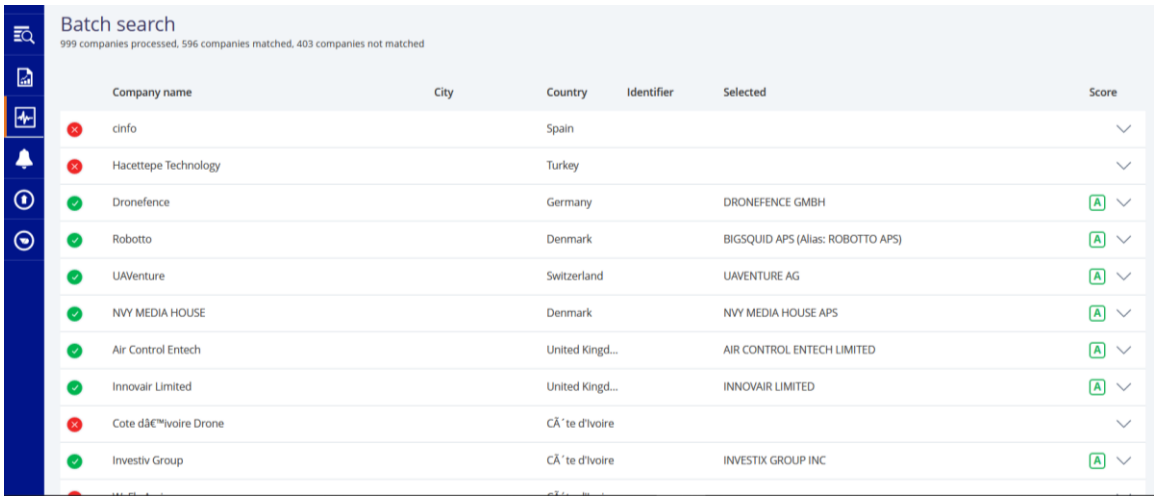


Figure 2.6: Sample of the information displayed before exportation in Orbis.

Next, all the information of the firms that are selected is downloaded. These Orbis exportations, in particular, have resulted in a database of 1,446 enterprises. However, Orbis is not without drawbacks and limits. As a result, it can happen that also firms paired with an "A" cannot coincide. So, a one-by-one check considering the company name and the headquarter location of the firm in Crunchbase is performed to verify the consistency with the one paired by Orbis. If the headquarter location field is "blank" in Orbis, the firm is examined utilizing other basic information such as the website or

the social media profiles. If the two paired firms are the same, the enterprise is kept and considered in successive steps. Contrary, the firm is discarded.

Starting from a sample of 1,446 firms, at the end of this screening procedure, 1,201 businesses are selected. The next step is to analyse the selected enterprises' frequency based on their NACE codes using an Excel pivot table. This research aims to find the NACE codes that most likely describe all of the firms involved in the drone sector, addressing the classification problem also explained at the end of the literature review chapter. The findings of this research will be critical for the census's future integration. Table 2.2 presents the core code digits and description of the NACE code obtained from this process.

NACE Rev. 2, core code (4 digits)	NACE Rev. 2, core code - description	#	Cumulated #	%	Cumulated %
3030	Manufacture of air and spacecraft and related machinery	87	87	9.58%	9.58%
6201	Computer programming activities	81	168	8.92%	18.50%
7112	Engineering activities and related technical consultancy	77	245	8.48%	26.98%
7490	Other professional, scientific and technical activities nec	76	321	8.37%	35.35%
2651	Manufacture of instruments and appliances for measuring, testing and navigation	31	352	3.41%	38.77%
6209	Other information technology and computer service activities	30	382	3.30%	42.07%
7420	Photographic activities	30	412	3.30%	45.37%
7022	Business and other management consultancy activities	29	441	3.19%	48.57%
7219	Other research and experimental development on natural sciences and engineering	27	468	2.97%	51.54%

5911	Motion picture, video and television programme production activities	26	494	2.86%	54.41%
8299	Other business support service activities nec	24	518	2.64%	57.05%
5829	Other software publishing	19	537	2.09%	59.14%
6311	Data processing, hosting and related activities	14	551	1.54%	60.68%
2899	Manufacture of other special-purpose machinery nec	13	564	1.43%	62.11%
7211	Research and experimental development on biotechnology	13	577	1.43%	63.55%
8559	Other education nec	13	590	1.43%	64.98%
4791	Retail sale via mail order houses or via Internet	12	602	1.32%	66.30%
6202	Computer consultancy activities	11	613	1.21%	67.51%
2611	Manufacture of electronic components	10	623	1.10%	68.61%
2790	Manufacture of other electrical equipment	10	633	1.10%	69.71%
3299	Other manufacturing nec	8	641	0.88%	70.59%
4690	Non-specialised wholesale trade	8	649	0.88%	71.48%
0161	Support activities for crop production	7	656	0.77%	72.25%
4120	Construction of residential and non-residential buildings	7	663	0.77%	73.02%
7120	Technical testing and analysis	7	670	0.77%	73.79%
4614	Agents involved in the sale of machinery, industrial equipment, ships and aircraft	6	676	0.66%	74.45%

5223	Service activities incidental to air transportation	6	682	0.66%	75.11%
6190	Other telecommunications activities	6	688	0.66%	75.77%
6312	Web portals	6	694	0.66%	76.43%
6420	Activities of holding companies	6	700	0.66%	77.09%
7311	Advertising agencies	6	706	0.66%	77.75%
4669	Wholesale of other machinery and equipment	5	711	0.55%	78.30%
4778	Other retail sale of new goods in specialised stores	5	716	0.55%	78.85%
7410	Specialised design activities	5	721	0.55%	79.41%
9609	Other personal service activities nec	5	726	0.55%	79.96%
2620	Manufacture of computers and peripheral equipment	4	730	0.44%	80.40%
2640	Manufacture of consumer electronics	4	734	0.44%	80.84%
2670	Manufacture of optical instruments and photographic equipment	4	738	0.44%	81.28%
4652	Wholesale of electronic and telecommunications equipment and parts	4	742	0.44%	81.72%
2811	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines	3	745	0.33%	82.05%
2829	Manufacture of other general-purpose machinery nec	3	748	0.33%	82.38%
4322	Plumbing, heat and air conditioning installation	3	751	0.33%	82.71%
5121	Freight air transport	3	754	0.33%	83.04%

6399	Other information service activities nec	3	757	0.33%	83.37%
8020	Security systems service activities	3	760	0.33%	83.70%
8230	Organisation of conventions and trade shows	3	763	0.33%	84.03%
0910	Support activities for petroleum and natural gas extraction	2	765	0.22%	84.25%
2599	Manufacture of other fabricated metal products nec	2	767	0.22%	84.47%
2612	Manufacture of loaded electronic boards	2	769	0.22%	84.69%
2630	Manufacture of communication equipment	2	771	0.22%	84.91%
2711	Manufacture of electric motors, generators and transformers	2	773	0.22%	85.13%
2751	Manufacture of electric domestic appliances	2	775	0.22%	85.35%
2830	Manufacture of agricultural and forestry machinery	2	777	0.22%	85.57%
3011	Building of ships and floating structures	2	779	0.22%	85.79%
3316	Repair and maintenance of aircraft and spacecraft	2	781	0.22%	86.01%
4110	Development of building projects	2	783	0.22%	86.23%
4222	Construction of utility projects for electricity and telecommunications	2	785	0.22%	86.45%
4520	Maintenance and repair of motor vehicles	2	787	0.22%	86.67%
4645	Wholesale of perfume and cosmetics	2	789	0.22%	86.89%

4651	Wholesale of computers, computer peripheral equipment and software	2	791	0.22%	87.11%
4743	Retail sale of audio and video equipment in specialised stores	2	793	0.22%	87.33%
4752	Retail sale of hardware, paints and glass in specialised stores	2	795	0.22%	87.56%
4765	Retail sale of games and toys in specialised stores	2	797	0.22%	87.78%
4799	Other retail sale not in stores, stalls or markets	2	799	0.22%	88.00%
5110	Passenger air transport	2	801	0.22%	88.22%
5222	Service activities incidental to water transportation	2	803	0.22%	88.44%
5320	Other postal and courier activities	2	805	0.22%	88.66%
5610	Restaurants and mobile food service activities	2	807	0.22%	88.88%
5912	Motion picture, video and television programme post-production activities	2	809	0.22%	89.10%
6110	Wired telecommunications activities	2	811	0.22%	89.32%
6499	Other financial service activities, except insurance and pension funding nec	2	813	0.22%	89.54%
6619	Other activities auxiliary to financial services, except insurance and pension funding	2	815	0.22%	89.76%
6831	Real estate agencies	2	817	0.22%	89.98%
6910	Legal activities	2	819	0.22%	90.20%
7810	Activities of employment placement agencies	2	821	0.22%	90.42%

7911	Travel agency activities	2	823	0.22%	90.64%
8130	Landscape service activities	2	825	0.22%	90.86%
8291	Activities of collection agencies and credit bureaus	2	827	0.22%	91.08%
8690	Other human health activities	2	829	0.22%	91.30%
8899	Other social work activities without accommodation nec	2	831	0.22%	91.52%
9319	Other sports activities	2	833	0.22%	91.74%
9329	Other amusement and recreation activities	2	835	0.22%	91.96%
0163	Post-harvest crop activities	1	836	0.11%	92.07%
0210	Silviculture and other forestry activities	1	837	0.11%	92.18%
0240	Support services to forestry	1	838	0.11%	92.29%
0729	Mining of other non-ferrous metal ores	1	839	0.11%	92.40%
1105	Manufacture of beer	1	840	0.11%	92.51%
1320	Weaving of textiles	1	841	0.11%	92.62%
1330	Finishing of textiles	1	842	0.11%	92.73%
1396	Manufacture of other technical and industrial textiles	1	843	0.11%	92.84%
1413	Manufacture of other outerwear	1	844	0.11%	92.95%
1820	Reproduction of recorded media	1	845	0.11%	93.06%
2041	Manufacture of soap and detergents, cleaning and polishing preparations	1	846	0.11%	93.17%
2042	Manufacture of perfumes and toilet preparations	1	847	0.11%	93.28%

2445	Other non-ferrous metal production	1	848	0.11%	93.39%
2454	Casting of other non-ferrous metals	1	849	0.11%	93.50%
2720	Manufacture of batteries and accumulators	1	850	0.11%	93.61%
2910	Manufacture of motor vehicles	1	851	0.11%	93.72%
3099	Manufacture of other transport equipment nec	1	852	0.11%	93.83%
3240	Manufacture of games and toys	1	853	0.11%	93.94%
3250	Manufacture of medical and dental instruments and supplies	1	854	0.11%	94.05%
3314	Repair of electrical equipment	1	855	0.11%	94.16%
3320	Installation of industrial machinery and equipment	1	856	0.11%	94.27%
3511	Production of electricity	1	857	0.11%	94.38%
3900	Remediation activities and other waste management services	1	858	0.11%	94.49%
4321	Electrical installation	1	859	0.11%	94.60%
4339	Other building completion and finishing	1	860	0.11%	94.71%
4399	Other specialised construction activities nec	1	861	0.11%	94.82%
4519	Sale of other motor vehicles	1	862	0.11%	94.93%
4617	Agents involved in the sale of food, beverages and tobacco	1	863	0.11%	95.04%
4618	Agents specialised in the sale of other particular products	1	864	0.11%	95.15%
4619	Agents involved in the sale of a variety of goods	1	865	0.11%	95.26%

4634	Wholesale of beverages	1	866	0.11%	95.37%
4642	Wholesale of clothing and footwear	1	867	0.11%	95.48%
4643	Wholesale of electrical household appliances	1	868	0.11%	95.59%
4661	Wholesale of agricultural machinery, equipment and supplies	1	869	0.11%	95.70%
4666	Wholesale of other office machinery and equipment	1	870	0.11%	95.81%
4674	Wholesale of hardware, plumbing and heating equipment and supplies	1	871	0.11%	95.93%
4719	Other retail sale in non-specialised stores	1	872	0.11%	96.04%
4724	Retail sale of bread, cakes, flour confectionery and sugar confectionery in specialised stores	1	873	0.11%	96.15%
4759	Retail sale of furniture, lighting equipment and other household articles in specialised stores	1	874	0.11%	96.26%
4771	Retail sale of clothing in specialised stores	1	875	0.11%	96.37%
4941	Freight transport by road	1	876	0.11%	96.48%
5020	Sea and coastal freight water transport	1	877	0.11%	96.59%
5122	Space transport	1	878	0.11%	96.70%
5590	Other accommodation	1	879	0.11%	96.81%
5630	Beverage serving activities	1	880	0.11%	96.92%
5914	Motion picture projection activities	1	881	0.11%	97.03%

6020	Television programming and broadcasting activities	1	882	0.11%	97.14%
6200	Computer programming, consultancy and related activities	1	883	0.11%	97.25%
6612	Security and commodity contracts brokerage	1	884	0.11%	97.36%
6622	Activities of insurance agents and brokers	1	885	0.11%	97.47%
6810	Buying and selling of own real estate	1	886	0.11%	97.58%
6820	Renting and operating of own or leased real estate	1	887	0.11%	97.69%
6830	Real estate activities on a fee or contract basis	1	888	0.11%	97.80%
6920	Accounting, bookkeeping and auditing activities; tax consultancy	1	889	0.11%	97.91%
7010	Activities of head offices	1	890	0.11%	98.02%
7111	Architectural activities	1	891	0.11%	98.13%
7320	Market research and public opinion polling	1	892	0.11%	98.24%
7735	Renting and leasing of air transport equipment	1	893	0.11%	98.35%
7740	Leasing of intellectual property and similar products, except copyrighted works	1	894	0.11%	98.46%
7990	Other reservation service and related activities	1	895	0.11%	98.57%
8010	Private security activities	1	896	0.11%	98.68%
8110	Combined facilities support activities	1	897	0.11%	98.79%
8121	General cleaning of buildings	1	898	0.11%	98.90%

8422	Defence activities	1	899	0.11%	99.01%
8532	Technical and vocational secondary education	1	900	0.11%	99.12%
8560	Educational support activities	1	901	0.11%	99.23%
8621	General medical practice activities	1	902	0.11%	99.34%
8622	Specialist medical practice activities	1	903	0.11%	99.45%
9411	Activities of business and employers membership organisations	1	904	0.11%	99.56%
9499	Activities of other membership organisations nec	1	905	0.11%	99.67%
9511	Repair of computers and peripheral equipment	1	906	0.11%	99.78%
9522	Repair of household appliances and home and garden equipment	1	907	0.11%	99.89%
9604	Physical well-being activities	1	908	0.11%	100.00%

Table 2.2: Frequency analysis on NACE codes generated.

Thanks to the previous Orbis' data collection, it is possible to have a list of NACE codes that reasonably represent the drone's industry. However, to properly use this valuable data, additional research in Orbis is required. Therefore, the tool "Batch Research" is not utilized; instead, the analysis is carried out using filters similarly to what was done with the Crunchbase research. The organizations identified are then extracted if and only if their characteristics conform to the following constraints:

1. **Status**: Active;
2. **Year of incorporation**: 2011 – 2021;
3. **Industry classification NACE rev 2** is part of the list of NACE code found at the previous step;
4. **Company name**: "drone";
5. **Company name**: "dron";
6. **Activity text search** considers info from the company description. This filter selects all the companies whose description contains one of the keywords

previously used for the Data collection from Crunchbase: Part II and presented in Table 2.1.

These filters are then linked using Boolean operators. In particular, the combination is the one presented in Figure 2.7.

Figure 2.7: Boolean search, second Orbis extraction.

The outcome of this research amounts to 33,350 enterprises exported into an Excel file through an iterative process due to the Orbis' limitation, which does not allow the exportation of more than one thousand companies per time. So, 34 different extractions were required.

Moreover, inactive companies were included in the analysis after an extensive feedback session with a panel of experts from Politecnico di Milano's Drone Observatory. The main reason under this strategic decision is the willingness to avoid committing errors related to the so-called Survivorship bias. Focusing this investigation only on actively operating entities generates a very high risk of misinterpretation, leading to results more optimistic than reality (Stephen J. Brown et al., 1992).

Consequently, in order to furtherly improve the precision of this study's outcome, a new Orbis filter research is carried applying the following filters:

1. **Status**: Inactive;
2. **Year of incorporation**: 2011 – 2021;
3. **Industry classification** NACE rev 2 is part of the list of NACE codes found previously.
4. **Company name**: "drone";
5. **Company name**: "dron."
6. **Activity text search**: contains one of the keywords previously used for the *Data collection from Crunchbase: Part II* and presented in Table 2.1: Keywords considered.

In practice, all the last research filters are maintained, excluding those defining the startups' status as active, which now switches to "inactive". The results are composed of a cohort of 6,558 startups exported following the aforementioned iterative process in Orbis. Finally, the results of the two pieces of research are merged to create the final database, which persists to the subsequent stage. At this moment, a whole set of 40,008 companies is contemplated.

2.1.1.2.6 Startup independency validation

The final stage in analyzing the Orbis data is to validate the independence of the companies discovered. It is a required step to take in order to include only those startups that larger corporations have not acquired in the following analysis. The GUO (Global Ultimate Owner) is the piece of information used to implement this verification. This information indicates who presently owns the startup and is the best available proxy for determining whether or not the company is independent. In practice, businesses that show one of the three following traits are picked:

1. The GUO is a physical person (i.e. name and surname);
2. The company name and the GUO are the same or are very similar;
3. The GUO is not present.

In all the other cases, the startup is considered dependent and consequently discarded for the following analysis.

This final phase allows almost half of the corporations detected in the previous step to be discarded, leaving 22,370 independent businesses. These firms are further investigated in order to determine which ones are truly involved in the drone sector. Screening one by one these startups is an option, but it is not the most efficient one. As a result, the NACE code was once again adopted as a proxy to deal with the massive number of startups to analyze at this moment. Following a new round of discussion from a panel of researchers from Politecnico di Milano's Drone Observatory, it was agreed to select only the organization classified with highly representative NACE codes related to drones' businesses.

Consequently, a frequency analysis is undertaken on the companies selected at the end of the Crunchbase extraction, which generated the NACE codes used during the progressive Orbis' extractions based on filters. The result is the list of the codes that characterize approximately 80% of the companies selected at the end of the Crunchbase extraction and presented in Table 2.3.

NACE Rev. 2, core code (4 digits)	NACE Rev. 2, core code - description	#	Cumulated #	%	Cumulated %
3030	Manufacture of air and spacecraft and related machinery	87	87	9.58%	9.58%
6201	Computer programming activities	81	168	8.92%	18.50%
7112	Engineering activities and related technical consultancy	77	245	8.48%	26.98%
7490	Other professional, scientific and technical activities nec	76	321	8.37%	35.35%
2651	Manufacture of instruments and appliances for measuring, testing and navigation	31	352	3.41%	38.77%
6209	Other information technology and computer service activities	30	382	3.30%	42.07%
7420	Photographic activities	30	412	3.30%	45.37%
7022	Business and other management consultancy activities	29	441	3.19%	48.57%
7219	Other research and experimental development on natural sciences and engineering	27	468	2.97%	51.54%
5911	Motion picture, video and television programme production activities	26	494	2.86%	54.41%
8299	Other business support service activities nec	24	518	2.64%	57.05%
5829	Other software publishing	19	537	2.09%	59.14%
6311	Data processing, hosting and related activities	14	551	1.54%	60.68%
2899	Manufacture of other special-purpose machinery nec	13	564	1.43%	62.11%

7211	Research and experimental development on biotechnology	13	577	1.43%	63.55%
8559	Other education nec	13	590	1.43%	64.98%
4791	Retail sale via mail order houses or via Internet	12	602	1.32%	66.30%
6202	Computer consultancy activities	11	613	1.21%	67.51%
2611	Manufacture of electronic components	10	623	1.10%	68.61%
2790	Manufacture of other electrical equipment	10	633	1.10%	69.71%
3299	Other manufacturing nec	8	641	0.88%	70.59%
4690	Non-specialised wholesale trade	8	649	0.88%	71.48%
0161	Support activities for crop production	7	656	0.77%	72.25%
4120	Construction of residential and non-residential buildings	7	663	0.77%	73.02%
7120	Technical testing and analysis	7	670	0.77%	73.79%
4614	Agents involved in the sale of machinery, industrial equipment, ships and aircraft	6	676	0.66%	74.45%
5223	Service activities incidental to air transportation	6	682	0.66%	75.11%
6190	Other telecommunications activities	6	688	0.66%	75.77%
6312	Web portals	6	694	0.66%	76.43%
6420	Activities of holding companies	6	700	0.66%	77.09%
7311	Advertising agencies	6	706	0.66%	77.75%
4669	Wholesale of other machinery and equipment	5	711	0.55%	78.30%
4778	Other retail sale of new goods in specialised stores	5	716	0.55%	78.85%

7410	Specialised design activities	5	721	0.55%	79.41%
9609	Other personal service activities nec	5	726	0.55%	79.96%

Table 2.3: Most representative NACE codes.

Subsequent, a one-by-one screening process is carried out, utilizing all available information for each startup. For instance, the website is examined to see if the company's primary business is related to drones. The screening process described above results in a total of 7,798 enterprises engaged in the drones industry. The data gathered so far may be further integrated by employing two additional databases: the "Registro delle imprese" and the "Analisi Informatizzata delle Aziende Italiane" (AIDA), which contribute to the repository development bringing extra Italian startups' information.

2.1.1.2.7 Italian startups data collection from Registro delle imprese (Innovative Startups section) and AIDA

The Registro delle Imprese is an Italian database that registers all firms working in Italy. A list of 14,024 innovative startups is exported into a new Microsoft Excel spreadsheet from the ad-hoc section present in the database.

denominazione	nat.giuridica	codice fiscale	pr	comune	data iscrizione alla sezione delle	data iscrizione al Registro Imprese	data inizio dell'esercizio effettivo dell'attività	ateco 2007
POPSA HOLDINGS LTD	GRUPPO EUROPEO DI INTERESSE ECONOMICO	0019182993 3	CT	E IRLANDA DEL NO LONDON	20/07/2017	20/07/2017	27/06/2017	1813
MODAIMPRESA SRL	SOCIETA' A RESPONSABILITA' LIMITATA	[illegible]	IS	MIRANDA	27/05/2016	02/12/2015	22/12/2015	14131
CREAZIONI MODA SOCIETA' COOPERATIVA	SOCIETA' COOPERATIVA	[illegible]	IS	PETTORANELLO DEL MOLISE	03/10/2017	17/08/2017	15/09/2017	829999
WELFAREIN - SRLS	SOCIETA' A RESPONSABILITA' LIMITATA SEMPLIFICATA	0095634094 7	IS	ISERNIA	27/09/2017	19/09/2017	26/09/2017	702209
HYDROGEN FOR MOLISE S.R.L.	SOCIETA' A RESPONSABILITA' LIMITATA	[illegible]	IS	VENAFRO	07/11/2017	07/11/2017	02/11/2017	71122
DATASOUND - SRL	SOCIETA' A RESPONSABILITA' LIMITATA	[illegible]	IS	PESCHE	17/05/2018	15/11/2017	10/04/2014	5829
AUTHENTICON S.R.L.S	SOCIETA' A RESPONSABILITA' LIMITATA SEMPLIFICATA	0096379094 4	IS	SANT'AGAPITO	24/07/2018	09/07/2018	12/07/2018	702209
POLIGLASS SOCIETA' A RESPONSABILITA' LIMITATA SEMPLIFICATA	SOCIETA' A RESPONSABILITA' LIMITATA SEMPLIFICATA	0096396094 3	IS	ISERNIA	01/08/2018	18/07/2018	23/07/2018	32505
FROG SOCIETA' A RESPONSABILITA' LIMITATA SEMPLIFICATA	SOCIETA' A RESPONSABILITA' LIMITATA SEMPLIFICATA	0096576094 5	IS	PESCHE	11/03/2019	08/10/2018	18/10/2018	261109
SPIN SOCIETA' A RESPONSABILITA' LIMITATA SEMPLIFICATA	SOCIETA' A RESPONSABILITA' LIMITATA SEMPLIFICATA	0096577094 4	IS	PESCHE	15/03/2019	08/10/2018	18/10/2018	323
PLEIADIS S.R.L.	SOCIETA' A RESPONSABILITA' LIMITATA	[illegible]	IS	AGNONE	09/11/2018	09/11/2018	04/10/2018	47911
YUK SOCIETA' A RESPONSABILITA' LIMITATA SEMPLIFICATA	SOCIETA' A RESPONSABILITA' LIMITATA SEMPLIFICATA	0096651094 3	IS	MONTERODUNI	04/12/2018	16/11/2018	20/11/2018	5819
MENDEL CAPITAL S.R.L.	SOCIETA' A RESPONSABILITA' LIMITATA	[illegible]	IS	ISERNIA	30/10/2020	30/11/2018	15/04/2019	642
INNOVATION DEVELOPMENT ADVANCED SOLUTIONS - I.DE.A.S. S.R.L.	SOCIETA' A RESPONSABILITA' LIMITATA	00970810941	IS	ISERNIA	15/04/2019	15/04/2019	10/04/2019	620909
VECAS SOCIETA' A RESPONSABILITA' LIMITATA SEMPLIFICATA	SOCIETA' A RESPONSABILITA' LIMITATA SEMPLIFICATA	0097190094 3	IS	FILIGNANO	04/06/2019	30/05/2019	31/05/2019	28293
ILCOMMERCIALISTAONLINE S.R.L.	SOCIETA' A RESPONSABILITA' LIMITATA	[illegible]	IS	VENAFRO	05/07/2019	05/07/2019	25/06/2019	6201
LABELSCOIN BLOCKCHAIN S.R.L.	SOCIETA' A RESPONSABILITA' LIMITATA	[illegible]	IS	VENAFRO	10/01/2020	10/01/2020	03/01/2020	721909
MEDITERRANEA SOCIETA' A RESPONSABILITA' LIMITATA SEMPLIFICATA	SOCIETA' A RESPONSABILITA' LIMITATA SEMPLIFICATA	00971110949	IS	ISERNIA	03/07/2020	22/01/2020	13/05/2020	439909
R4PSO S.R.L.	SOCIETA' A RESPONSABILITA' LIMITATA	[illegible]	IS	POZZILLI	22/07/2020	22/07/2020	20/07/2020	7211
FABC SRLS - SOCIETA' A RESPONSABILITA' LIMITATA SEMPLIFICATA	SOCIETA' A RESPONSABILITA' LIMITATA SEMPLIFICATA	0098187094 2	IS	ISERNIA	06/08/2020	30/07/2020	31/07/2020	6202
CLAUD SOCIETA' A RESPONSABILITA' LIMITATA	SOCIETA' A RESPONSABILITA' LIMITATA	[illegible]	IS	ISERNIA	17/12/2020	17/12/2020	15/10/2020	856001
FIBRE - SOCIETA' A RESPONSABILITA' LIMITATA	SOCIETA' A RESPONSABILITA' LIMITATA	[illegible]	IS	PETTORANELLO DEL MOLISE	21/12/2020	21/12/2020	25/11/2020	721901
POLYMERES - SOCIETA' A RESPONSABILITA' LIMITATA	SOCIETA' A RESPONSABILITA' LIMITATA	[illegible]	IS	POZZILLI	21/12/2020	21/12/2020	25/11/2020	721909
MOLO21 S.R.L.	SOCIETA' A RESPONSABILITA' LIMITATA	[illegible]	IS	ISERNIA	26/02/2021	26/02/2021	16/12/2020	774
MISIMA SOCIETA' A RESPONSABILITA' LIMITATA SEMPLIFICATA	SOCIETA' A RESPONSABILITA' LIMITATA SEMPLIFICATA	0098509094 3	IS	VENAFRO	08/03/2021	13/01/2021	08/02/2021	47911
SCHOOLLY SOCIETA' A RESPONSABILITA' LIMITATA SEMPLIFICATA	SOCIETA' A RESPONSABILITA' LIMITATA SEMPLIFICATA	0098531094 5	IS	CERRO AL VOLTURNO	29/01/2021	29/01/2021	15/01/2021	6201
PYROTECH SOCIETA' A RESPONSABILITA' LIMITATA SEMPLIFICATA	SOCIETA' A RESPONSABILITA' LIMITATA SEMPLIFICATA	01002500146	SO	SONDRIO	26/02/2018	07/02/2017	23/02/2017	282129

Figure 2.8: Registro delle imprese exportation sample.

The second step is collecting relevant data from the Analisi Informatizzata delle Aziende Italiane (AIDA) database. The collecting process is quite simple since also AIDA has a dedicated section for all the innovative Italian startups. Consequently, the selected organizations are picked considering their general characteristics, i.e., company name, tax code number, ATECO code, ATECO code description and website. The results obtained from this analysis are 13,748 startups.

After that, the results obtained from the "Registro delle imprese" and AIDA are combined. This operation is possible using as a key to connect the findings the tax code number, which is unique and present in both databases. Therefore, the two extractions are merged, deleting duplicates. The net merging result is a list of 14,143 startups. The following step is screening this database and selecting only the companies belonging to the drone sector. An ad-hoc process is chosen to reach this purpose by exploiting companies' available data. The first proxy considered is the ATECO code description to identify and eventually discard enterprises that deliver value in industries completely not related to drones. The second driver used during this screening process is the NACE code following the same approach considered when selecting the startups at the end of the Orbis' independence analysis.
After this selection process, and further one-to-one analysis, a total of 40 Italian startups is classified as part of the drones industry.

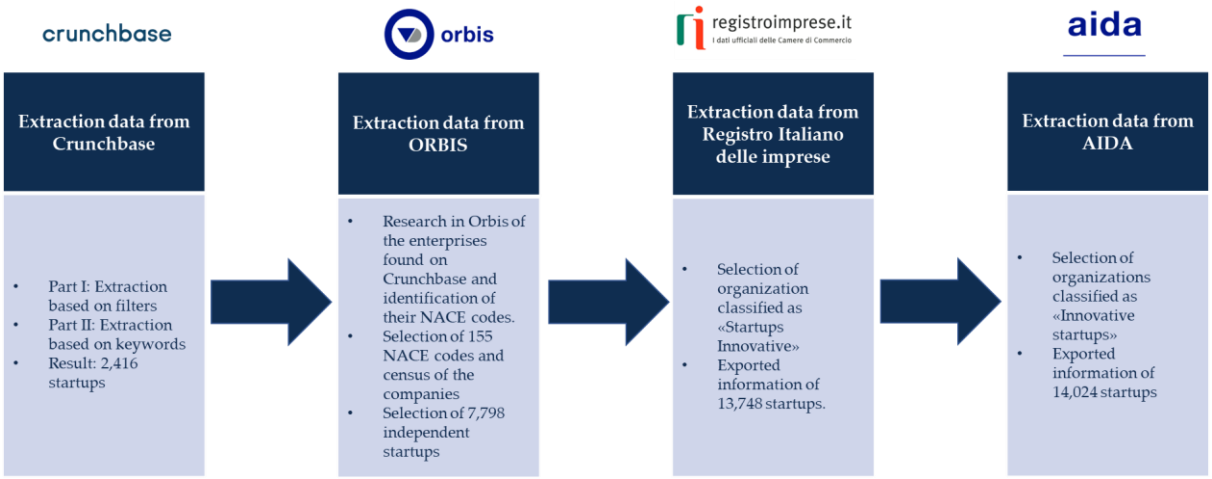


Figure 2.9: Summary of the extraction process from Crunchbase, Orbis, Registro delle Imprese and AIDA.

2.1.1.2.8 Final Consolidation

After collecting the information from Crunchbase, Orbis, AIDA and the Registro delle imprese, a final consolidated database is created to perform the further steps of the study. The actions made to create an integrated list of relevant startups for this

research were mainly related to eliminating duplicates and a further check on the startup's nature to improve the scope's precision of this study continuously.

At the end of a long yet essential consolidation process, from an initial database of 41,865 companies, 6,414 are classified as independent and operating in the drone industry.

2.1.1.3 Funding verification

The previously mentioned database is a great instrument for our study. However, it is not complete with all of the material necessary to further advance this research since there is no evidence indicating whether the firm has received support from external investors. This final piece of information is critical in answering the last two research questions. So, it is necessary to separate entities that could get external funding from those that could not. Now that the next step is well-placed, it is necessary to understand how to accomplish it.

The most efficient way to distinguish companies backed considering the data available at this moment is to exploit the database and, in particular, one information: the presence of the startup in Crunchbase. The absence of a company from the latter organizations' information platform can be acknowledged as a good proxy for not being backed by external investors since Crunchbase has provided excellent coverage of startups' financing operations in recent years. In practice, a specific tool is analyzed to determine if a company is present or not in CB: "List Import", and its logic is very similar to Orbis's "Batch Research" instrument. However, a long and iterative process is needed to import the database in Crunchbase due to the limitation of this tool. In particular, the list of all the companies found until now is divided into different comma-separated values (CSV) files. Each of the last contains only two columns: the company's name and the website. So, all the database was firstly copied and then adapted to the new requirements. Secondly, the list of 41,865 was divided into 42 different files containing a maximum of one thousand rows. Thirdly, the generated files are uploaded one by one in CB with list import. The outputs of each imported .csv file are two different spreadsheets: one containing all the companies found and matched in Crunchbase and the other containing all the organizations absent. Before exporting CB's information related to the matched companies, it is necessary to select their relevant characteristics, i.e., Crunchbase's columns of data. In particular, the chosen ones, in this case, are listed in the table below together with other information coming from Orbis only, such as the NACE code.

Characteristic	Explanation
Company Name	Name of the company
Backed Company	"Yes" if the company received funding. "No" otherwise
Organization Name URL	Direct link to the Crunchbase page of the startup
Website	Link to the official website of the startup
Twitter	Link to the company Twitter account
Facebook	Link to the company Facebook account
LinkedIn	Link to the company LinkedIn account
Description	Brief description of the company
Founded Date	Date in which the startup was founded
Headquarter City	City of the startup headquarters

Headquarter Region	Region of the startup headquarter
Headquarter State	State of the startup headquarter
Headquarter Geographical Area	Geographical area of the startup's headquarter: ▪ Africa ▪ Asia ▪ Central-South America ▪ Europe ▪ North America ▪ Oceania
Geographical Scope	Geographical area in which the startups operate; it could be either worldwide or one of the previous geographical areas
Contact Email	Email of the startup or its founders
Phone Number	Phone number of the startup or its founders
Founders	Name of the founders
Target Market	▪ B2B ▪ B2C ▪ B2B2C
Total Funding Amount ($)	Total amount of money received from the startup since its foundation (in US $)

Last Funding Amount ($)	Amount of money received from the startup during its last funding (in US $)
Last Funding Date	Date in which the startup received its last funding
Lead Investors	Corresponds to the column "Top 5 investors" from Crunchbase: the 5 major entities that invested in the startup since its foundation
NACE Rev. 2, core code (4 digits)	Code attributed by the NACE classification
NACE Rev. 2, core code - description	Description of the NACE code
Offer Typology	▪ Product ▪ Service ▪ Combination of product and service
Activity Typology	▪ Specialized: the startup focus is exclusively on drone-based products and/or services ▪ Generalized: the startup also offers products and/or services belonging to other industries, such as IoT, AI, robotics, etc.
Platform	▪ Products marketplace ▪ Digital location where demand and offer meet (e.g. freelance pilots)
Product Typology	▪ Hardware ▪ Software ▪ Both hardware and software
Hardware Typology	▪ Drone platform: the drone itself, the hardware infrastructure of the machine

	▪ Payload: objects that the drone can carry (e.g. cameras, sensors, etc.) ▪ Components (engine, battery, navigation system, controller, docking or charging station, launch and retrieval systems, etc.) ▪ More than one of the previous
Platform Typology	▪ Fixed-wing ▪ Rotating wing ▪ Vertical Take-Off & Landing (VTOL) ▪ Airship ▪ More than one of the previous
Payload Typology	▪ Photo/Video Camera ▪ Thermic Camera ▪ Optical Reader ▪ Dispenser of Substances ▪ Box/Container ▪ Sensor (multispectral, scanner, laser, thermographic, gas detector, etc.) ▪ Others (speaker, parachute, etc.)
Software Typology	▪ Communication, more related to ground activities (includes data and information transmission) ▪ Navigation, more related to onboard activities (solutions to manage navigation systems) ▪ Integration (creation of an ecosystem that includes all the control operations and the data processing, e.g. ground station and digital platform) ▪ Digital Modelling (Data processing aiming at giving a model of reality)
Application Field	Describes to which particular context is applied the product and/or service offered by each startup; within each category, it is possible to introduce further specificity. The possible applications are listed in the lines below
Application Field: Unmanned Traffic Management (UTM)	▪ Monitoring ▪ Counter drone (The product/service of the startup is related to systems that are used to detect and/or intercept UAV)

Application Field: Search & Rescue	▪ Search ▪ Rescue
Application Field: Site Inspection	▪ Infrastructure inspection ▪ Post environmental disaster inspection ▪ Surveying ▪ Environmental/agricultural inspection
Application Field: Security & Surveillance	▪ Security (Data leaks, external intrusion) ▪ Protection (more people related) ▪ Surveillance
Application Field: Transports	▪ Goods ▪ People
Application Field: Inventory	This field comprehends all the activities related to the warehouse inventory
Application Field: Maintenance	This field comprehends all the activities related to Maintenance
Application Field: Supply	Substance release (water, pesticides, etc.)
Application Field: Entertainment & Media	▪ Photo/video ▪ Aerial shows ▪ Races ▪ Graphical arts ▪ Learning ▪ Advertisement
Additional Services	Extra-services concerning the core value proposition of the startup: ▪ Consulting (usually about how to integrate the drone technology within the company activities) ▪ Pilot provision ▪ Fleet provision ▪ Training (about the drone technology and its application) ▪ Others

	▪ More than one of the previous
Client Sector	Defines the sector to which the client of each startup belongs. The possible sectors are listed in the lines below
Client Sector: Agriculture	This sector includes all the actors operating in the agricultural sector (farmers, growers, winegrowers, etc.)
Client Sector: Utilities	This sector includes all the actors that provide basic goods (water, sewage services, electricity, dams, natural gas, etc.)
Client Sector: Entertainment & Media	This sector includes activities – run by either businesses or privates – in the field of entertainment and multimedia content creation for a set of different purposes (e.g. games, drone races, marketing campaigns, video making, photo shooting, etc.)
Client Sector: Infrastructures & Buildings	This sector refers to all the actors operating in that set of infrastructures allowing for society and organizations to run effectively
Client Sector: Environment	This sector includes all the actors involved in preserving the environment, monitoring environmental conditions or the organization of society (bodies responsible for plant life and wildlife protection, Public Administrations, police officers, firefighters, etc.)
Client Sector: Public Sector	This sector includes actors which the government controls
Client Sector: Telecommunications	This sector includes all the companies operating in the field of telecommunications and Internet service provision
Client Sector: Logistics & Transport	This sector includes actors operating in the logistics sector, involved in the delivery and transport of goods and people; it includes logistics operators, transport companies, and manufacturers of logistic, drone-based products or that use drones to offer their services

Client Sector: Healthcare & Pharmaceutical	This sector includes actors involved in healthcare or pharmaceutical activities (mainly hospitals, pharmaceutical companies, research laboratories, etc.)
Client Sector: Art & Culture	This sector includes the actors operating in arts and culture (museums, municipal bodies, private exhibitions, etc.)
Client Sector: Automotive	This sector includes all the actors' protagonists of the automotive sector
Client Sector: Insurance	This sector includes actors that run insurance activities
Client Sector: Consumer	This sector includes economic entities operating in the consumer goods industry
Client Sector: Other	This sector includes all the startups operating in a client sector which is not listed above
Client Sector: Multisector	This section includes all the startups whose offer is so generic that it could be related to all the sectors previously listed

Table 2.4: Explicative table of columns in the database analyzed.

Once added the information to recognize if external investors backed a startup, the database is finally ready to be deeply analyzed to exhaustively answer the research question and create further scientific knowledge on this new and fascinating industry, which will progressively increase its presence in citizens daily life.

In conclusion, the database build comprises 41,865 organizations. After a continuous and always more accurate check, 5,283 are clustered in the drone industry. Among them, 4,528 startups were not found in Crunchbase and consequently are considered as entities that have not received funds.

Now that an exhaustive census on startups operating in the drone industry is obtained, it is the moment to focus on resolving the three research questions, paying particular attention to all the funding collected starting from the startups' day of foundation.

2.1.2 Econometric models

Starting with the data collected in the previous sub-sections, two different econometric models are developed, tested, and run to answer the final two research questions. Stata is the software used to create this quantitative study. The two statistical analyses take a different approach. However, the major part of variables is shared by both of them. Consequently, to provide a more agile overview of the entire process, it is preferable to begin by presenting the explaining variables considered before drilling down into each statistical investigation. The following parameters, in particular, represent the overall characteristics of the startups under consideration:

- Age: this variable tells how many years have passed since the startup foundation. Due to the time interval considered, it can assume values from 0 to 10.
- Headquarters' Geographical location: The startup headquarters region can assume three values: North America, Europe or Other.
- Number of investors attracted: This variable shows the number of investors that invested their capital into the considered startup;
- Number of founders: This variable indicates the number of persons who formed the organization;
- Types of investors attracted: This factor describes the investor typologies that opted to invest in the business under consideration. It can assume four values: Venture Capital, Business Angel, Funds & Banks or Innovation Dedicated Programs. Further details about the investors' typologies considered are shown in Table 2.5.

Investor ID	Investor Type Class	Investor types included
1	Venture Capital	Venture Capital, Micro VC, Corporate Venture Capital, Government Office, Private Equity Firms, Fund Of Funds, Investment Partner
2	Business Angel	Individual/Angel, Angel Group
3	Funds and banks	Investment Bank, Family Investment Office, Hedge Fund, Venture Debt
4	Innovation dedicated programs	Accelerator, Incubator, Entrepreneurship Program, University Program, Co-Working Space

Table 2.5: Investors' class composition

- Startups' offer typology: product, service, or both. This variable takes into account the main value proposition, excluding any extra products/services supplied by the business that are not required to develop the core value proposition.
- Existence of any additional service: This is a binary variable that assumes 1 if the startup provides: Consulting on how to integrate drone technology into company activities, Pilot or Fleet provision, Training on drone technology and its application, Data collection/analysis, or more than one of the previous services. This factor is equal to 0 in all other circumstances.
- Client sector: a series of binary variables are created to model all the client sectors analyzed and understand their impact on the dependent variable. In particular, all the 15 client sectors explained in Table 2.4 are considered.
- Application field: a set of binary variables is established to replicate all the nine application fields listed in Table 2.4.

Now that the main variables are defined, it is possible to offer a deeper description of how each model leveraged them in order to deliver a valuable contribution to this research.

2.1.2.1 Econometric model 1: Regression Analysis

The first econometric model tries to provide insights into the potential aspects that might major impact the overall amount of money acquired by a drone business. The method adopted to attain this goal is regression analysis. The variable that has been designated as dependent is the total funding amount in dollars received by each startup of the sample. In contrast, the independent ones include age, geographical location of the headquarters, the number and the typology of investors engaged, the number of founders, the type of the startup's offering, the availability of any supplementary service, and the client sector.

Following the analysis, the output is reviewed to determine whether any explanatory variable has statistical significance. If this is the case, additional research is conducted to see how it affects the total financing amount obtained by a drone startup.

2.1.2.2 Econometric model 2: Multinomial Logistic Regression

The second econometric model seeks to answer the last research question, finally finding startup characteristics that may influence Venture Capital Business Angels, Funds & Banks or Innovation Dedicated Programs to fund or not a drone firm. This time, the statistical technique used is Multinomial Logistic Regression.

The dependent variable is categorical, and its value varies depending on the sort of investor that sponsored the evaluated business, as described in Table 2.5 and assuming values from one to four.

Furthermore, several distinct explanatory factors were analyzed this time, each indicating a unique startup trait. Age, headquarters' geographical location, number of investors attracted, number of founders, startups' offer typology, presence of any additional service, and client sector are the independent variables considered for this second statistical research, as explained at the beginning of subsection 2.1.2.

After the elaboration process, the output regarding each investor's type is further analysed to see if any independent variable assumes a statistical significance. If that is the case, a further reflection on the outcome obtained is developed to answer research question three in the most exhaustive way.

3. Quantitative analysis results

This chapter presents the analysis of the census produced following the process described in the previous section and shows the results generated by the two econometric models built, one for the second and the other for answering the third research question. The first part of this chapter gives a close view of the main aspects of the companies in the census across three main pieces. The first one gives a general analysis of the characteristics of the organizations in the drone industry, giving insights on the age, geographical distribution and national legal form most adopted across the whole industry. After an overview, the last two parts of the census description focus on comparing backed and not backed companies and a final deeper analysis of startups that received external funding, respectively.

Therefore, the chapter continues with a detailed description of the results concerning RQ2). In particular, all the assumptions and characteristics of the statistical analysis are considered, and a further description of the results obtained is performed. In this way, several major factors that influence the amount of funding a startup receives in the drone industry are identified.

Finally, this chapter explains all the properties of the second econometric model developed to address RQ3) and a detailed summary of the analysis' findings. Thus, certain features of startups that might impact venture capital, business angels, funds and banks, and innovation-focused initiatives are determined and examined in depth.

3.1 Census results

3.1.1 Analysis of the entire census

A complete overview of the drone sector is possible thanks to the census conducted using the procedures detailed in the previous chapters. From 2011 through 2021, a total of 5,283 startups from around the world are properly examined. It is significant to recognize that a data gap might impact the number of firms created in the last years since an inadequate update with the most recent startups could have impacted the examined databases. With a 39.60 per cent rise in the number of organizations created compared to the previous year, 2015 had the greatest relative growth in new organizations. However, 2017 is the year that records the greatest number of drone startups founded.

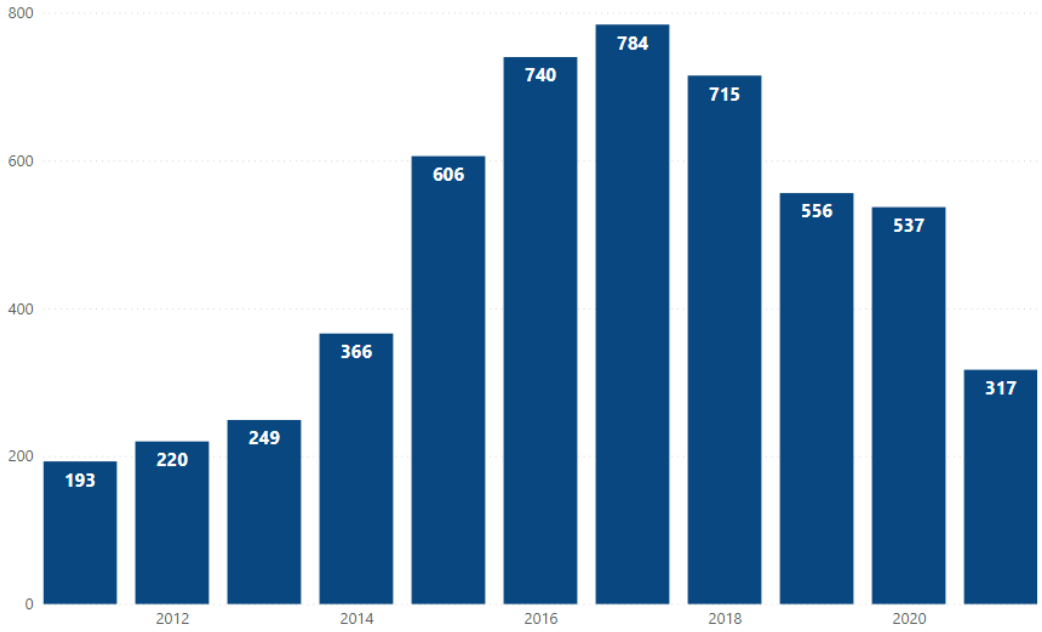


Figure 3.1: The distribution of startups according to the year of foundation[6].

The majority of drone organizations founded between 2011 and 2021 own their headquarters in the European Union (3,469 startups). However, the United States and Canada, which are in second place with 713 enterprises in the drone sector, also play a significant role in the global drone industry development. Aside from that, whereas Central-South America and Asia also have a notable presence, Oceania and Africa play a marginal part, with exactly 70 drone startups working in these two regions combined.

[6] Total sample: 5,283 startups. Data about 2020 and, in particular, 2021 are underestimated due to possible gaps in latest updates of the database used.

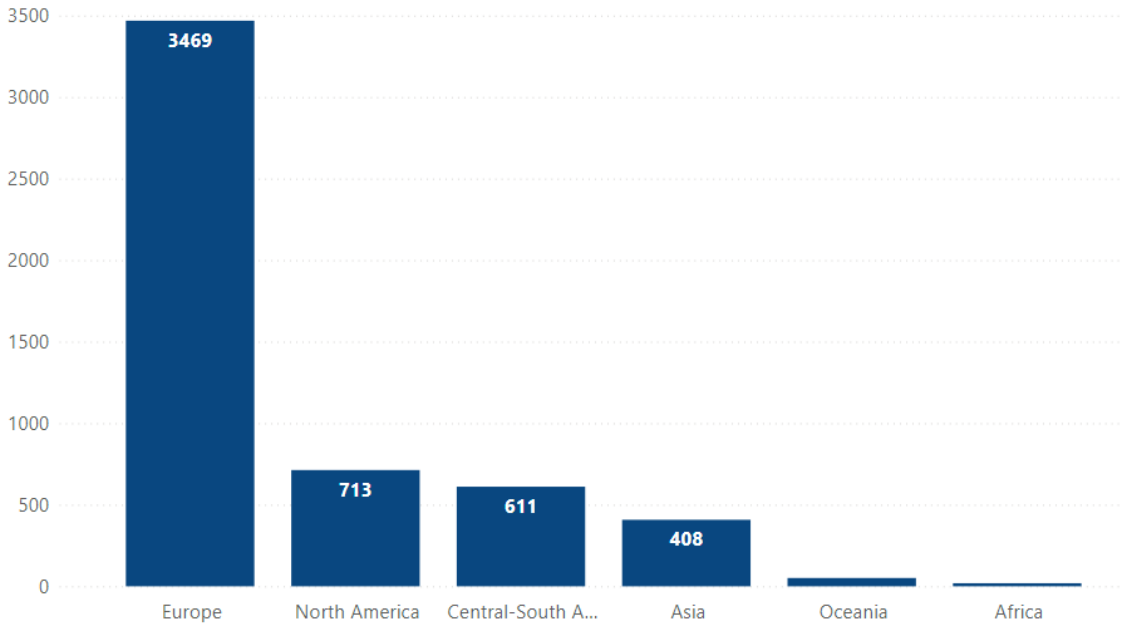


Figure 3.2: Geographical distribution of startups analyzed[7].

When examining the national legal forms adopted in the sample, the most widespread is the Limited Liability Company. Several factors may support such a settlement. First and foremost, it ensures that the organization of entrepreneurs is as simple as possible in terms of bureaucracy and taxation. Being uncomplicated is one of the characteristics that enable limited liability corporations to expand in an agile manner. Consequently, it is reasonable for a newly formed company to go for such a national legal structure. Also, the Private Limited company assumes significant importance with the limited liability company - SRL. All three of the most broadly adopted national legal forms share the feature that the entrepreneurs are not personally accountable for the debts and obligations owed by the company, in contrast to the situation that subsists, for example, in the case of Sole Proprietorship, where the shareholders are personally liable.

[7] Total sample: 5,271 startups.

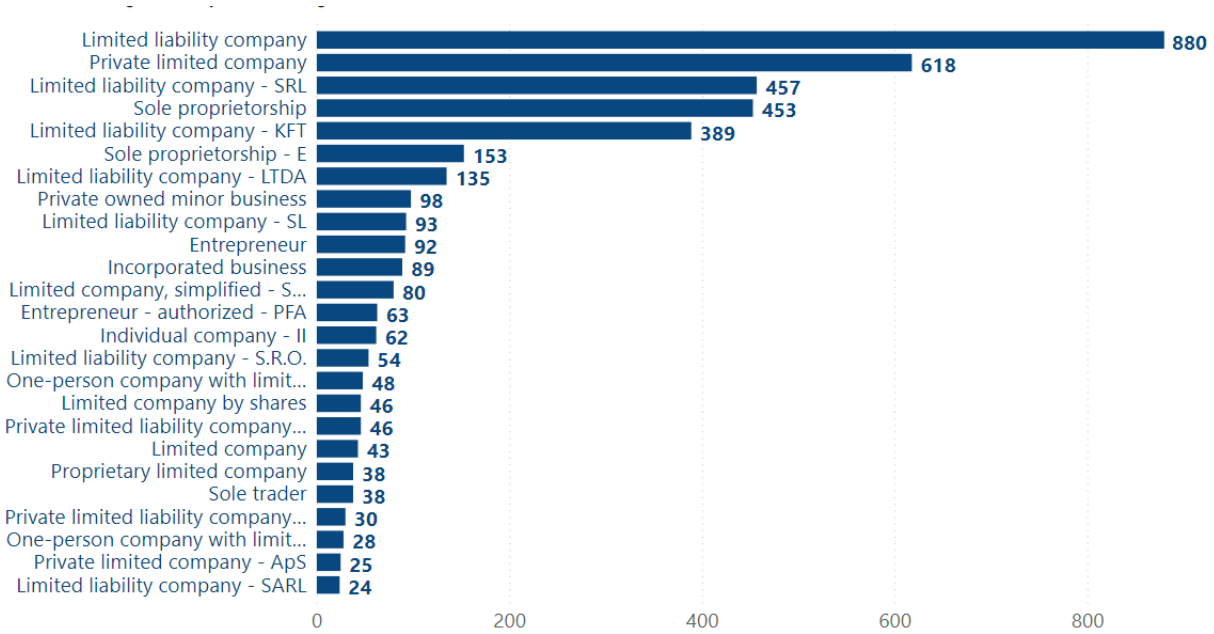


Figure 3.3: National Legal Form distribution of startups analyzed[8].

The drone industry is an emerging sector, so there is a lack of clear classification, especially in organizations' databases. For instance, there is not a dedicated NACE code associated with companies operating in this industry. As a result, it is important to present in which industrial divisions drone startups are now listed. The BvD sector is being examined in order to achieve this purpose. It is an indicator used by the Orbis database to classify enterprises based on the activities they develop. Business services are the most prevalent industry section attached to drone startups (1,831 startups). In addition, the BvD sector Travel, Personal & Leisure (988 startups) is highly considered, too.

[8] Total sample: 5,283 startups.

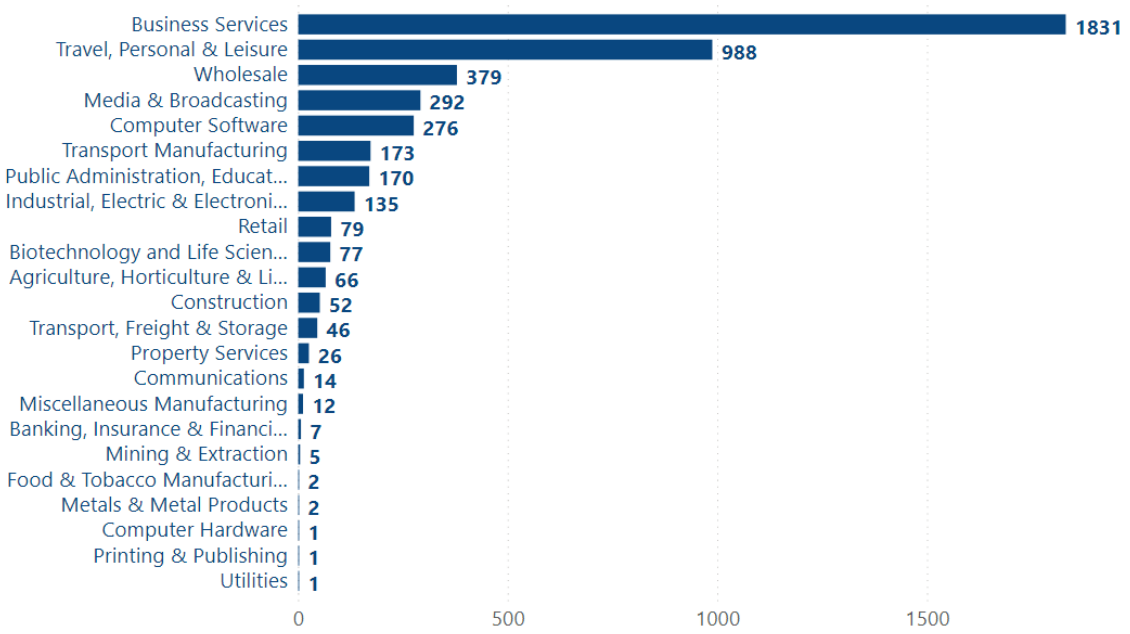


Figure 3.4: BvD Sector[9] distribution of the startups analyzed.

The quantity of Total Assets owned by each firm in the database appears to have an increasing trend. However, the data for the year 2021 is negligible owing to the very high likelihood of a missing update in the values in the databases under consideration.

[9] Total sample: 4,624 startups. Data about 2020 and, in particular, 2021 are underestimated due to possible gaps in latest updates of the database used.

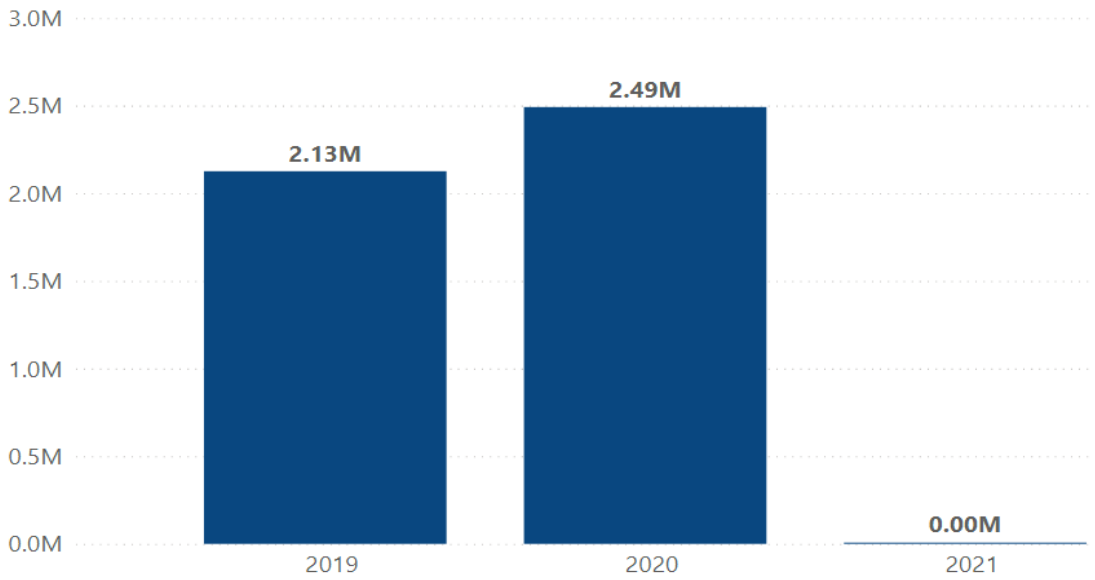


Figure 3.5: The distribution of Total assets of the startups' sample according to the year[10].

3.1.2 Comparison between backed and not backed startups

Once analyzed how the sample is distributed and elements' main characteristics, the analysis moves on to a comparison between the relevant characteristics between the startups that have received funding and those that have not received any financial support. The first, very aggregated, data is the percentage of backed startups on the total number of organizations present in the census results. The 14.29% of the startup's sample has received economic support from external investors.

[10] Total sample: 1,378 startups. Data about 2020 and, in particular, 2021 are underestimated due to possible gaps in latest updates of the database used.

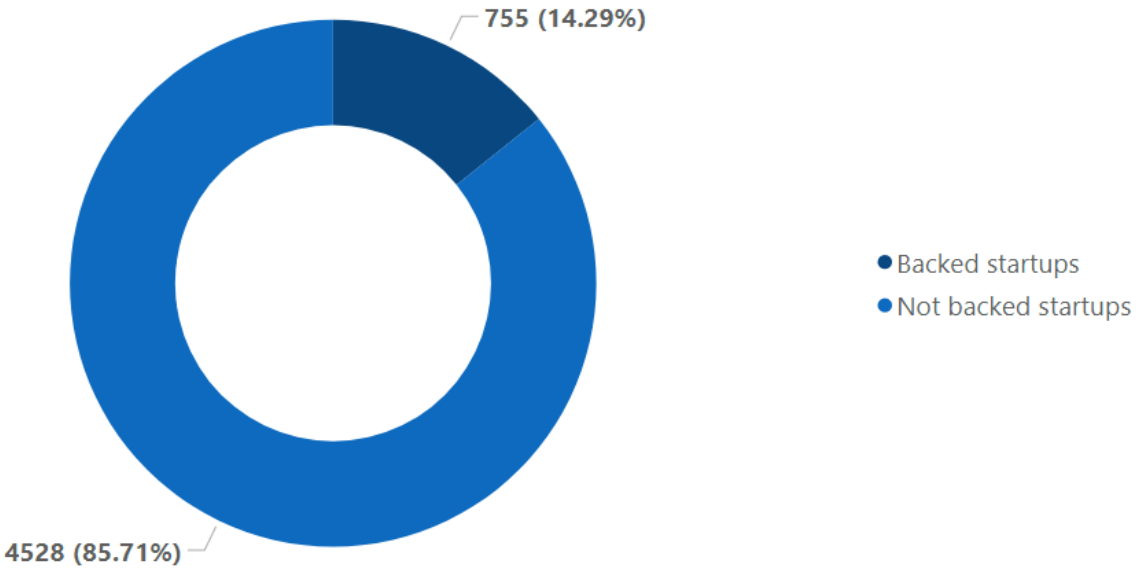


Figure 3.6: Percentage of backed and not backed startups[11].

The investigation continues crossing the foundation year of the organizations with their ability to receive or not funds. The year with the greatest number of financed startups is 2015 (159 startups).

[11] Total sample: 5,283 startups

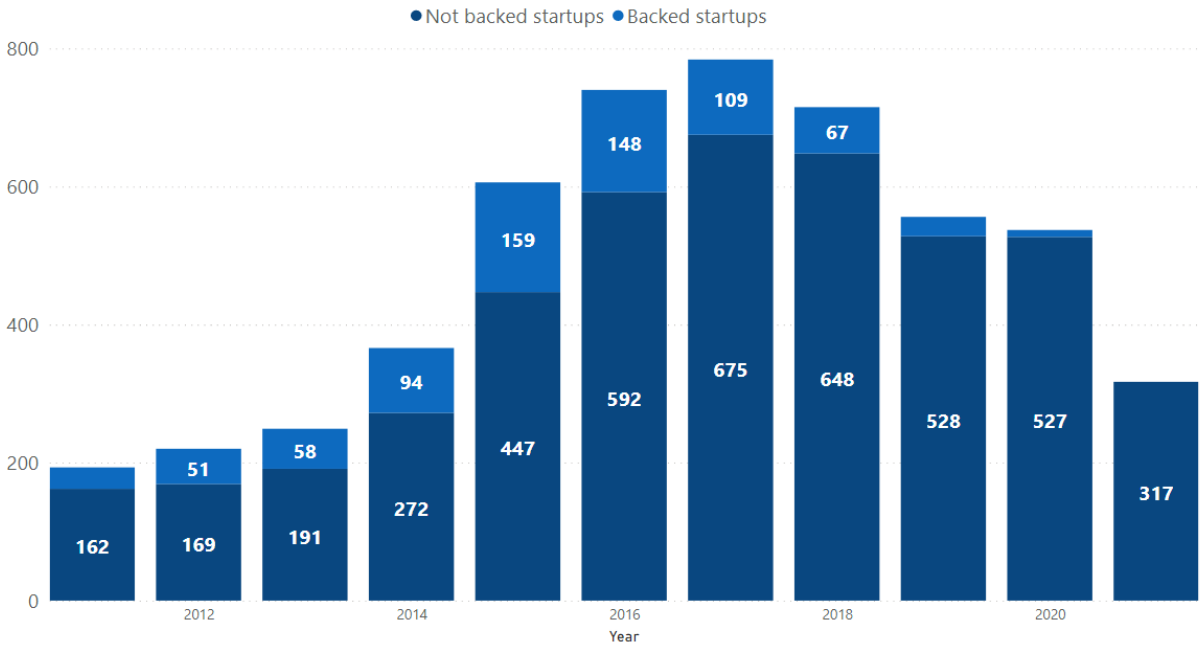


Figure 3.7: The distribution of startups backed and not-backed according to their year of foundation[12].

It is feasible to evaluate the distribution of funded and not-backed companies based on the geographical location of their headquarters, exploiting the available data. North America has the highest proportion of companies that have successfully raised funds; nearly half (44.2 per cent) of the companies in this region have done so. The proportion of corporations based in Asia, Africa, and Oceania that have successfully collected external financing ranges from 25.5% to 29.4%. However, in Europe and even more in Central and South America, just a few organizations are financed by external entities, accounting only for 8.1% and 1.3% of the total number of drone startups based in these areas, respectively.

[12] Total sample: 5,283 startups. Data about 2020 and, in particular, 2021 are underestimated due to possible gaps in latest updates of the database used.

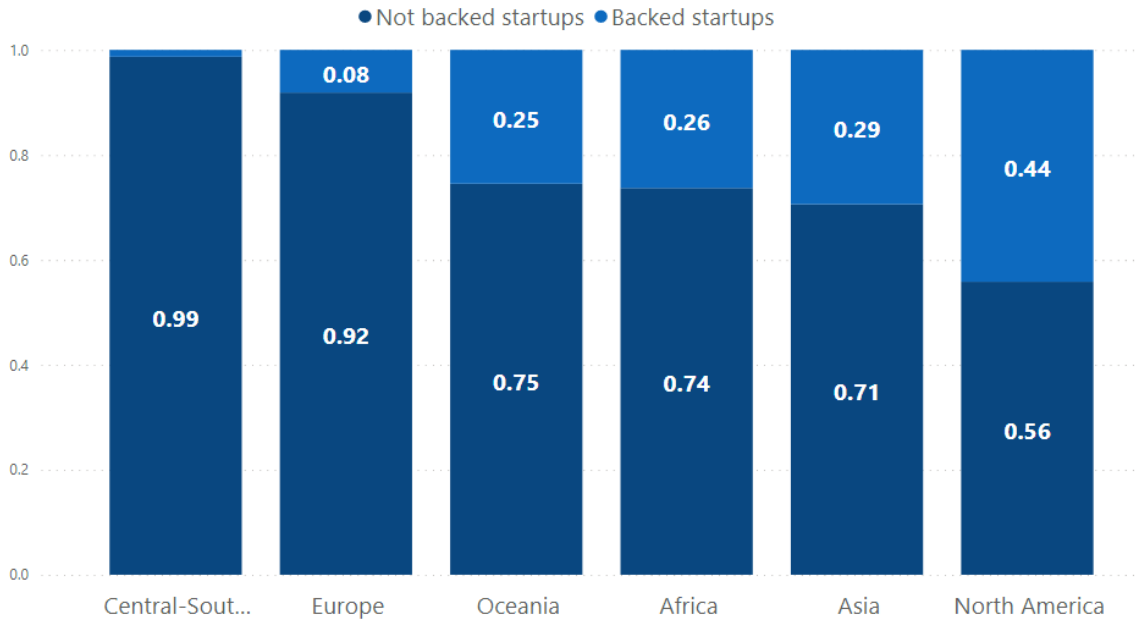


Figure 3.8: The distribution of startups backed and not-backed according to the headquarters' geographical area [13].

The BvD sector, which presents the highest quantity of backed startups, is Business Services. Computer software, Transport Manufacturing and Industrial, Electric & Electronic Machinery present a percentage of startups which successfully received funds above 92%.

[13] Total sample: 5,271 startups.

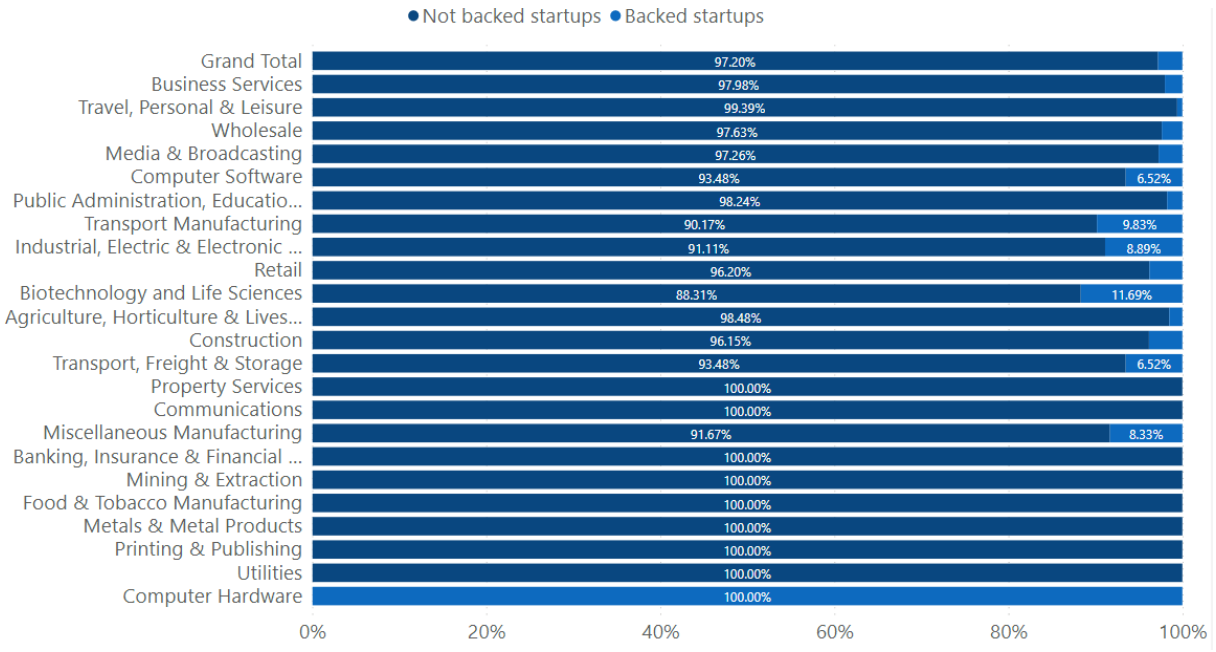


Figure 3.9: backed and not-backed startups distributed according to the BvD sector [14].

3.1.3 Focus on backed startups

After providing a general overview of the drone industry in the first subsection, focusing on the differences between founded and unfounded startups, the following section will provide a detailed analysis of the startups that may attract due to their unique characteristics funds from external economic entities. In particular, the following analysis will concentrate on the startups which received funding from external investors and consequently are present in Crunchbase. The sample, in this case, is made up of 755 startups.

The total money received is $7.067 B[15]. The concentration of funding is relatively high since four firms have accumulated 35.83 per cent of the total capital raised. Three of these four businesses are based in California, two in San Francisco and one in Ohio. As a result, firms located in the United States possess approximately one-third of the total finances obtained in the drone sector.

[14] Total sample: 4,635 startups.
[15] Total sample: 318 startups

Startup name	Total Funding Amount (in th $)	Cumulated Total Funding Amount (in th$)	%Cumulated Total Funding Amount
Vertiv	$1,239,000.00	$1,239,000.00	17.53%
Anduril Industries	$ 691,000.00	$ 1,930,000.00	27.31%
Scale AI	$ 602,620.00	$1,930,000.00	35.83%

Table 3.1: 35.83% of total funding amount distribution[16].

Following the study with a focus on the headquarters area, it is clear that North America is responsible for 75.23 per cent of the total money collected in the sample investigated, corresponding to $ 5.317 B. On the other hand, European organisations have got $ 1.016 B, while all other geographical areas have received a total of $ 733.95 B.

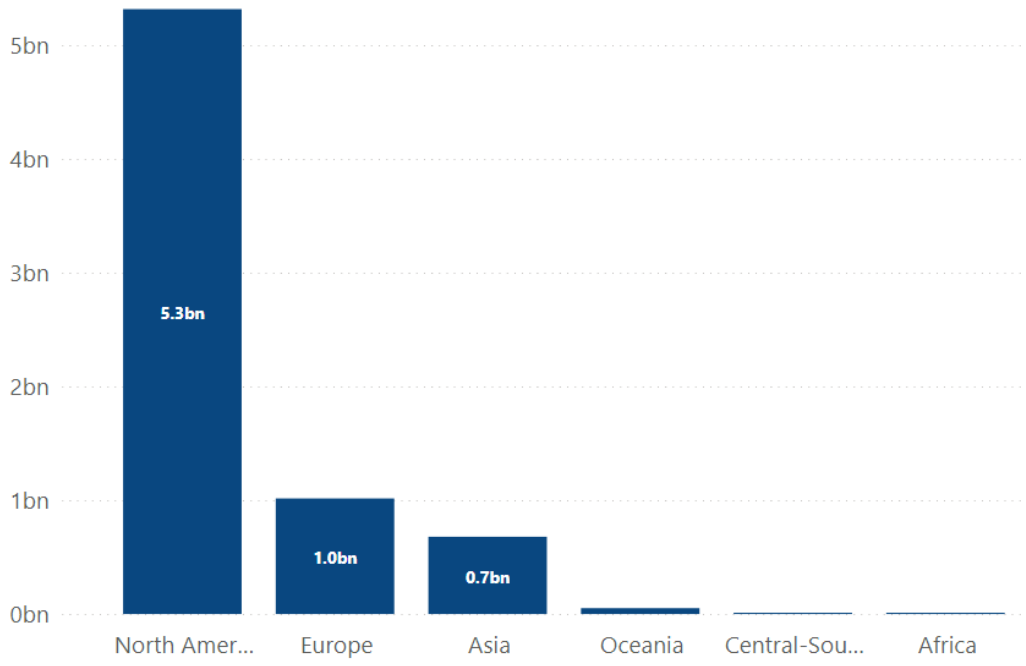


Figure 3.10: Distribution of funding received according to the Geographical Area[17].

[16] Total sample: 398 startups
[17] Total sample: 398 startups

Zooming in to the geographical distribution of funding, it is feasible to highlight which country performed best. Again, the United States leads the list, together with Germany ($ 466 M funding received) and China ($ 229 M funding received) respectively at the second and third place.

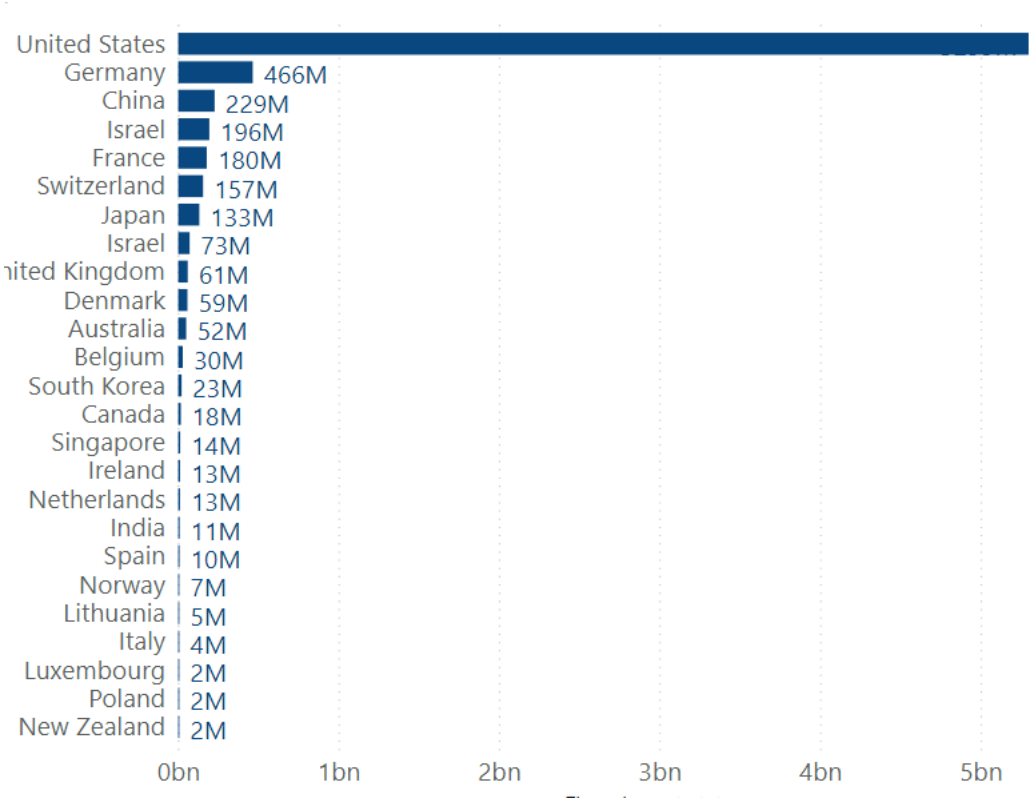


Figure 3.11: Distribution of funding received according to the headquarters' country[18].

After explaining how financing is distributed based on where businesses' headquarters are located, the research shifts its emphasis to the market targeted by funded firms. Among the 726 startups with a specified target market, 65.4 per cent work exclusively in the business-to-business market, 187 firms operate in both the B2B and B2C segments, and just 42 organizations deliver their goods or services only to end-users. Finally, 13 startups are target B2B2C and B2B markets, six businesses are active in B2B2C, six are active exclusively in the B2B2C market, one company is active in both the B2B2C, and B2C markets, and two are active in all three analysed markets.

[18] Total sample: 318 startups

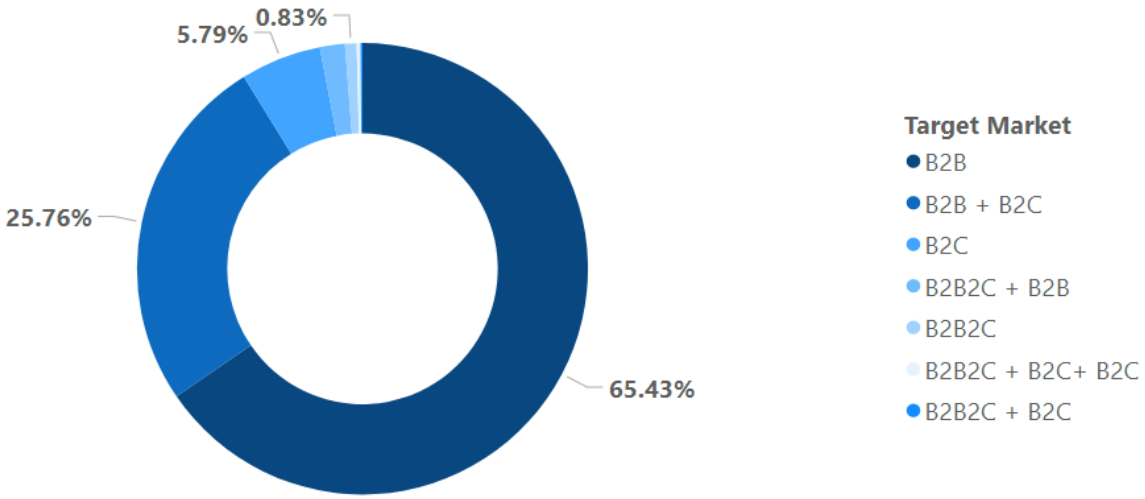


Figure 3.12: Distribution of startups according to the target market[19].

Considering all the startups operating in the B2B market and eventually in others (B2C, B2B2C), the percentage of organizations offering products or services not directly to consumers is 93.25% of the sample considered. So, it is insightful to analyse more in-depth startups operating in the B2B market to understand how these companies are distributed. In particular, 70.16% of startups working in the business-to-business market are specialized only in this target market (475 startups), while 187 startups work in the B2B and B2C markets. The remaining 13 startups are mainly working in the B2B2C and B2B and the 2 in all the considered markets.

[19] Total sample: 726 startups

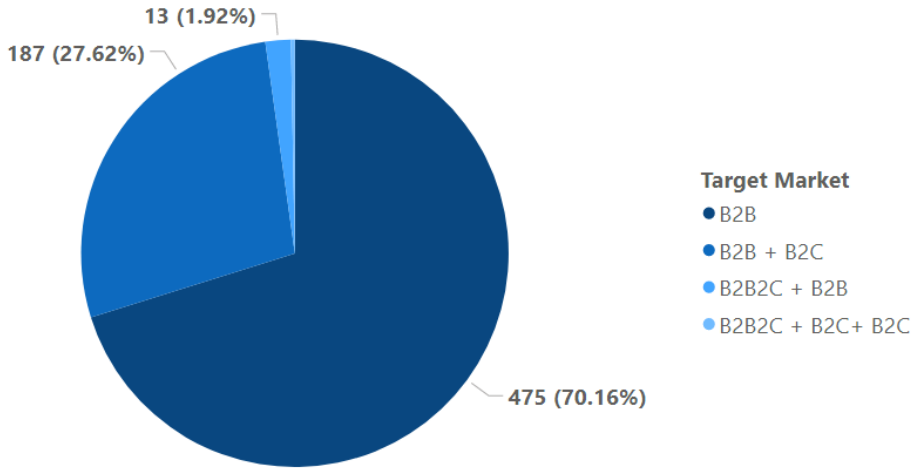


Figure 3.13: Distribution of startups operating in the B2B market[20].

In the sample analyzed the 73.11% of startups are specialized in the drone's industry, meaning that their core business is exclusively related to the supply of drone services or products. In contrast, considering organizations with a generalized activity typology, they frequently also offer products or services in the Internet of Things or Artificial Intelligence field in addition to the UAVs industry.

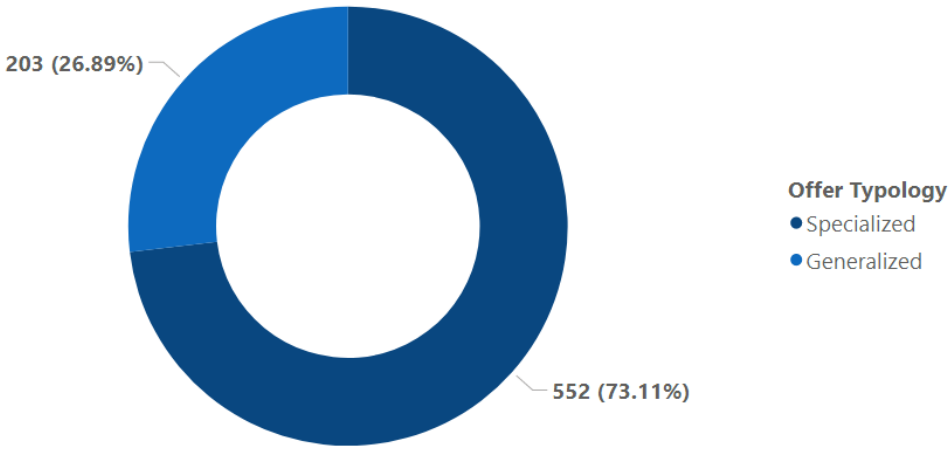


Figure 3.14: Distribution of startups according to the offer typology[21].

[20] Total sample: 677 startups
[21] Total Sample: 755 startups

Going deeper into the offer typology, the startups supplying products have received more than half of the total funding amount (55%), corresponding to $ 6.4 B. The remaining funds are almost equally distributed between organizations offering services (25%) and companies delivering a combination of both products and services (20%).

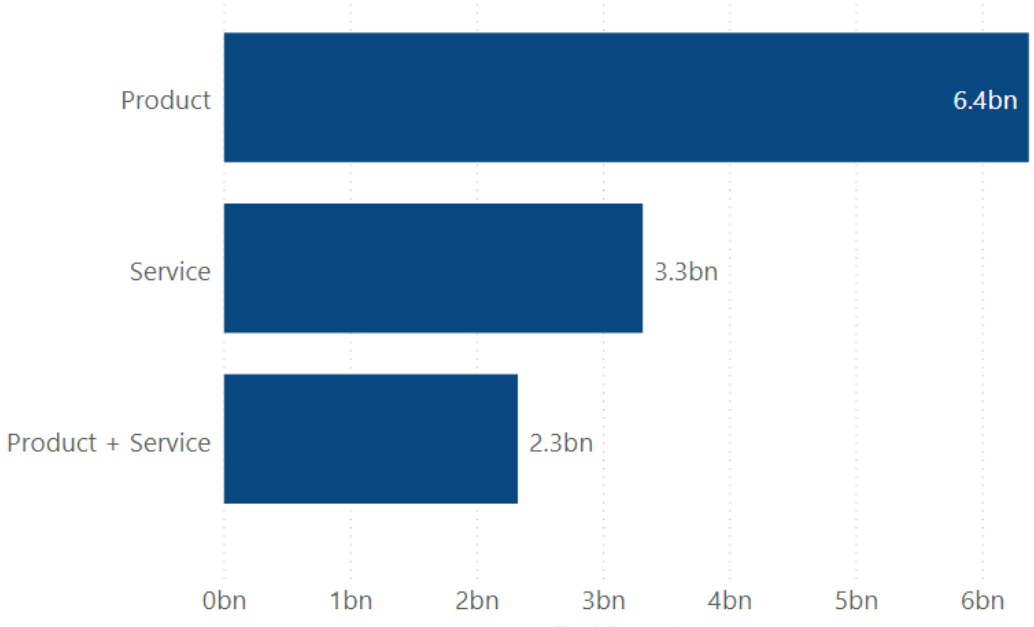


Figure 3.15: Distribution of startups' funding according to their value proposition[22]

Oceania and North America seem to have the largest quota of organizations offering products as well as Asia. It is not a surprising result since product-based offers are common among organizations that operate in countries where technology is well developed and well established. In contrast, states with a lower degree of technical development are more likely to have a greater quantity of startups proposing only services to their customers.

[22] Total sample: 541 startups. Each startup may be counted for more than one value proposition.

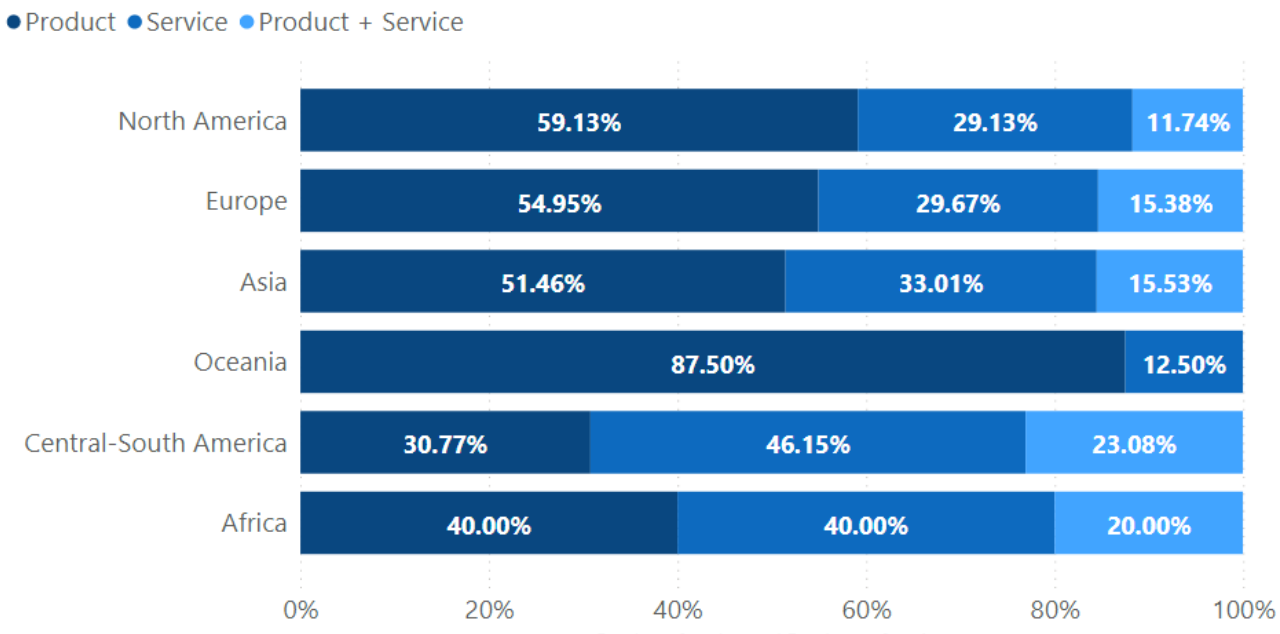


Figure 3.16: Distribution of backed startups according to their value proposition by Geographical area[23].

After concentrating the offer analysis on the geographical area distribution, the investigation continues with more extensive research to comprehend the most popular products offered by financially backed drones startups.

The distribution between startups offering hardware or software is fairly homogeneous, respectively 219 and 209 startups. However, the average funding obtained by organizations offering these two product typologies are acutely different. For instance, organizations marketing softwares were able to attract $ 1.6 M more than businesses offering hardwares. Moreover, the number of startups with a bundled offered constituted of both product typologies is lower than the other two categories. Nevertheless, organizations offering both hardware and software are the ones that draw, on average, the higher funding amount, as shown in Figure 3.18.

[23] Total sample: 541 startups

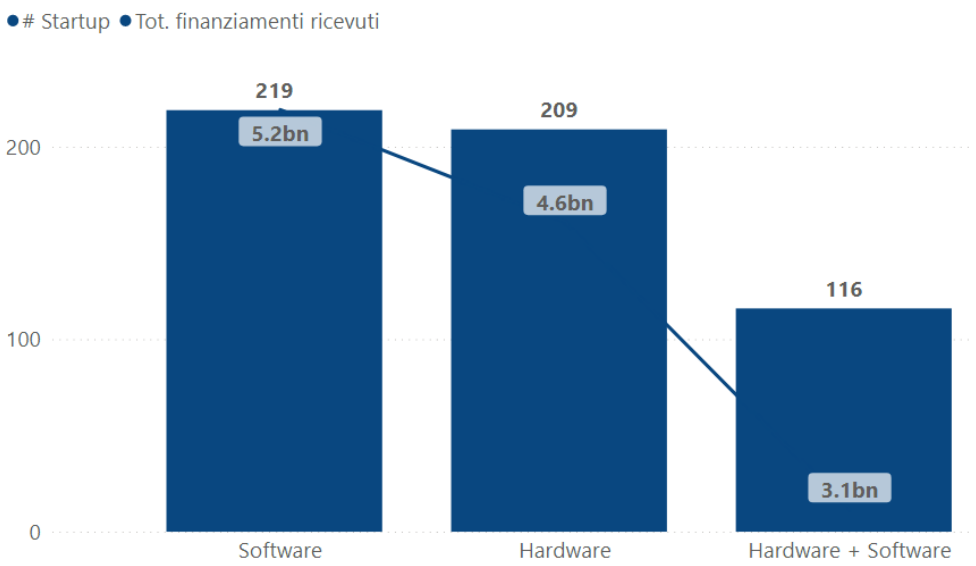


Figure 3.17: Distribution of startups according to Product typology: Hardware, Software or Hardware and Software [24].

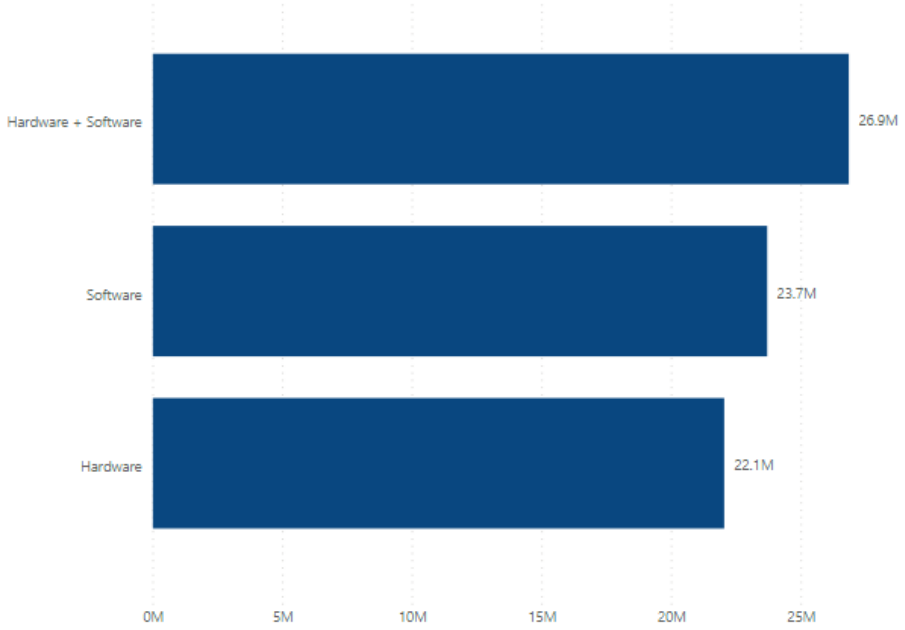


Figure 3.18: Average funding amount per product typology: Hardware, Software or Hardware and Software[25]

[24] Total sample: 544 startups. Each startup may offer more than one product typology.
[25] Total sample: 313 startups. Each startup may offer more than one product typology.

The vast majority of software producers diversifies their offers by supplying multiple typologies of them. The most commercialized software is related to the communication of data and information, mainly ground focused. A similar number of organizations supplies integration softwares whose objective is to create an ecosystem around the product, which follows all the users' needs from ground station management to data processing. Less diffused are products related to Navigation systems, mainly applied in order to deal with onboard necessities. Finally, the least software typology diffused is Digital Modelling, which essentially aims at processing the data gathered through drones to create a model of reality over which further specific analysis can be developed.

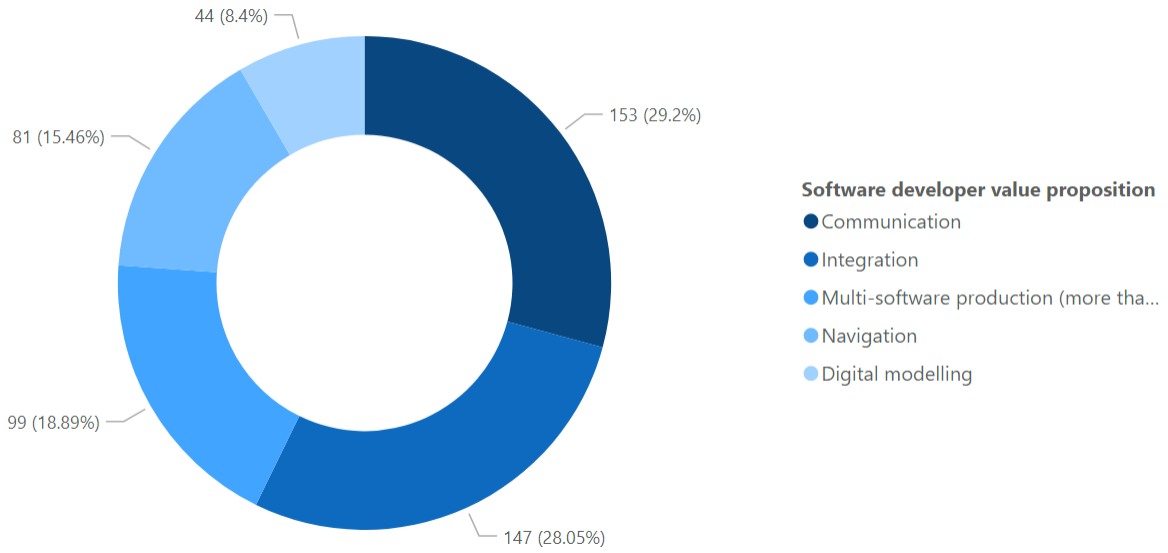


Figure 3.19: Type of software produced by startups of the sample[26]

When considering the quota of funding received for each software type, it is interesting to notice how, although Digital Modelling is not so much diffused, startups specializing in its production are the ones that have collected the highest volume of capital. Moreover, considering the other organizations' funding, they are almost homogeneously distributed, except for companies concentrated in navigation software that received only $ 8 M.

[26] Total sample: 219 startups. Each startup may offer more than one software typology.

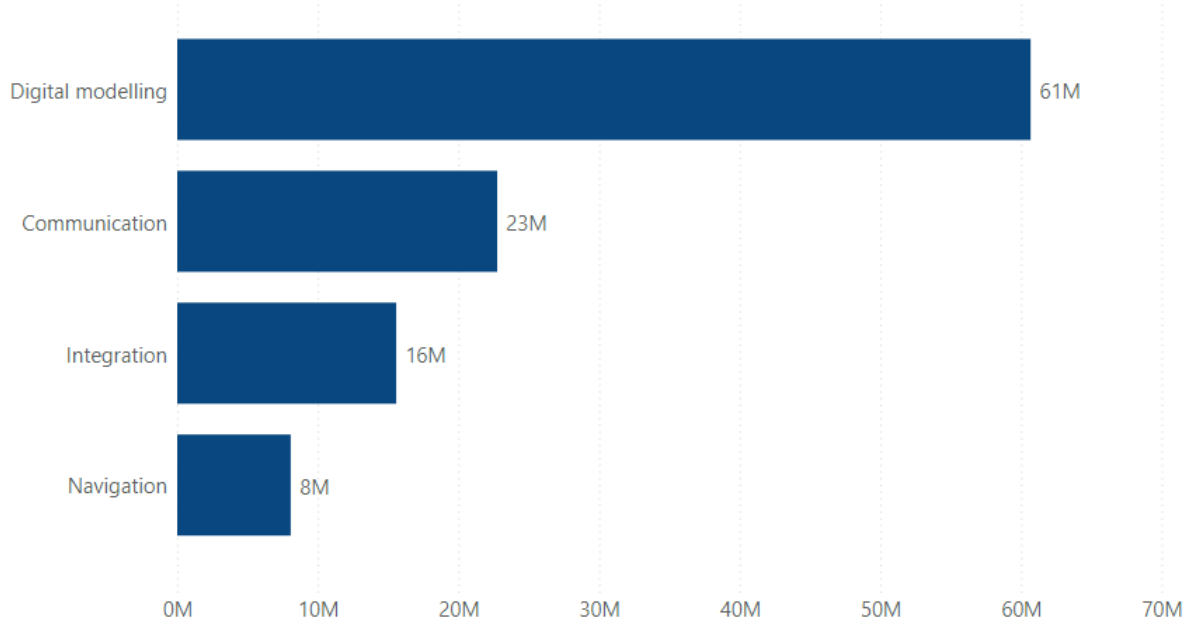


Figure 3.20: Type of software and relative average funding received[27].

The second type of offer made by product-selling organizations is centred on hardware in terms of the offering. In this cluster, a total of 209 startups provide drone platforms, payloads, and components to their customers, who can be businesses or end-users. Moreover, it is essential to emphasize that most startups are focused on drone platforms (254 startups).

The total funding received by hardware-focused startups amounts to approximately $ 4.6 B, with the funds being distributed in a highly disparate manner. There are three major categories. The first class consists solely of companies that provide both platforms and payloads, with a financing amount that is significantly higher than the one of the other categories. Following that, companies specializing in producing payloads, components, and platforms record a quantity of financing totalling between $ 21 M and $ 33 M. At long last, a final block of hardware suppliers received less than $ 10 M and offers complete products, such as a combination of platforms, payloads and components, both payloads and components, as well as platform and components.

[27] Total sample: 219 startups. Each startup may offer more than one software typology.

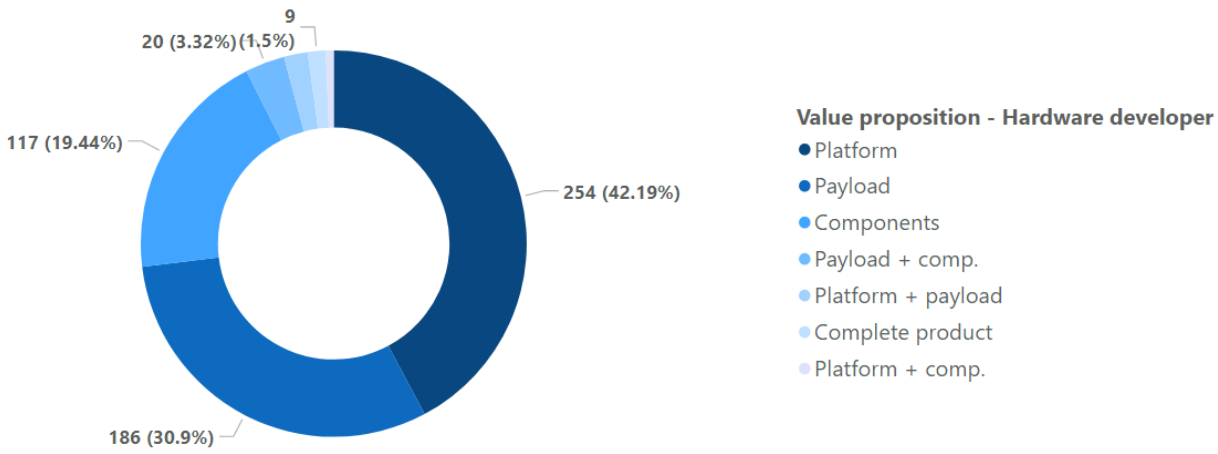


Figure 3.21: Type of drone hardware produced by startups of the sample[28].

Platform developers are primarily concerned with providing rotating wings hardwares. In addition, 60, 44, and 39 startups sell vertical take-off and landing (VTOL), more than one type of platform, or fixed wings drones, respectively. Finally, a very low portion of the organization is specialized in airships.

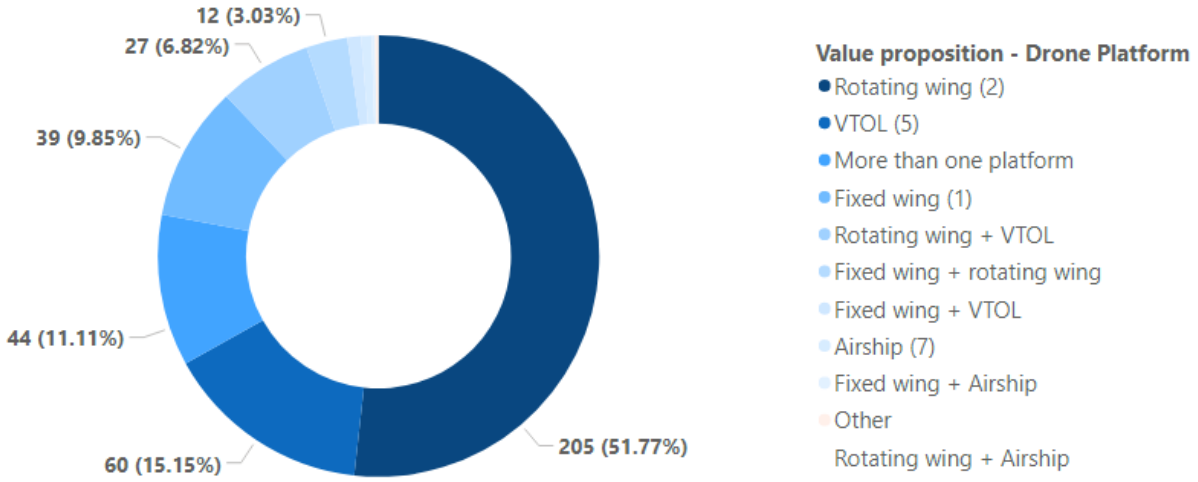


Figure 3.22: Type of drone platform produced by startups of the sample[29]

[28] Total sample: 209 startups. Each startup may offer more than one hardware typology

[29] Total sample: 147 startups. Each startup may offer more than one platform typology

When it comes to payloads, the most widely distributed are the Photo/video camera and sensor, which together account for nearly half of the total payloads supplied (49 per cent of the total approximately). Another point to mention is that many startups in the payload market (21.8 per cent) have chosen to specialize in more than one type of shipment of this drones' part.

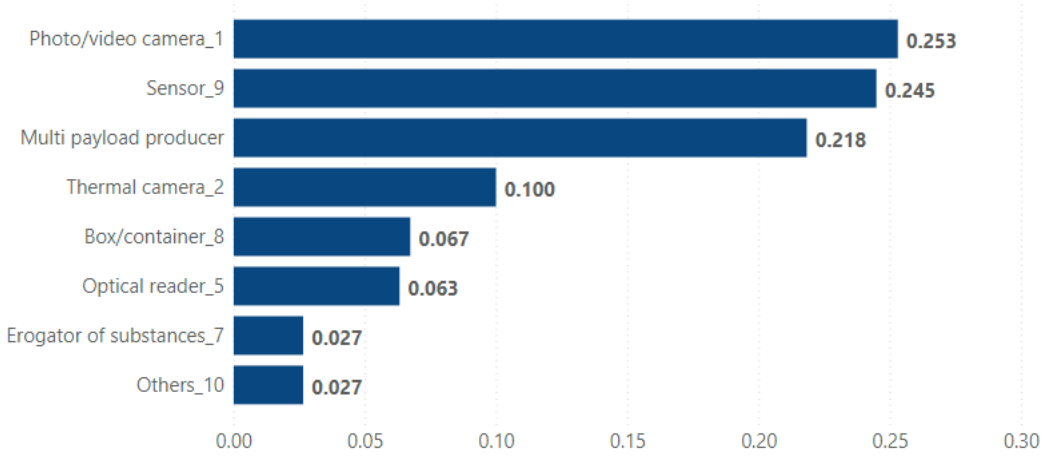


Figure 3.23: Type of drone payloads produced by startups of the sample[30].

The startups offering thermal cameras as payloads were the ones that collected the highest amount of funding on average. This result is quite surprising since thermal cameras are only the fourth type of payload in quantity.

[30] Total sample: 201 startups. Each startup may offer more than one payload typology

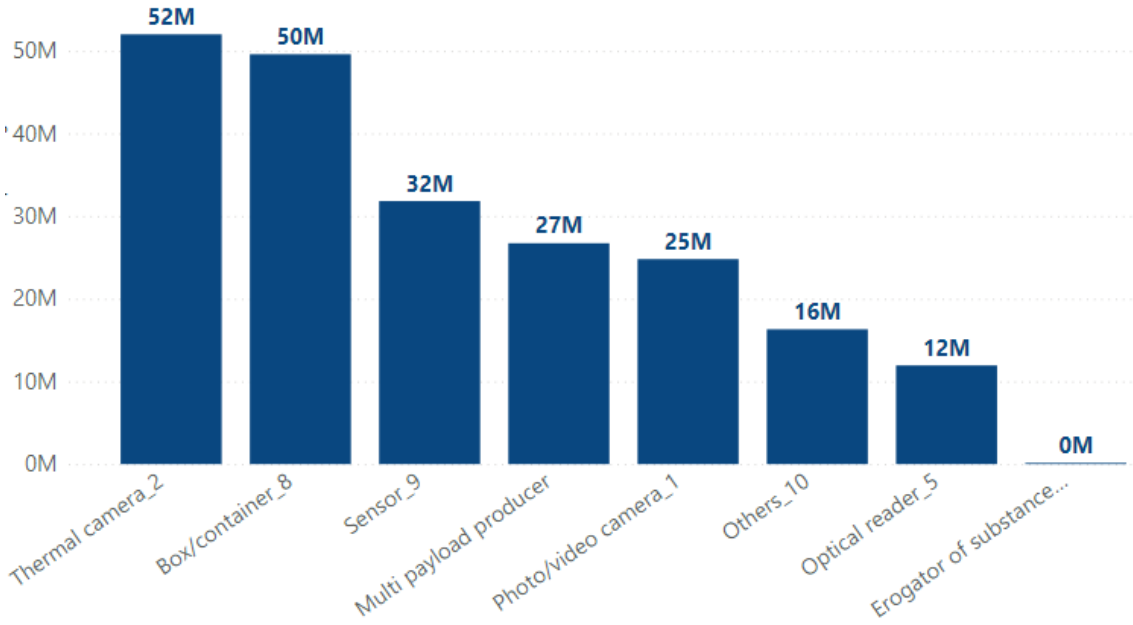


Figure 3.24: Type of payloads offering and relative average funding[31].

Drones are a highly adaptable technology that can be used in a wide range of applications, bringing significant added value to the table while also reducing costs to the end-user in most cases.

Many startups are offering services or products in the field of site inspection, allowing users and customers to inspect infrastructures and buildings and monitor utilities and plants, among other employment typologies. Furthermore, Unmanned Aerial Vehicles (UAVs) are an excellent tool for inspecting the condition of geographical areas after a natural disaster to obtain high-quality information about the damages caused in a brief span of time. Another application of drones in the field of site inspection is the surveying of buildings and infrastructure. Furthermore, UAVs are widely used in agricultural scenarios to obtain up-to-date information about crops and, based on the data collected, to determine the necessary future actions to improve harvest efficiency. Drone technology is also employed in entertainment and media, which is the second most popular application. In particular, UAVs are being utilized to record videos and take flying photographs for the entertainment industry and advertising. They are proving to be a true innovation in the movie industry due to their versatility and lower cost compared to traditional vehicles used to shoot aerial videos.

[31] Total sample: 118 startups. Each startup may offer more than one payload typology.

Moreover, UAVs races attract many enthusiastic spectators who enjoy watching these unmanned aerial vehicles fly above their heads and compete in challenging contests. They have also been used for aerial shows in the recent past. The Tokyo 2020 Olympics[32], in particular, will be remembered for one of its most notable appearances ever. This technology is also deployed in the field of graphic arts in a variety of ways.

Continuing in descending order of the number of companies that have entered a particular product implementation field, the third application is Security and Surveillance. Additionally, drones' versatility in any situation has arisen as critical security, protection, and surveillance tool in today's world. For instance, UAVs are exploited to inspect a specific location during large-scale demonstrations and events that attract great numbers of people. Drones are primarily used by law enforcement, military, and first responders in this field of work. Concerning first responders, in particular, firefighters also use this technology as an instrument to extinguish fires. As a result, the number of human lives potentially put at risk with drones in the team could be reduced.

UAVs can also be accustomed to transporting both goods and people from one location to another. On the one hand, the latter is still in its early stage of development, with only a few companies (22) focusing on transporting individuals from one location to another. Drones, on the other hand, are widely used in the delivery of goods. For example, the startup Apian[33] employs them to quickly deliver healthcare devices to doctors, avoiding time wastes like traffic jams.

Drones are a disruptive technology that can be used for search and rescue operations in areas that would otherwise be inaccessible. However, it is necessary to keep an eye also on the drones themselves to avoid collisions and other troubles. Consequently, developing unmanned traffic management (UTM) and counter-drone solutions to monitor traffic flight and prevent the misuse of UAVs is critical.

Because of the large number of payloads that can be mounted on drones, they can also be used to dispense liquid substances, powders, and granules, among other things. These practices are particularly diffused in the agriculture sector. Ultimately, this technology is also employed for the inventory management of large warehouses.

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[32] https://www.ft.com/content/c42072a5-b820-4e57-8883-fa27b1bb6300

[33] https://www.apian.aero/

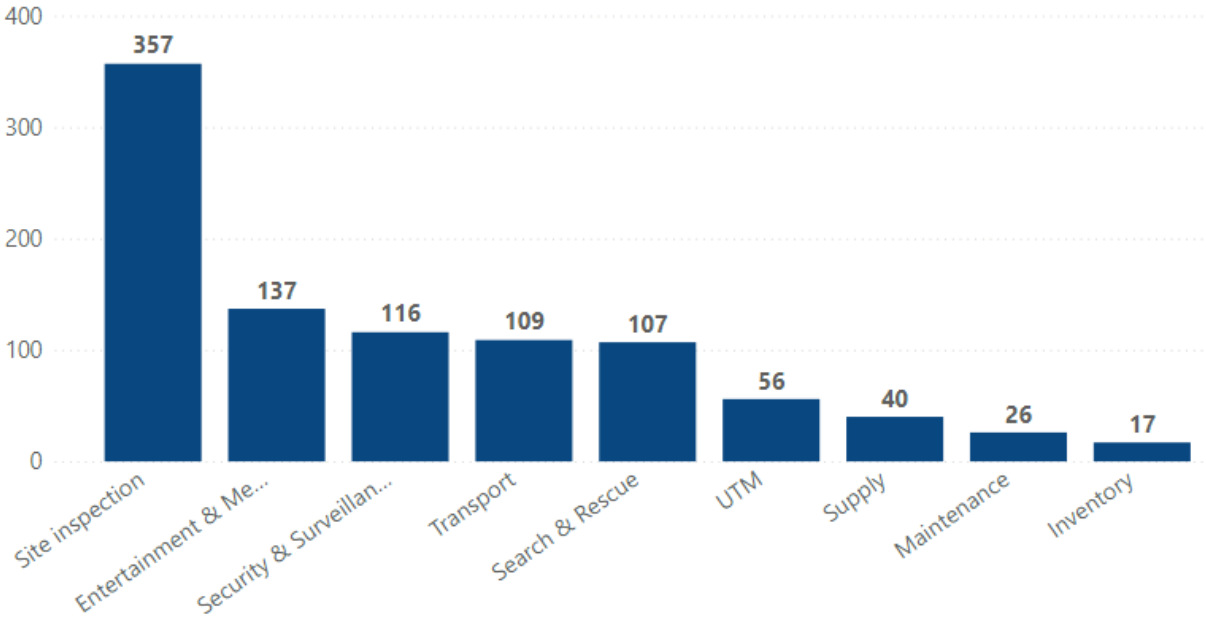

Figure 3.25: Application fields of products and services of startups analyzed[34].

Studying both the application field of the products and services of the startups analyzed, it is appropriate to recognize which organizations received more funding according to their application field.

Firstly, the highest overall value of capital received is related to startups offering services for the Site Inspection scope, amounting to $ 1.68 B. This last conclusion is considerably foreseen due to the high number of organizations operating in this field. Secondly, Security and Surveillance is the second most founded application scope. Thirdly, organizations delivering products or services with applications in Security & Surveillance, UTM, goods and people Transportation raised $ 1.64 B $, 1.25 B, $ 1.23 B, respectively. Also, startups specialising in the Search & Rescue could collect a relevant amount of money ($ 1.22 B). Finally, the remaining startups collected a much lower quantity of funds, accounting for a cumulated total of approximately $ 0.5 B.

[34] Total Sample 755 startups. Each startup may operate in more than one field.

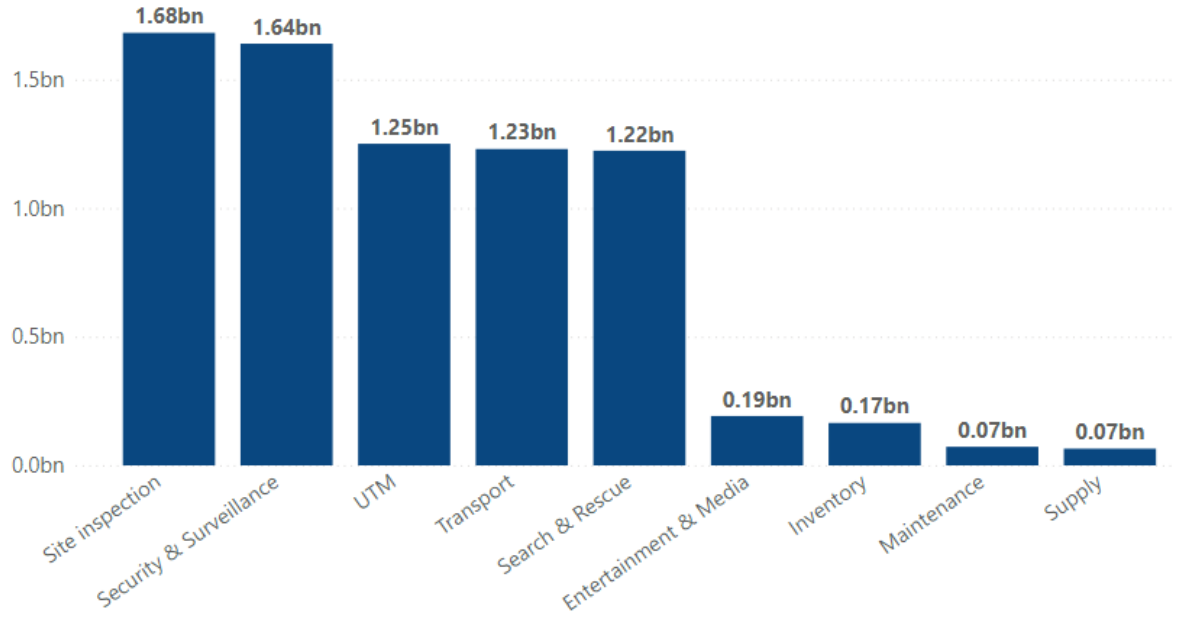

Figure 3.26: Typology of application field and relative total funding[35].

Startups applying their products or services into the Unmanned Aircraft System Traffic Management (UTM) received, on average, the highest amount of funding. In this case, the site inspections assumes only marginal importance differently from what happens when considering the overall financing amount received.

[35] Total sample: 538 startups. Each startup may offer a product or service in more than one application field.

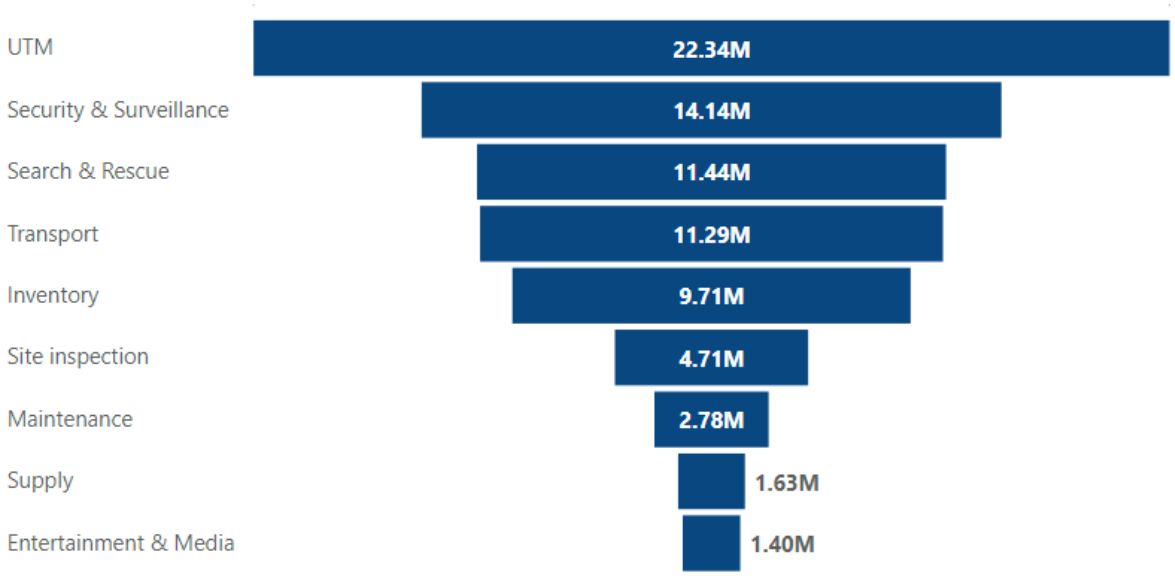

Figure 3.27: Typology of application field and relative average funding[36].

Primary importance is covered by infrastructure and buildings, Utilities, Agriculture, Environment and Logistics & Transports when considering the distribution of drones startups according to the client sector.

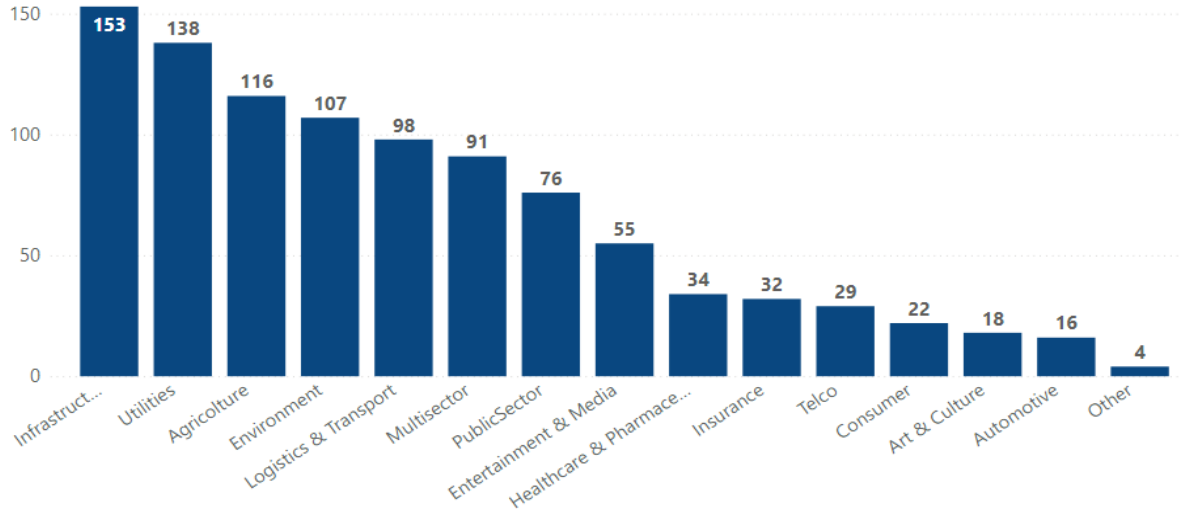

Figure 3.28: Distribution of startups by client sector[37].

[36] Total sample: 538 startups. Each startup may offer a product or service in more than one application field.

[37] Total sample: 755 startups. Each startup may offer a product or service to more than one client sector.

In terms of total funding received, the infrastructure and building client branch is displaced by the Public sector, whose startups have attracted $ 3.0 B alone. On the other hand, Infrastructure and Building, Environment, Logistics & Transport received a quite homogeneous amount of funding. The Utility received $ 2.00 B less if compared to the three latter client sectors mentioned.

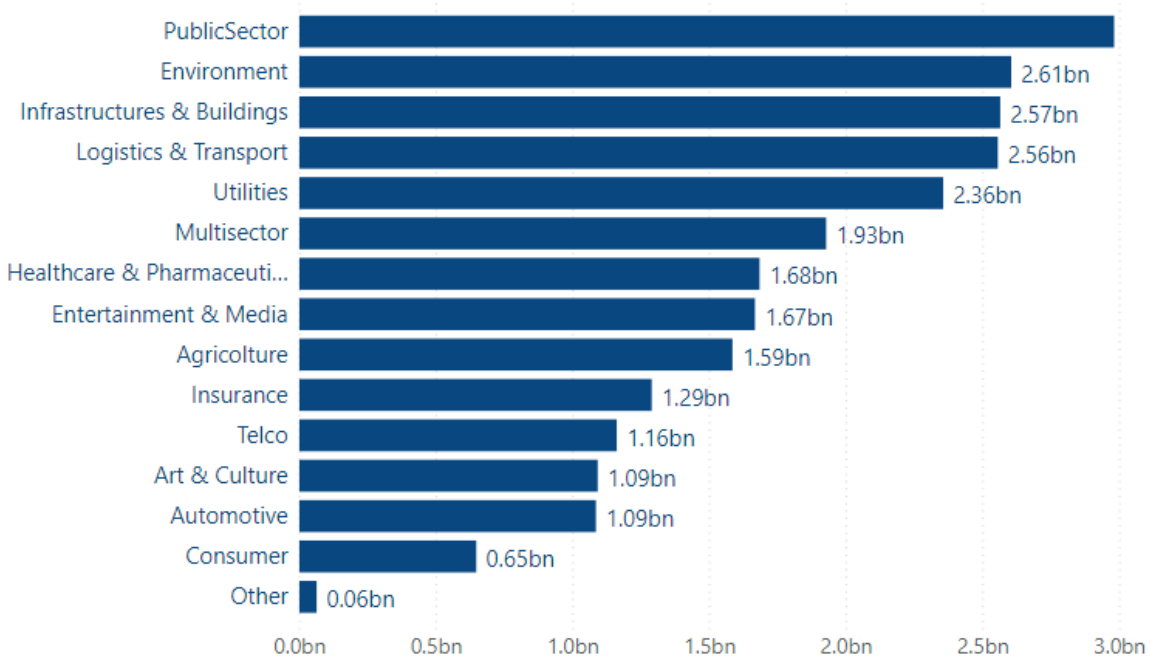

Figure 3.29: Typology of client sector and relative total funding[38].

The relevance of the client sector changes again when considering the average funding received by the startups. In this case, Automotive is the industry where startups collected the highest amount of investments, followed by Arts & Culture and Healthcare & Pharmaceutic.

[38] Total sample: 398 startups. Each startup may offer a product or service in more than one client sector.

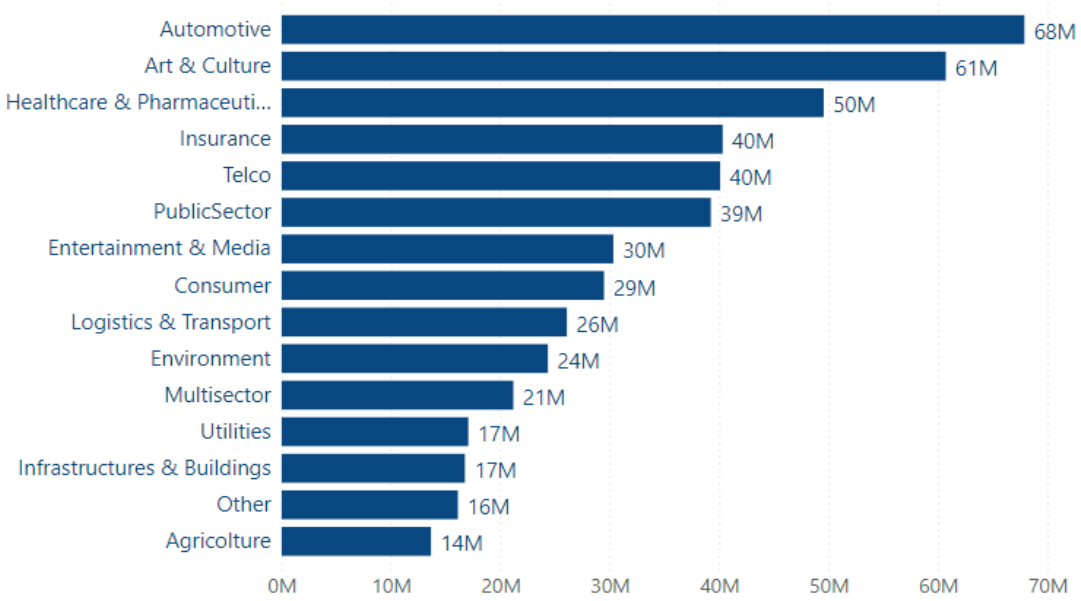

Figure 3.30: Typology of client sector and relative average funding[39].

Finally, it is insightful to analyze how the drone industry performs compared to other innovative technologies such as the Blockchain and Language AI regarding startups' quantity, total and average funding. In particular, the UAV technology is the most-backed one in both average and absolute values. However, the blockchain-based number of startups (860 startups) is 103 elements higher than the drone industry (757 startups). The latter result suggests that the UAV industry seem to be more capital-intensive if compared to Blockchain. Finally, the language AI technology is characterized by consistently lower figures in all the dimensions considered.

[39] Total sample: 398 startups. Each startup may offer a product or service in more than one client sector.

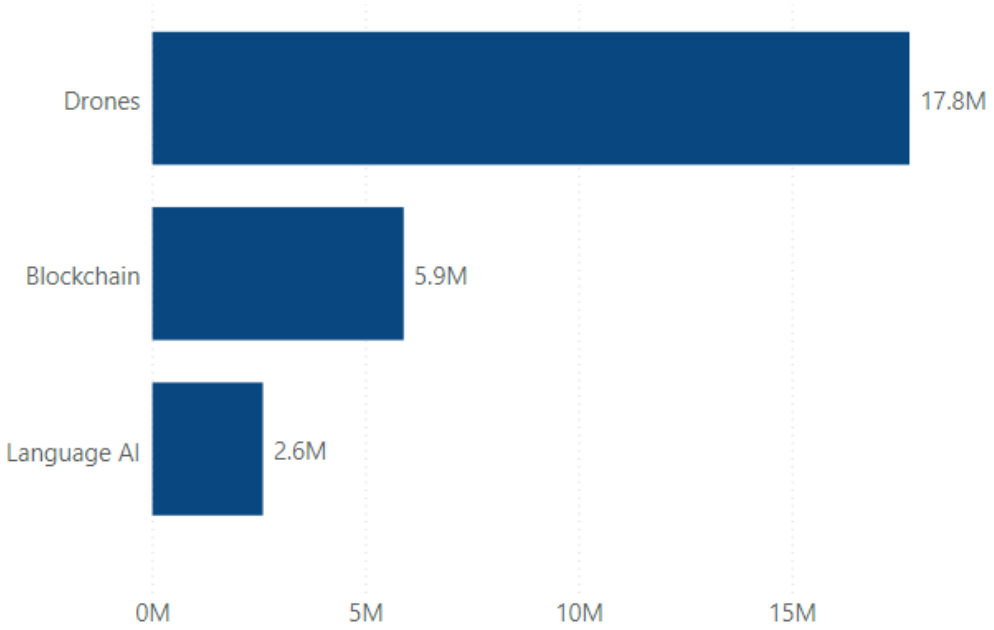

Figure 3.31: Average funding amount for drone[40] startups with respect to other innovative fields[41]

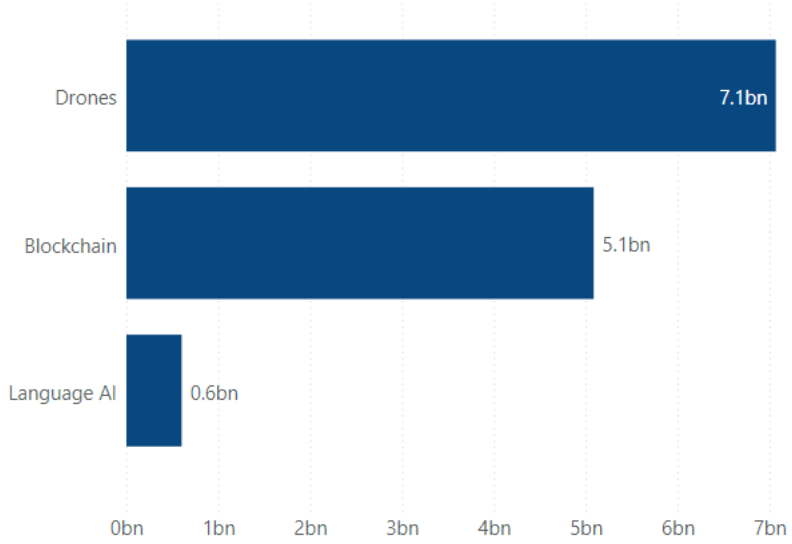

Figure 3.32: Total funding amount for drone startups with respect to other innovative fields[42]

[40] Total sample considered fo: 398 startups
[41] Source: Drone Observatory, Politecnico di Milano, Research Edition 2020-2021.
[42] Source: Drone Observatory, Politecnico di Milano, Research Edition 2020-2021.

3.2 Econometric models results

The research continues with further analysis in order to answer to the last two research questions, namely:

- RQ2) What major factors influence the amount of funding received by a startup in the drone industry?
- RQ3) Are there any specific startups' characteristics that could influence Venture Capital or other investors' types to fund or not a startup in the drone industry?

For what concern RQ2), a regression is carried out to discover which eventually are the startups' characteristics that significantly impact the number of total funding collected. The approach adopted to reach this objective is a regression.

Once significant results from the first analysis are obtained, a further investigation is carried out to understand which new ventures' peculiarities could affect the decision of four investor categories to finance a drone startup. In this case, the technique applied is a multinomial logistic regression.

The chapter is divided into two subsections, one for each econometric model. Then, there is a brief synthesis of the main results discovered.

3.2.1 Econometric model 1: Regression Analysis

This first statistical analysis aims to discover the most significant drone startups' characteristics that impact the total funding amount collected by the organization. In technical terms, the regression is set in the following way:

- Dependent variable: Total funding amount in $
- Independent variables, as described in section 2.1.2:
  - Age;
  - Headquarters' Geographical location;
  - Number of investors attracted;
  - Number of founders;
  - Types of investors attracted;
  - Startups' offer typology;
  - Presence of any additional service;
  - Client sector;
  - Application field.

First of all, an overall assessment of the variables' quality is made. The Total funding amount in $ does not present a symmetric distribution. As a consequence, a logarithmic transformation is used to normalize this variable. The two histograms

below, Figure 3.33 and Figure 3.34 give a fair representation of the variable distribution before and after the normalization process, respectively.

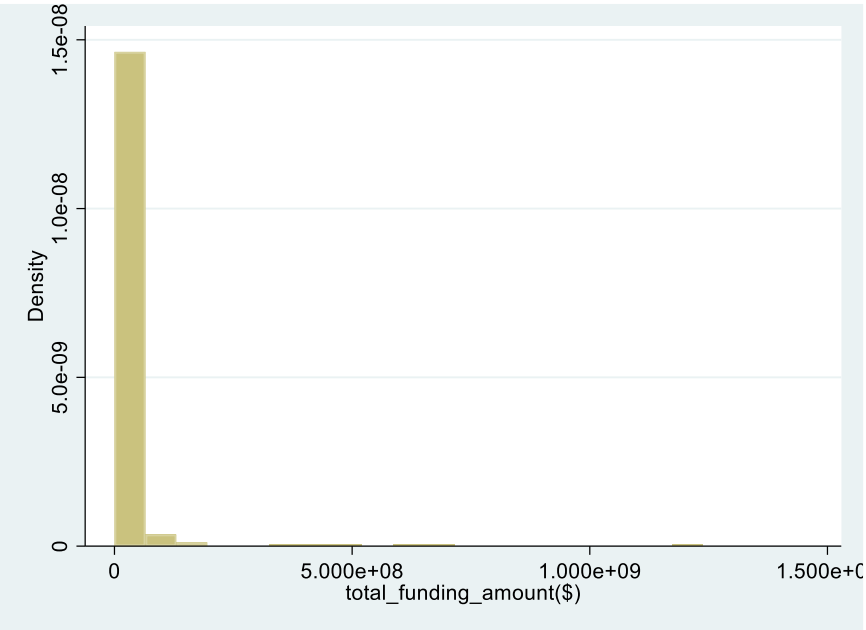

Figure 3.33: Variable representing the Total funding amount in $ before normalization.

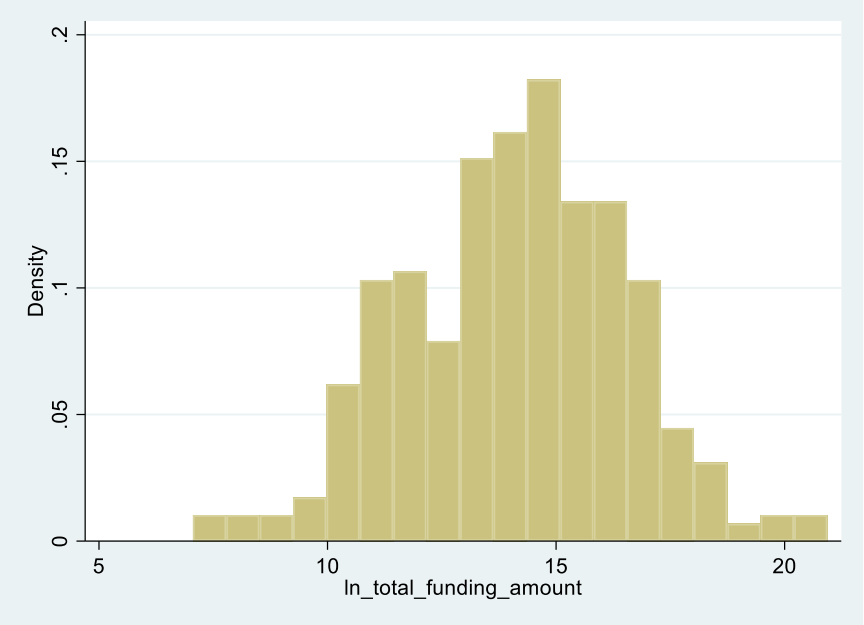

Figure 3.34: Variable representing the Total funding amount in $ after the normalization process.

After this first preparation step, the analysis can be carried out. Table 3.1: Summary table of relevant results of the regression presents the only significant results obtained by performing the regression study.

Explaining Variable	Coefficient	Robust std. err.	P > | t |
Number of investors attracted	0.4590344	0.0613733	0.000
Investor type: Funds and Banks	2.049579	0.9122002	0.026
Investor type: Innovation dedicated programs	-1.000052	0.4822237	0.039
Number of founders	0.1265057	0.0664429	0.058

Table 3.1: Summary table of relevant results of the regression.

The variable representing the number of attracted investors is statistically significant and has a positive coefficient. As a result, a greater number of investors appealed means a greater value of total funding collected by the company under consideration. According to the econometric model, investor types such as funds and banks are positively related to an increase in the amount of money collected by a drone startup. The ultimate consideration is drawn from the coexistence of two output characteristics related to the variable Investor type: Funds & Banks. First of all, it is associated with a p-value well below 0.1. Second, the corresponding coefficient has a positive value. Continuing the analysis, the first and only variable with a negative coefficient that is also statistically significant represents another investor typology: Innovation dedicated programs. As a result, backers such as Accelerator, Incubator, Entrepreneurship Program, University Program, or Co-Working Space could hinder the total funding gathered by a UAVs organization. The final statistically significant result obtained concerns the number of founders. The econometric model's explaining variable, representing the latter dimension, has a positive coefficient and a p-value of 0.058. As a result, it is possible to confirm that startups with more founders tend to receive more external funding when limiting the scope to the drone industry.

The table below provides a final synthesis of the impact of each statistically significant variable on the total funding amount according to the study conducted.

Explaining Variable	Does it impact significantly?	Impact on the total funding amount
Number of investors attracted	Yes	Positive
Investor type: Funds and Banks	Yes	Positive
Investor type: Innovation dedicated programs	Yes	Negative
Number of founders	Yes	Positive

Table 3.2: Summary table of the explaining variables impact.

3.2.2 Econometric model 2: Multinomial Logistic Regression

Once the second research question is answered, the research continues with a deep study to understand some specific startups' characteristics that could influence a particular investor's decisions. So, the dependent variable this time is the investors' typology, and it can assume four different values according to the funder category considered, as described in Table 2.5: Investors' class composition. On the other side, the explaining variables are the following startups' characteristics whose details are described in section 2.1.2:

- Age
- Headquarters' Geographical location;
- Number of founders;
- Presence of any additional service;
- The type of offer, namely products services or a bundle of them;
- Client Sector;
- Application Field;

The results will be shown sorted by investor type, with only those explaining variables that revealed statistical significance being considered.

3.2.2.1 Lead investor type: Venture capital

The statistically significant outcomes for the Venture Capital class are shown in the table below.

Independent Variable	Coefficient	Robust std. err.	**P > | z |**
Additional Services	-1.562249	0.8144002	0.055
Client Sector: Utility	2.247896	1.126312	0.046
Client Sector: Infrastructure and Building	-1.827232	0.8540761	0.032
Client Sector: Insurance	2.32714	1.191623	0.051
Application Field: Maintanance	18.76874	2.653041	0.000
Application Field: Supply	18.55304	2.197736	0.000

Table 3.3: Venture Capital, a summary table highlighting the impact of only statistically significant dependent variables

The variable additional services is statistically significant and has a negative coefficient. As a result of the latter results, a startup that provides additional services such as pilot or fleet provision and training has a lower probability of being backed by VCs than a drone organization that limits its offering to "traditional" products or services. In contrast, a startup specializing in the Utility client sector tends to be more attractive for Venture capital. The last consideration stems from the coefficient with a value greater than zero and the significant p-value associated with the corresponding variable. Pursuing the analysis that client sectors have on Venture Capitals' decision-making process on whether or not to fund drone startups, Infrastructure and Building, and Insurance play a significant role. The statistical results relating to these two client sectors are significant, but the signs of their coefficients differ.

On the one hand, the value associated with Infrastructure and Building is negative, implying that it probably acts as a deterrent for VCs. When considering Venture Capitals as investors, however, a startup offering products or services to clients in the

insurance sector has a positive effect on the overall attractiveness of the organization. The last startup dimension to be considered is the application field. When it comes to Maintenance and Supply, they both have statistical significance, which is complemented by a positive coefficient. As a result, these two application fields positively impact the probability of receiving VC investments for organizations operating in the UAVs industry.

3.2.2.2 Lead investor type: Business Angel

Considering the second lead investors' category, namely the Business Angels, comprising both the Individual and BAs group, the statistically significant startups' characteristics highlighted by the econometric model's output are shown in **Error! R eference source not found.**.

Independent Variable	Coefficient	Robust std. err.	**P > |t|**
Additional Services	1.538224	0.8183177	0.060
Client Sector: Utility	-2.26819	1.126601	0.044
Client Sector: Infrastructure and Building	1.825647	0.857259	0.033
Client Sector: Insurance	-2.327842	1.198	0.052
Application Field: Maintanance	-18.75114	1.545798	0.000
Application Field: Supply	-18.45419	1.466698	0.000

Table 3.4: Business Angel, a summary table highlighting the impact of only statistically significant dependent variables.

In this investor's type case, the additional services play an important role in attracting BAs. This time the contribution is positive, indicating that additional services may increase the startup's attractiveness to receive funds. When it comes to the client sector targeted by drone startups, the only statistically significant one that favours receiving BAs' funding is Infrastructure and Building. Due to their negative coefficients associated with significant p-values, the Insurance and Utility sectors, on the other hand, can harm the final BAs' decision on whether or not to back an

organization operating in the UAVs industry. The analysis is completed by looking into the specific context in which the startup's product and/or service is utilized, i.e. the application field. In terms of this subject, the two statistically significant employment scenarios are Maintenance and Supply. Both have a negative coefficient and statistical significance, implying that they could have a detrimental effect on the presence of individuals or Business Angels in the pool of investors.

3.2.2.3 Lead investor type: Funds and Banks (F&B)

Funds and banks are the third kind of investor to be examined. The table below shows the only statistically significant findings.

Independent Variable	Coefficient	Robust std. err.	P > |t|
Headquarters' Geographical location: Europe	5.837464	2.508387	0.02
Number of founders	-0.82072	0.455717	0.072
Number of Investors	1.442206	0.4095967	0.000
Offer Typology: Service	-21.9219	2.61068	0.000
Additional services	-20.1203	3.434131	0.000
Client Sector: Entertainment & Media	-25.6564	3.730622	0.000
Client Sector: Public Sector	7.117087	2.325962	0.002
Client Sector: Telecommunications	4.89694	2.768442	0.077
Client Sector: Logistics & Transport	2.945931	1.477849	0.046
Client Sector: Art & Culture	69.27315	7.663368	0.000
Client Sector: Automotive	19.3161	2.607985	0.000
Client Sector: Insurance	-13.9013	2.411058	0.000
Client Sector: Other	-39.5203	3.826711	0.000

Application Field: Search & Rescue	-21.4007	2.102642	0.000
Application Field: Inventory	-18.4758	1.844037	0.000
Application Field: Maintenance	8.521482	2.722052	0.002
Application Field: Entertainment & Media	-35.3529	4.641288	0.000

Table 3.5: Funds and banks, a summary table highlighting the impact of only statistically significant dependent variables

From a statistical standpoint, the overall analysis of Funds and Banks yields a rich pool of relevant results.

Starting with the geographical location of the headquarters, this investor type tends to be more drawn to organizations based on European soil. This consideration stems from a significant p-value and a positive coefficient associated with the independent variable corresponding to this startup's trait. A higher number of founders, on the other hand, is probably associated with a lower willingness of Funds and Banks to finance a drone startup. Furthermore, the number of investors could positively impact the attractiveness of UAVs organizations when considering F&Bs. The last is since the output related to the associated explaining variable is statistically significant, and the linked coefficient is greater than zero. Finally, in terms of offer typology, Funds and Banks tend to view startups marketing services or additional services negatively, as evidenced by the negative coefficient and statistical significance associated with the two variables representing these two dimensions in the multinomial logistic analysis' output obtained.

There are several relevant conclusions regarding the client sector. For instance, startups serving clients in the Public, Telecommunications, Logistics & Transport, Art & Culture, or Automotive sectors are more likely to be positively evaluated by Funds and Banks. All of the latter industries in which the startups' clients operate have a positive and statistically significant coefficient. As a result, it is possible to conclude that they all probably positively contribute to the presence of Funds and Banks as investors. On the other hand, Entertainment & Media and Insurance are client sectors that have a negative impact on the involvement of F&B in a drone startup's investor list.

For what regards the application field, from a mathematical standpoint, four results are relevant. They disagree, however, on the impact they have on the presence of this third investor category. On the one hand, providing an offer that could be applied to

the maintenance field increases the likelihood of being backed by Funds and banks, as evidenced by the corresponding positive coefficient associated with the model's respective variable. On the other hand, Search & Rescue, Inventory, and Entertainment media are employment contexts for drone startups' offerings that F&Bs tend not to appreciate because they all have a negative coefficient and statistical relevance in the multinomial logistic regression investigation.

3.2.2.4 Lead investor type: Innovation dedicated Programs

The last investor type analyzed is Innovation Dedicated Programs. The only statistically significant results are shown in Table 3.5.

Independent Variable	Coefficient	Robust std. err.	P > |t|
Headquarters' Geographical location: Europe	0.8765487	0.4165288	0.035
Headquarters' Geographical location: North America	0.7765016	0.3854705	0.044
Age	0.1572606	0.81565	0.054
Number of founders	-0.1444377	0.0861126	0.093
Client Sector: Agriculture	-1.473663	0.4770073	0.002
Client Sector: Healthcare & Pharmaceutical	1.801269	0.6136152	0.003
Application Field: Entertainment and Media	1.09342	0.6584627	0.097

Table 3.6: Innovation dedicated Programs, a summary table highlighting the impact of only statistically significant dependent variables

According to the above output, companies based in the European Union or North America have a positive probability of being supported by Dedicated Innovation programs. Another important factor considered by this investors' category is the age of the startups. It is statistically significant and negative, implying that a shorter organization's lifespan tends to attract entities from this investor group.

In these circumstances, the number of founders is also important. The latter explaining variable is statistically significant and has a negative coefficient. As a result, the higher the number of founders, the lower a startup's attraction level for Dedicated Innovation Programs probably tend to be.

Concerning the client sector, Agriculture is statistically significant and has a negative coefficient, implying that a drone startup targeting customers in this context seems to reduce the attraction level for Dedicated Innovation Programs. The application field in which this investor's typology probably believes the most, as supported by statistical significance and a positive coefficient, is Entertainment and Media. The same reasoning applies when focusing on startups that supply clients in the Healthcare and Pharmaceutical industries, as shown by the positive coefficient and statistical significance related to this independent variable.

4. Discussion of results

The first chapter dedicated to the analysis of the current academic literature set the starting point of this thesis that, thanks to a punctual census of the startups operating in the drones industry and two separate econometric models, has tried to answer the three research questions defined in the third chapter, dedicated to the description of the objectives and methodology of this thesis:

- RQ1) How many startups are currently operating in the drone industry at an international level, and how is their offer structured in relation to the funding received?
- RQ2) Which major factors influence the amount of funding received by a startup in the drone industry?
- RQ3) Are there any specific startups' characteristics that could influence Venture Capital or other investors' types to fund or not a startup in the drone industry?

This chapter is divided into three sections, each addressing the results obtained for every research question. First, it reveals the key findings from the initial quantitative analysis of drone industry characteristics, focusing on how UAVs startups' proposals are structured in relation to the external funding received. Second, the description converges on the key drivers that influence the quantity of capital received by drone startups, according to the linear regression performed on the relationship between the total funding amount obtained and a series of independent variables representing specific startup traits. Finally, the discussion ends with several conclusions on the second econometric model results', highlighting the relevant factors that may influence different investors' typologies to fund or not a new venture whose core business revolves around Unmanned Aerial Vehicles.

4.1 An overview of the drone startups' industry

The structured collection process used to create the startups' database enables the study to be rooted in an exhaustive collection of information about the drone industry. The result, in particular, is a set of figures that fairly represents the global UAVs sector, thanks to the iterative integration of various sources. On the other hand, combining different data sources is difficult due to their disparate approaches to classifying the same companies' details. As a result, a parametrization effort was made to categorize each startup's peculiarity in a univocal manner to construct a detailed data set.

Furthermore, some information not directly present in the data sources was obtained through a broad scouting search, which primarily used the organizations' websites and social profiles.

This laborious process results in a database comprised of several balance sheet data and key information that effectively explains what the startups offer, to whom, and how customers use the drone technology.

In terms of the number of organizations established, the UAVs industry has historically shown an increasing trend. However, when the latter figure is taken into account, the last four years have decreased. There could be a variety of reasons for this shrinkage. The first point to consider is always the time delay that there could be between a new venture foundation and its reporting into the database. As a result, there is a real chance that the number of startups established in the drone industry in the last three years, namely 2019, 2020, and 2021, is higher than the number reported. Second, it is appropriate to mention how the global economy is experiencing unique circumstances resulting from the COVID-19 pandemic, which has disrupted all firms operating in all industries worldwide (Maria Nicola et al., 2021). This one-of-a-kind phenomenon has had a dual impact on the drone industry.

On the one hand, the crisis has harmed the UAV business due to governmental measures against infection like lockdowns that have paused the whole economy. On the other hand, drones have been heavily used during the pandemic due to their flexibility and broad field of application (Skorup et al., 2020). Although the last positive effect, given the returns obtained on the number of drone startups founded during pandemic years, the positive influence appears to have had little impact. Moreover, while 2017 has the most startups founded, 2016 has the most startups founded that could attract external investors.

Focusing on the geographical area, the one which hosts the majority of drone startups is Europe. Nevertheless, only 8% of companies with headquarters in the Old World attracted external investors. It is the inverse of North American organizations, which received a total of $ 5.392 B capable of supporting the 44 per cent of UAVs startups headquartered in the New World. The underlying logic of this phenomenon could be explained by the stagnation that affected the European Venture Capital industry after years of growth, bringing it to a comparable level with its US-based counterparts when considering technology-based firms (Revest et al., 2012).

In light of the national legal form adopted by startups in the drone industry, the vast majority are limited liability companies (LLC). The latter result is quite predictable

given that LLCs require very few regulations and formal documents compared, for instance, to C-corporations. Furthermore, entrepreneurs who form an LLC are not subject to double taxation. As a result, they are exempt from paying taxes on corporate revenues and shareholder dividends, otherwise valued as personal income (Khurana et al., 2020).

Another relevant result comes from the BvD sector analysis. Business Services is the one in which the majority of startups are registered. It is a predictable conclusion given that the majority of startups' target market is primarily B2B. When funding are analyzed according to the BvD sector, the result is consistent with the number of organizations operating, as most supported startups operate in the Business Services BvD sector.

As stated in this thesis, one of the strengths of drone technology is its adaptability, as evidenced by the wide range of possible applications. Among these uses, the one related to site inspections is the most widespread and well-funded. However, when the results of the average funding amount received by each application field are considered, startups offering products and services functional in the UTM scope are the ones that received on average more financial support from investors. The motivations underlying this result could be a synthesis of the growing interest in drones and, as a result, an assessment of potential abuses that could be carried out using technology with such a broad spectrum of applications.

The total amount of funding collected by the overall companies operating in this business demonstrates the growing importance of the drone industry. UAV startups have raised a total of $ 7.1 billion. This result is even more significant when compared to approximately similar innovative technologies, such as Blockchain and Language AI, which collected $ 5.1 B and $ 0.6 B, respectively. Therefore, it is even more insightful to consider the average amount of funding collected by a single organization and get a more realistic assessment of the sector's attractiveness level. Also, in these terms, drones outperform both blockchain and language AI.

Examining the offer typology related to the geographical area of the headquarters yields another significant result. It appears that more mature markets like the US are populated by players who sell products rather than provide services solely. This result is reflected in the funds received, as the product-specialized organization belonging to more mature markets received the largest funding. A possible explanation is that creating a tangible product could probably send investors a robust positive quality signal. Deepening the analysis of product supplier organizations, most businesses specialize in software or hardware in nearly equal proportions, while a minor portion

of startups' business focuses on a combination of both product typologies. The latter product portfolio mentioned is related to the organizations that received, on average, the highest quantity of funding. Finally, investigating the results related to funding of software providers, most financial support is related to startups offering digital modelling programs that are extensively used in the inspection field, which, as also stated before, is the most popular application field for drone technology.

4.2 Major factors influencing the amount of funding received by a startup in the drone industry

Following a thorough examination of the main aspects of the drone industry, the analysis moves on to a new investigation. The primary focus is on the total funding amount, particularly the characteristics of the startups that may have a significant impact on this aspect. All available data was used to answer this question most thoroughly and comprehensively possible. According to the statistical findings, the total amount of funds collected by drone startups is dependent on the number of initial founders. It has been demonstrated, in particular, that the greater the number of founders, the greater the likelihood of receiving funding. However, having multiple founders is not the only important factor influencing a drone startup's total funding amount. The number of investors appears to have a relevant positive impact as well. This last conclusion is more than reasonable since each investor is expected to contribute more than zero dollars. As a result, it logically follows that a greater number of external backers has a beneficial effect on the total financial support gained. This final result could attest to the accuracy of the analysis. All the other variables considered in the econometric model used to produce the above results did not present a statistical significance. Consequently, nothing could be concluded on the impact that an organization's age, headquarters' location, offer typology, client sector, and application field could have on the total funding amount collected by a startup operating in the drone industry.

4.3 Startups' characteristics that could influence Venture Capital or other investors to fund or not a startup in the drone industry

Investigating the specific startups' characteristics that could make it more or less appealing to different potential investors has brought several important results. First, thanks to the set of a multinomial logistic regression, it has been possible to discover

how some organizations' peculiarities apparently meaningless become essential in the investors' choosing process. To run the analysis, four main investors' categories were identified: Venture Capital, Business Angels, Funds and Banks, and Innovation Dedicated Programs.

Starting from the first investor mentioned, it is demonstrated how serving clients in specific sectors could probably be a double-edged sword for pushing Venture Capital to invest in a drone organization. In particular, serving clients in the Infrastructure and Building sector seems to affect the probability of being backed by a VC negatively. At the same time, offering drone products or services to customers operating in the Utility or Insurance sectors seems to positively impact the chances to convince a VC to put his money into a UAVs company. As well as some of the client sectors, two of the products' or services' application fields are probably assessed by venture capitals. Both the Maintenance and Supply application field resulted in having statistical significance and positive impact by VCs.

On the other hand, the presence of additional services like the fleet or pilot provision reported significant results, but with a negative relationship, meaning that it probably lowers the chances of being backed by a Venture Capital. The presence of additional services reported opposite results for the second investors' category considered, i.e. the Business Angels. BAs consider additional services a plus for drone startups and consequently seem to be keen to invest in organisations that also offer such extra services. Another key factor on which BAs and VCs have an opposite opinion is the startups' client sector Infrastructure and Building, since the econometric model reports a probable positive effect on their investment. Also, the Utility and Insurance sector presents significant importance for BAs but with a negative impact. Concerning the application field, both Maintenance and Supply do not probably attract this typology of investor.

From a statistical standpoint, for what concerns Funds and Banks (F&B), the econometric model presented many significant conclusions, implying that multiple factors examined probably influence F&B's decision-making process regarding whether or not to fund a startup in the drone industry. In particular, Funds and Banks appear to consider the location of organizations' headquarters significantly, the number of founders and other investors, the offer typology and several application fields and client sectors. The econometric study estimates that the client sector with the greatest positive impact is Art & culture. Furthermore, providing goods or services to clients in the Public, Telecommunications, Logistics & Transport, and Automotive sectors could perhaps increase a drone startup's chances of receiving funding from Funds and Banks. The presence of startup clients operating in the Entertainment and

Media, and Insurance sectors, on the other hand, is likely to be significant and has a plausible negative impact on receiving investments by Funds and banks. Concerning the demographics of the startups, F&Bs tend to support new ventures based in Europe that have already received funding from other investors. Funds and banks may view the latter as a trustworthy indicator of the startup's good quality as other economic entities have already decided to stake their money on its success.

On the contrary, a higher number of founders and the presence of only services in the startup's offer may negatively affect the existence of Funds and Banks in the pool of investors of a drone startup. A possible reasoning for the last result could be that marketing only services could be interpreted as a lack of technological maturity. So, it could be comprehensible that F&Bs tend to not back startups offering only services. Furthermore, in the case of Funds and Banks, additional services are likely to reduce the plausibility of startups receiving funding. Finally, when it comes to application fields, F&Bs positively consider products whose primary use is maintenance while negatively evaluating those used in inventory or entertainment and media contexts.

The final investor class examined is Dedicated Innovation Programs, including Accelerators, Incubators, Entrepreneurship Programs, University Programs, and Co-Working Spaces. According to the econometric model's verdicts, this investor group prefers to push startups in Europe or North America. Furthermore, statistical findings show that Dedicated Innovation Programs tend to invest in the oldest startups in the drone industry with relatively few investors. Moreover, the significant result related to the organizations' client sector involves Healthcare and Pharmaceuticals, being positively associated with a financing of this investors' typology and the agricultural industry that seem to have the opposite influence. Finally, the only relevant application field is Entertainment and Media, which appears to increase the startup's attractiveness when considering Innovation Dedicated programs.

In conclusion, as expected, many characteristics are evaluated by investors during the decision-making process to select startups to finance. Furthermore, when considering different types of investors, the same factors can play opposing functions. For instance, BAs deemed relevant and positive additional services while VCs, Funds, and Banks view them negatively. Besides, providing products or services to clients in the insurance sector plays a dual role in attracting startups to investors. On the one hand, VCs consider it a positive factor, but it takes on a negative connotation when it comes to BAs, and Funds and Banks. On the other hand, several peculiarities are both significant and have the same effect direction for multiple investor typologies. Startups headquartered in Europe with fewer founders, for example, appear to be more appealing to both Innovation dedicated programs and Funds and Banks.

5. Conclusions and future development

5.1 Contribution to the academic literature

This thesis starts with a deep analysis of the current literature review on startups, funding and investors in general and specific terms, considering the industry-specificity of this research. Thanks to the examination of the existing scientific literature production, it was possible to individuate, perimeter and define the knowledge gaps related to the aforementioned principal arguments. The result obtained is that the relative youth of the drone industry is also reflected in the scientific paper's production dedicated to this emerging technology. As a result, there is still a shortage of consistent literature when zooming into the UAVs sector. This scarcity is even enhanced when considering the topic of drone startups' funding.

Before the development of this thesis, there was not an updated census of the organizations operating in the drone industry in the last ten years. So, it was impracticable to conduct studies on the characteristics of this fascinating technology creating valuable insights. Therefore, the first thing to do to answer the first research question was an articulated data collection process that set the very base of further research. Once an integrated dataset of businesses belonging to the drone industry was obtained, the first quantitative analysis was run.

The key finding of this initial part of the investigation is the importance that drones cover in the economic context, considering the amount of funding that UAVs startups could collect in the last ten years, totalling $ 7.067 B. Moreover, drone technology is bringing to society a huge contribution thanks to its multiple fields of application. For instance, the most popular employment context for drones is site inspections, which is also the most founded, with $ 1.68 B collected by startups offering products or services related to this employment context. Another relevant characteristic is the high concentrations of funds in the drone industry, witnessed by a few startups owing approximately 30% of the industry's funding. Moreover, North America is the geographical area with the highest portion of founded startups (44 % of the total), which collected an overall amount of $ 5.3 B.

After the industry analysis, two statistical models are set, and the same number of analyses is run to provide exhausting answers to the following questions. The second inquiry investigates the major factors that affect the amount of funding collected by drone startups. Thanks to regression analysis, it is possible to affirm that the most relevant agents that impact the financial support received by ventures in the drone industry are the number of founders and the typology of investors attracted since different kinds of investors have different impacts on the financial support's entity.

The third research question, which mainly focuses on four investors' categories, namely Venture Capitals, Business Angels, Funds and Banks, and Innovation Dedicated Programs, is answered thanks to a multinomial logistic regression. The results of the analysis are multiples. The first insightful outcome is appreciable looking at the output with a comprehensive perspective. The same startups' characteristics could play a dual and opposite role in the decision-making process of different typologies of investors on whether or not backing a drone startup. For instance, when considering the startups' offering range, additional services, namely fleet and pilot provision or training, could positively impact the founding reception by BAs but seem to generate the reverse effect for VCs and Funds and Banks. To be more specific, the relevant peculiarities that Venture Capital are likely to assess before founding a drone startup are, besides the existence of additional services, the client sector, specifically Utility, Infrastructure and Buildings, and Insurance. Moreover, VCs tend to positively evaluate the ventures drone products or services applicable in the field of Maintenance and supply.

5.2 Limitations and further research directions

To our knowledge, this study represents one of the first researches to focus on the performance of drone startups in collecting funding from external investors, considering a deep analysis of the organizations' demographic, offering, and financing characteristics for an extended time interval (10 years).

However, research is a complex path toward the discovery of novel scientific knowledge. So, it is normal that it presents some limitations.

Firstly, it is essential to highlight that the startups' definition is still a broader concept, and along with this research, some assumptions on this notion had to be made. As a consequence, changing these basic conjectures impacts the final results: different assumptions mean different conclusions.

The second limitation regards the lack of a unique categorization code for startups operating in the drone industry. There is not still a NACE or ATECO code that univocally defines the organizations working in this emerging field. So, it is not

completely excludable that some startups could be missing in the drone industry census.

Thirdly, it is relevant to highlight how the starting data extracted from Crunchbase, Orbis, Registro delle imprese Italiane and AIDA could present a bottleneck for this thesis for several reasons. First of all, the drone industry is very fast, while the data update across the considered databases is mainly performed periodically. Consequently, there could be a delay in the information recording on themes like new organizations, investments, or acquisitions. An effort to reduce this construction error was made by integrating independent sources. Moreover, many pieces of data were missing in the data sources considered, especially figures belonging to the liabilities side of the balance sheet for many startups.

Given the above reflections, there is space for the development of further research. First of all, it could be insightful to keep track of the industry updates to provide a punctual timeline of the drone industry development and have an overall view of the impact of this emerging technology on society. Secondly, this thesis can be used as a base for further comparative research related to other emerging technologies to have a complete picture of the most promising emerging industries at the moment.

It would also be interesting to go deeper into the consequences that each investors' type has on the startups, not only in terms of total funding provided but also for what concerns the managerial and operational activities carried out by the backed organizations. Such a study could be essential to fully understand the impacts that different external investors could have on drones' organizations and provide reliable advice to founders to enhance the probability of success of their organization.

Last but not least, continuing to study the drone industry is fundamental to fully understand the characteristics of this fascinating technology and exploiting its countless potentialities at most.

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