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Exploring the impact of open innovation on companies' financial performances: a focus on the Italian market

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Abstract

This thesis analyses the impact of Open Innovation on the financial performances of Italian listed companies, focusing on how Open Innovation Practices influence a series of key financial metrics. In the complex dynamics of modern business, where innovation's pace accelerates continuously, properly understanding the financial implications of Open Innovation results to be fundamental for businesses, especially in a market like the Italian one. The research has been developed through a quantitative analysis, which highlights the relationship between Open Innovation, measured through a specific Open Innovation Index, and financial performances, by looking specifically at metrics like the Return on Asset. The study draws data from Italian listed companies, providing a unique insight into the effectiveness of Open Innovation in a specific geographical context, underlining both the positive and negative aspects of implementing Open Innovation Practices. The findings help in the theoretical understanding of Open Innovation, also providing suggestions that highlight the significant potential benefits for companies' performances.

List of Abbreviations:

BS: Balance Sheet

CAGR: Compound Annual Growth Rate

IP: Intellectual Property

IS: Income Statement

NACE: Nomenclature statistique des Activités économiques dans la Communauté Européenne

OI: Open Innovation

OII: Open Innovation Index

OLS: Ordinary Least Squares)

OIP: Open Innovation Practices

R&D: Research & Development

RIO: Risks in Open Innovation

ROA: Return on Asset

SME: Small & Medium Enterprise

VIF: Variance Inflation Factor

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1. Introduction

Since Chesbrough's (2003) introduction of the concept of Open Innovation (OI), the topic has been broadly analyzed under several perspectives (Greco et al., 2016). OI can be defined as a "*distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model*" (Chesbrough & Bogers, 2014, p. 12). This definition highlights the relevance of knowledge management and shows exactly what OI is about: the obtaining of knowledge, ideas, know-how and perspective across companies' organizational boundaries.

In today's fast paced environment, companies are continuously seeking new and innovative strategies to effectively gain a competitive edge, ensuring a long-term sustainable growth. Among these strategies, OI has rapidly emerged as an effective approach, completely reshaping the traditional paradigms of innovation management (Zhang et al., 2023; Barrett et al., 2021).

Overall, Open Innovation Practices (OIP) have been linked with both the obtaining of a competitive advantage and the improvement under a financial perspective (Caputo et al., 2016; Parida et al., 2012; Chiang & Hung, 2010). Therefore, numerous companies have implemented OIPs to boost their business' horizons, dealing with an increased number of potentially helpful stakeholders and reshaping their boundaries and perspectives.

In order to understand all the different facets and details of the phenomenon of OI, it has been relevant to evaluate companies' performances among specific geographical boundaries. The work focuses on the Italian market, providing an analysis of the listed companies of the Country.

Based on this premise, the work aims to deepen the understanding of the impact of OI on companies' financial performances, taking into account companies' different indicators both under an OI and financial performances point of view.

Overall, this thesis contains five different sections. Firstly, a complete and coherent theoretical background has been built. Through an analysis of the literature, it has been possible to develop the hypothesis and the methodology section through which the way through which the measurement of the relationship between OI and financial performances is explained. The findings and the discussion provide an evaluation of how OI has impact on financial performances, measuring both variables and developing a proper analysis to do it. Finally, through the conclusions, an overall summary of the work has been developed. By doing this, it has been possible to enrich the current literature about the topic, developing a theoretical framework that highlights the specific challenges and opportunities associated with implementing OI in the Italian context.

1.1 Research gap

Although there has been a lot of study on the relationship between OI and financial performances (Kovacs et al., 2015; Lu & Chesbrough, 2022) in the academic literature, much of it has used different theoretical frameworks and lenses to effectively examine the relationship. Several research works have tried to look into the relationship between OI approaches and overall companies' performances, looking at different aspects like organizational structure (Lee et al., 2016), innovation strategies and collaboration patterns (Battistella & Nonino, 2012).

These relevant sources have provided a comprehensive understanding of the complexity of the described phenomenon, as well as insightful information about the methods through which OI can affect financial performances.

This master's thesis attempts to fill a significant research gap that exists in spite of the volume of the previously published material. In fact, despite earlier research has created relevant insights into the connection between OI and financial performance, the studies have been conducted only on some specific sectors: service (Vincenzi & da Cunha, 2021), pharmaceutical (Michelino et al., 2015), banking (Tornjanski et al., 2016), biopharmaceutical (Fu et al., 2019; Caputo et al., 2016).

The aim of this Master's thesis is to understand, based on the literature analysed, the impact on firm's performances of the processes of OI. In a country like Italy, full of Small & Medium Enterprises (SME), the impact of OI has not been analysed yet (Da Roit & Iannuzzi, 2023). In fact, despite the growing interest in OI as a strategy to enhance competitiveness, the existing literature has focused mostly on the development of analysis based on other countries like the United States. Moreover, the impact of OI on financial performances may vary across different sectors due to variations in the structure of the industry and market dynamics. Italy, for example, creates a totally different environment when developing a firm compared to the United States and this can have a major impact on the structure of the companies.

Culturally speaking, Italy is particularly recognized for its business environment, mostly characterized by SMEs. The prominence of SMEs within Italy's business environment is not coincidental, but it's rooted in historical, cultural, and economic factors (De Chiara & Minguzzi, 2002; Battaglia et al., 2014). The country is characterized by the dominance of traditional sectors such as manufacturing, textiles, and fashion, due also to the tradition of craftsmanship and artisanal production. The focus on these typologies of sectors has been accompanied by a tradition of small, family-owned businesses.

Nonetheless, the prevalence of SMEs could have major implications on innovation practices and collaboration patterns of both listed and non-listed companies. SMEs, in fact, are agile, flexible, responsive to market dynamics and usually lack of R&D sources, together with difficulties in terms of time allocation and funding (Wynarczyk, 2013). These factors can directly influence listed companies' approaches to innovation and partnerships. The historical and cultural emphasis on craftsmanship and family-owned businesses creates a collaborative atmosphere where listed companies can often engage with SMEs to obtain specialized skills and localized knowledge. These cultural factors influence the environment in which listed companies operate, making the Italian business landscape unique under several perspectives.

The research of a missing framework, together with the lack of research in the field of OI in the Italian market have represented the key drivers of choice of the topic.

Consequently, this research aims to address these gaps by conducting a quantitative analysis of the impact of OI on financial performances in the Italian market.

1.1.1 Research question

In this dynamic and evolving environment, the relationship between OI and financial performances becomes an intriguing area of study to which extended analysis could be provided. Despite an abundance of research has been done on the theoretical underpinnings of OI, there is still inconsistent and fragmented empirical evidence about its actual effects on financial performances in the Italian market.

In this context, understanding the relationship between OI and financial performances is crucial. This paper aims to put a spotlight on this intricate relationship, providing insights into the mechanisms driving organizational success. In order to do so, the following research question has been developed:

RQ1: How does open innovation impact financial performances in Italian listed companies?

The rationale behind this research question stems from the continuous understanding that, in today's globalized society, OI can represent a crucial source of competitive advantage (Lee & Yoo, 2019; Martinez, 2014). It is more important, now than ever, for companies to find ways to deal with more intense competition and disruptive technological forces (Liu et al., 2020).

1.2 Intended thesis' audience

Overall, this study is meant to serve a broad variety of stakeholders who are directly involved or influenced by the dynamics of innovation management. This thesis will benefit business leaders and managers since the insights about how OI influences financial performances could be crucial in the implementation of innovation practices. Moreover, this work will provide interesting insights for both academic scholars and students in the field of business and innovation management, enriching the academic discourse over innovation strategies. Finally, consultants who operate in the field of innovation would obtain innovative perspectives about the topic by reading this thesis.

By doing this, this thesis could create the basis for developing potentially impacting advices in terms of growth and sustainability. Overall, this master's thesis aims to empower these audiences with new knowledge and relevant insight on the previously developed one.

2. Literature Review

To be able to answer the research question, a literature review has been conducted and has been divided into four different areas. A well-detailed and precise analysis has been necessary in order to offer a proper background about the topics examined. For this reason, the papers chosen underline several key concepts, which results to be helpful in understanding different facets of both OI and company's financial performances, providing an effective overview of the topics covered.

The data for this study have been obtained via the *Gothenburg University* library's and the *LUISS Guido Carli* university library's databases and by the utilization of different search tools. Precisely, the literature review data collection has happened by utilizing the databases Scopus, Google Scholar, Science Direct and Web of Science. These specific databases have been selected on the basis of the concept of relevance and reliability. In order to obtain relevant data, the literature search has been conducted utilizing the following key-words: *open innovation, financial performances, impact of OI on financial performances, limits of open innovation, evolution of open innovation, open innovation and organizational performances, impact of open innovation on organizational performances, open innovation models, different types of open innovation, competitive advantage and financial performances, competitive advantage, quantitative research, ROA as proxy of financial performances.*

In order to identify pertinent concepts and patterns for this literature review, an extensive thematic analysis methodology has been employed. This methodical approach has entailed a deep dive into the vast range of scholarly articles available, leading to the discovery of subjects and common themes that appear in a significant percentage of these academic papers. Through this process, the primary objective has been to understand and recognize fundamental elements, which have been essential for the central research framework.

The thematic analysis provided is not just about the accumulation of information. It also requires a methodical process made of investigation, classification and interpretation. We can think at every article as a component of a puzzle, and the overall analysis as assembling the puzzle pieces to reveal a bigger picture. This process involves looking past the obvious and peering into the underlying layers within the literature. A meaningful literature review is much more than just identifying papers. Hart (1998) defined the literature review as “*the use of ideas in the literature to justify the particular approach to the topic, the selection of methods, and the demonstration that this research contribute to something new*”. (Hart, 1998, p.1)

The process of identifying these key elements has put particular emphasis on examining various components within the articles. This includes a thorough examination of abstracts, methodologies, and conclusions. Moreover, where considered pertinent, a more in-depth exploration of the empirical findings has been conducted, to gain a comprehensive understanding of the principles expressed.

Among the vast number of themes and topics that have emerged from this analysis, one of the predominant focuses has been on the concept of OI and its impact on financial performances, across diverse sectors. This theme runs through all of the chosen works and provides a solid foundation for the analysis and interpretation that follow. This analysis attempts to offer a comprehensive and effective understanding of the topic by exploring the complex debates around OI and its effects on financial measures.

2.1 The evolution of the concept of open innovation

In its book, Chesbrough (2003) introduces the concept of OI, defining it as a paradigm shift in how companies approach innovation. Chesbrough (2003) describes this approach as a way to deal, with a different logic, with sources and uses of ideas. OI means that “*valuable ideas can come from inside or outside of the company as well*” (Chesbrough, 2003, p. 9). The author underlines how OI involves actively seeking and incorporating external sources of knowledge, ideas and technologies in a corporate’s innovation process. This could include also collaborating with external partners, such as suppliers, customers, institutions, universities and even competitors to gain access to complementary expertise and resources (Chesbrough, 2003; Elmquist et al., 2009). The

author provides a comprehensive definition of OI, which have been broadly applied in a vast series of other works, emphasizing the importance of using properly external sources of knowledge and collaborating with external partners to drive innovation (Chesbrough, 2003; West & Bogers, 2017; Huizingh, 2011).

Moreover, Chesbrough (2003) underlines how the previous model to approach innovation, named *Closed Innovation Model*, states that companies must generate and develop ideas by their own, focusing mostly on their internal processes. The limits highlighted in this approach are related to the creation of a so-called virtuous circle, through which companies that spent more on R&D had more possibility to develop effectively helpful ideas, creating new products and new features and increasing sales and profits. This would have translated into increased investments in R&D, that would have made the process start again (Chesbrough, 2003; Enkel et al, 2009; Schumacher et al., 2018).

In fact, according to Chesbrough (2003), there are different erosion factors that have led to a decrease, in terms of efficiency, of the *Closed Innovation Model*. The first factor that has led to the evolving lack of efficiency of the *Closed Innovation Model* is the continuous *increase in the availability and mobility of skilled workers*. This factor has created the necessity to look for potentially helpful elements also outside of the companies' boarders. The *evolution of the venture capital market* is the second factor analyzed by Chesbrough (2003). According to the author, in fact, the venture capital market has rapidly changed and evolved, providing useful alternatives for companies. The third factor is represented by the potential solutions for ideas that have not been used by companies. In fact, having external relationship can increase the possibility to find external options for ideas and solutions which are currently sitting on the shelf, making them potentially helpful. Finally, external suppliers capability represents a relevant factor that has led to the worsening, in terms of efficiency, of the *Closed Innovation Model*. (Chesbrough, 2003)

Based on what has been firstly developed by Chesbrough (2003), the *Closed Innovation Model* have then been analyzed by several studies (Herzog, 2009; Marques, 2014; Aas

& Jørgensen, 2016) which have underlined the limiting factors of it. Chesbrough (2003) introduces the concept of OI Model by underlining the fact that ideas around company's environment are often available to be used, and often people who created them are available to be hired. According to Chesbrough (2003), in fact, with the diffusion of knowledge and ideas, the role of research in companies changes drastically, with researchers that try to develop not only their ideas, but also seek to find interesting perspectives in other segments that, through the use of the *Closed Innovation Model*, would have remained unexplored (Chesbrough, 2003).

Furthermore, Bigliardi et al. (2021) underline how, since the 2003 publication of Chesbrough, the concept of OI has gained increasing attention over time. However, the basis of this concept can be found in antecedent publications compared to Chesbrough's one. Since the 1970s, in fact, scholar like Freeman (1974) and Allen (1984) underlined that relevant sources of innovative ideas could derive from outside of the firm.

Bigliardi et al. (2021) agree on the fact that, since the introduction of the concept by Chesbrough (2003), the definition of the concept itself has evolved. In fact, the most recent definition has been provided by Chesbrough & Bogers (2014) as an evolution of the original one: "*We define open innovation as a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model*" (Chesbrough and Bogers, 2014, p. 17) (Bigliardi et al., 2021).

Moreover, according to Bigliardi et al. (2021), OI, regardless of the definition, is based on the concept that underlines how, in such a fast-paced environment like the one in which firms operate today, today's organizations have to cooperate with stakeholders over a continuous knowledge sharing process across their boundaries to acquire resources and ideas from the external environment (Galati, 2015; Galati & Bigliardi, 2017) (Bigliardi et al., 2021). Finally, Bigliardi et al. (2021) underline how OI has become one of the most researched topics in innovation management over the years. According to Bigliardi et al. (2021), this is demonstrated not only by the rapidly increasing number of conferences, special issues and books on the topic, but also by the

broad variety of perspectives under which the theme has been analyzed and deepened. (Bigliardi et al., 2021)

2.2 Different typologies of open innovation

Vanhaverbeke & Chesbrough (2014) underline how there are several typologies of OI approaches. These approaches can differ on a series of variables, which make the OI environment particularly complex. However, understanding properly the variety of different OI approaches results to be crucial for organizations seeking to maximize the value of the external inputs received. (Vanhaverbeke & Chesbrough, 2014)

Rodríguez-Ferradas et al. (2016), highlight how the lack of comprehensive and unified list of typologies of OI practices in the literature has negative consequences to the development of the understanding of the OI model under two perspectives. On one hand, it obstructs the comparison of findings by different researchers. On the other, it makes very complex for managers select the right approach according to the needs and resources of the company.

In order to solve these issues, Rodríguez-Ferradas et al. (2016) have developed a theoretical framework to classify different OI practices. The framework takes after an analysis provided by Gassman & Enkel (2004), which describes the three core processes for OI practices:

- *Outside-in process*. It is characterized by the enrichment of company's own knowledge through the integration of suppliers, customers and external resources.
- *Inside-out process*. It is characterized by earning profits by bringing ideas to the market.
- *Coupled process*. It is characterized by the simultaneous implementation of the two previously mentioned practices. (Gassman & Enkel, 2004)

Furthermore, Rodríguez-Ferradas et al. (2016) have introduced the variable of the practice typology, distinguishing five different typologies (IPS) according to the stage of the innovation process. The five IPS are listed as following:

IPS 1: Opportunity identification. First stage of the innovation process, the company identifies opportunity gaps in the market.

IPS 2: Idea generation. Creative stage of the innovation process, new ideas are generated.

IPS 3: Concept and product development. Transformation of ideas into workable concepts.

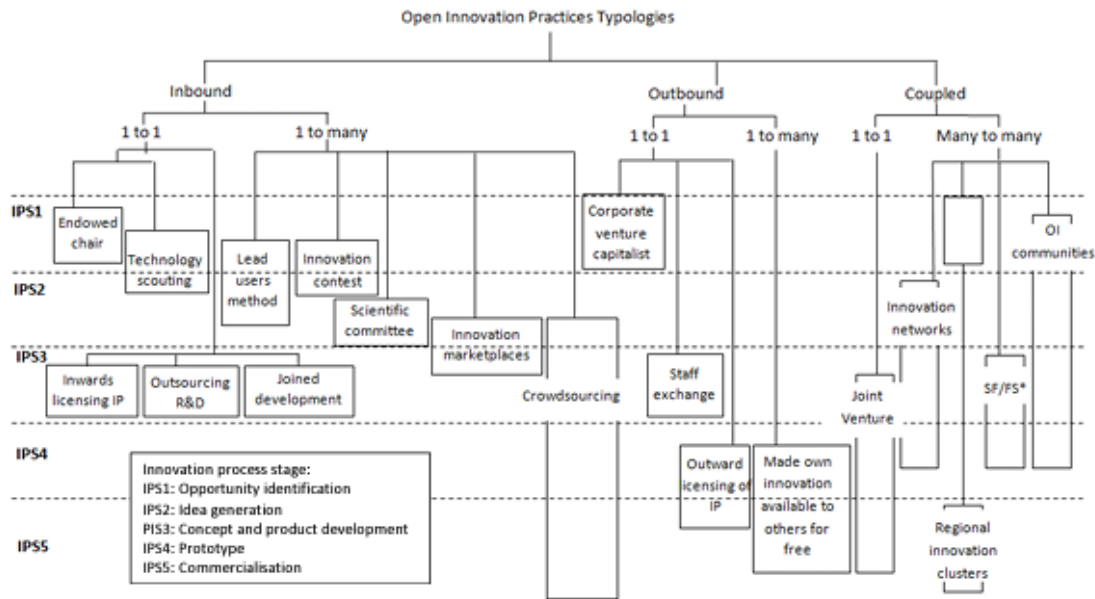
IPS 4: Prototype. Further development of the workable concepts through the use of prototyping.

IPS 5: Commercialization. Activities that engage outside partners to bring technologies to market.

Finally, Rodríguez-Ferradas et al. (2016) introduced another dimension named “type of relationship, which can take three different values. The first one refer to the *one-to-one* type of relationship. In this specific case, a company needs to involve only one partner for implementing properly the OI. The second type of relationship is described as *one-to-many*. According to this specific typology, a company should involve more than one partner for the implementation of the OI. Finally, the third kind of relationship is referred to as *many-to-many*. In this specific situation, the relationship established refers to a series of partners. Specifically, a set of different partners cooperate with each other in win-win conditions, in order to successfully implement the OI. (Rodríguez-Ferradas et al., 2016)

Given these different classifications, the framework developed by Rodríguez-Ferradas et al. (2016) appears as showed in *Figure 1*. The framework distinguishes 19 different OIP according to the variables previously mentioned.

Figure I: Framework including all the different typologies of Open Innovation



Source: Rodríguez-Ferradas et al. (2016)

2.3 Open innovation & Financial Performances

According to Zhang et al. (2023), OI, over time, has been analyzed under several perspectives. The authors underline how different studies have tried to understand the impact of such approach on different fields. Examples are represented by the impact of OI on organizational culture (Naqshbandi et al., 2015) or on business models (Hung & Chiang, 2010). Zhang et al. (2023) highlight how, another relevant field of study that interests OI is related to the investigation of its impact on firm's financial performances. However, the authors underline how if, on one hand, there are several studies that stress how the Open Innovation Model has a positive influence on a firm's performance, whereas some authors contend that OI could cause potential diminishing marginal returns or even negative effects on a firm's performance, as showed in the case of Duysters & Lokshin (2011) (Zhang et al., 2023).

Zhang et al. (2023) have evaluated the impact of OI on the development of a competitive advantage. The authors, by choosing a sample of high-tech firms with annual revenues <10 million dollars, underline how the use of an OI approach can have significant positive direct and indirect effects to sustainable competitive advantage. In fact, Zhang et al. (2023) stress that the existence of significative indirect effects on

competitive advantage can be caused by mediating mechanism. The authors, together with Lichtenthaler (2011), underline how managers should be open to the external environment in order to acquire resources and knowledge for innovation, as companies developing OIPs are more likely to better compete in a rapidly evolving market. (Zhang et al., 2023)

Vincenzi & da Cunha (2021) highlight how the development of innovation activities can have a major impact on company's financial performances. This is related to the fact that these kind of investments usually have financial returns obtainable in the medium or long term and, therefore, are not always successful.

The authors have defined different degrees of intensity in terms of innovation, according to the capability to go outside companies' boundaries. The three degrees of innovation, which represent one of the theoretical output of their work, appear as follows: totally outside the company through the acquisition of patents or through R&D, totally inside the company establishing a sector responsible for innovation activities or in an hybrid way developing research inside the company and, simultaneously, interacting with the market and establishing relationships with other agents. Moreover, Vincenzi & da Cunha (2021) state that the justification of larger investments in internal innovation activities has become more complex, due mainly to the high costs of development in innovation and diminishing product life cycle. In this evolving scenario, according to the authors, OI can represent a solution, making possible the use of external resources in the development of new projects and allowing the company to profit from the commercialization of new ideas. (Stal et al., 2014) (Vincenzi & da Cunha, 2021)

Given this background, Vincenzi & da Cunha (2021) develop an analysis about the impact of OI on the financial performances of companies in the service industry, understanding how the different degrees of innovation, which have been previously mentioned, can create an influence on a series of different companies. According to the authors, in fact, when innovating companies must determine the intensity of its innovative effort and the amount of resources used to develop it.

The analysis provided by Vincenzi & da Cunha (2021) shows how operating in an international market and being part of a corporate group leads to superior financial performance. Moreover, the intensity of OI, in the analysis, is positively related to the performances of organizations in the service sector. This has, in fact, been translated into the fact that companies with stronger OI orientation, in the service industry, present better financial performances in terms of net sales per employee, developing a substantial competitive advantage. (Vincenzi & da Cunha, 2021)

Caputo et al. (2016) explore the relationship between the openness of firms and their innovation and financial performances. There has been a growing propensity towards openness, with companies relying more and more on outside information and, at the same time, becoming more active in licensing-out and selling to the external market internally-developed technology (Spithoven et al., 2013).

According to Caputo et al. (2016), OI has become a fundamental part of companies' business model, creating a growing interest about the relationship between openness and financial performances (Schroll & Mild, 2012). However, due to the complexity of OI, it is still not easy to investigate its effects on financial performances (Ahn et al., 2015).

Caputo et al. (2016) have focused on a sample made of the 110 worldwide top Research & Development (R&D) spending bio-pharmaceuticals companies. The results of the work proposed by the authors are slightly different compared to other studies such as Chiang & Hung (2010), Ebersberger et al. (2012) and Parida et al. (2012), which underlined how OI leads only to positive effects in terms of company's performances. Caputo et al. (2016) underline how, in terms of innovation performances, R&D productivity and revenues to patents ratio, which are two of the measure used to analyze the variable openness, are negatively affected by OI, decreasing over time, whilst patent growth is not influenced by the implementation of it. On the other hand, financial performances do not follow a linear perspective. In fact, sales growth shows a positive

trend with openness. Operating profit and turnover, on the contrary, decrease with the adoption of OI.

2.3.1 The impact of competitive advantage on financial performances

The previous studies analyzed underline how OI can have a substantial impact on financial performances. Numerous authors have highlighted how this impact can have a significant influence on companies' strategic and financial situations, leading also to the creation of competitive advantage.

Porter (1985) introduces the concept of competitive advantage, explicating how it represents the value that a company brings to its customers that exceed the cost of creating it. Competitive advantage signifies one of the pivotal factors for a long-term successful company, and for this reason, companies live a continuous evolving journey, through which developing their abilities to enhance their competitive advantage (Porter, 1985). On the other hand, Hay & Williamson (1991) underlined how competitive advantage represents the assessment of the companies' capabilities and market position, with relation to the advantage it achieves in relation to competitors (Hay & Williamson, 1991).

Furthermore, according to Le & Dang (2018), competitive advantage is the possession of specific values, which allow companies to effectively capture business opportunities to gain profit. Le & Dang (2018) underline how competitive advantage stays in the value that the firm can create for buyers, which is directly related to the willingness that customer pays for goods or services. Having a higher competitive advantage can have an impact on financial performances, due to the change that the customer's willingness to pay faces. (Le & Dang, 2018)

This perspective is enriched by Mukerjee (2016), who underlines how corporate level strategies, diversification decisions and strategic renewals need to be managed correctly in order to develop competitive advantage among companies. The author highlights how several factors result to be pivotal in the development of a stable and long-lasting competitive advantage. One of these factors is represented by strategy, which results to

be a game-changer in companies' overall performances and is a perfect explanatory variable of why some firms obtain sustainable competitive advantage over other firms (Barnett & Burgelman, 1996). On the other hand, another relevant factor is represented by forecasting, that helps firms in anticipating and responding to environmental changes ensuring competitiveness (Goll et al., 2007). Ownership, moreover, is fundamental. Firms need, in fact, to be the best possible owner for the business, satisfying its necessities and being compatible with the critical success factors (Krueger et al., 2012). Nevertheless, strategic decisions concerning the values chain can impact the development of a competitive advantage (Hansen & Birkinshaw, 2007). In the end, Mukerjee (2016) states that, in order to gain and effectively sustain a competitive advantage, firms need to focus on the factors previously listed. In this way, companies can survive in an always more competitive market. (Mukerjee, 2016)

In order to understand the effective implications related to the development of a competitive advantage, Zahid et al. (2021) provide an analysis through which is possible to understand the relevance of it as a driver to increase financial performances. According to Zahid et al. (2021), corporate social responsibility represents one of the key drivers to develop a substantial competitive advantage. Companies, by exploiting this typology of advantage, can attract new clients and, at the same time, gratify the existing ones (Saeidi et al., 2015; Guarnieri & Kao, 2008; Arnold, 2017; Cante & Zardini, 2018).

Focusing on a sample of manufacturing companies, Zahid et al. (2021) underline how corporate social responsibility has a substantial positive effect on the financial performances. These finding results to be coherent with several prior studies (Al-Shuaibi, 2016; Branco & Rodrigues, 2006; Karyawati et al., 2020). Moreover, according to Zahid et al. (2021), corporate social responsibility has a direct positive effect also on competitive advantage. Zahid et al. (2021) finally underline how competitive advantage and financial performances are related positively. (Zahid et al., 2021)

Furthermore, Majeed (2011) underline the effect of competitive advantage on financial performances. Moreover, several studies (Morgan et al., 2004; Wang & Lo, 2003; Raduan et al., 2009; Nguyen & Hoan, 2021) support the *association between the*

competitive advantage and firm performances in a positive way (Majeed, 2011 p. 5). According to Majeed (2011), the literature has underlined how competitive advantage can have a direct, major impact on the development of companies' financial performances. (Majeed, 2011)

2.4 Limiting factors of open innovation

According to Audretsch & Belitski (2023), despite there being several studies about the different implementation of the concept of OI, there is still a lack of research about the limits of OI across different contexts. The authors underline how unfortunate this gap is, also due to the arguments provided by several authors about the necessities to study the limits of OI under different perspectives like the risk management (Hervas-Oliver et al., 2021), the organizational (Vnhaverbeke et al., 2017) and the technology (Noh & Lee, 2020) one.

Audretsch & Belitski (2023) provide a perspective about the use of OI approach and its limits regarding the collaboration with external partners located across four different dimensions (regionally, nationally, Europe and world) and across different firms in the most innovative UK sectors (high-tech, manufacturing and others). The authors highlight how the geographical factors analyzed do not have a major impact on the return deriving from OI. Companies which use OI across the four different geographical dimensions analyzed all perform in a similar way, making geographic dimension a non-influencing variable. Limits to knowledge collaboration do not increase with the change of the geographical markets where the collaboration happens. According to Audretsch & Belitski (2023), the development of new, digital technologies and the evolution of informal mechanism of knowledge appropriation have permitted to successfully apply the OI model across different geographical locations (Bogers et al., 2018). (Audretsch & Belitski, 2023)

Su et al. (2022) analysed all the potential limiting factors of the implementation of OI, creating a framework divided in three main categories: *organizational*, *operational* and *individual* factors. The *organizational factors* are mostly related to the limitations, in the open innovation model, concerning the definition and communication of exact goals

and objectives to stakeholders (Faridian & Neubaum, 2021; Albats et al., 2023, Bertello et al., 2022), the difficulties in securing and allocating resources needed for open innovation operations (Urbinati et al., 2020, Torres et al., 2022, Beck et al., 2022) and the limits in the designing and establishment of OI design and structure (Gentile-Lüdecke, 2020; Cenamor & Frishammar, 2021; Cavallo et al., 2021). On the other hand, operational factors are linked with possible limitations in coordinating OI activities and interactions between internal and external actors (Germonprez, 2020; Marullo et al., 2021), with the constraints in time management and in the development of technological capabilities to manage the processes (Nguyen et al., 2021; Abhari et al., 2022) and the restrictions that companies face in the OI integrating process (Daniel et al., 2020). Finally, the individual factors are linked with the issues that could arise in keeping individual actors motivated and engaged in the OI environment (Hofstetter et al., 2021; Fischer et al., 2021) and the limitations in recruiting qualified individuals with proper skills (Cheah et al., 2021).

Su et al. (2022) underline how these factors, even when faced by companies with solid foundations, may lead to a failure in the innovation process. According to the authors, these factors need to be considered when approaching OI. Moreover, the use of technologies, together with the continuous engagement of the external actors and the quality of the OI community from which to get ideas and insights, is pivotal for the success of the OI processes. (Su et al., 2022)

2.4.1 The risks of Open innovation

Madanaguli et al. (2023) states that OI, despite the creation of numerous potential upsides, can expose firms to significant risks. These risks can arise both during and after the innovation process. The authors underline how engaging, in OI, means that firms boundaries can become more penetrable. The direct consequence is represented by the fact that the locus of control of the knowledge can rapidly shift outside of the firm, causing a potential loss of both the knowledge and the competitive advantage deriving from it (Rosell et al., 2017). Moreover, Madanaguli et al. (2023) underline that, due to the fact that OI highly depends on outside conditions, the approach could also lead to a

loss of control of the overall innovation process, making the firm which is using it unable to deliver the innovation at the right time.

Madanaguli et al. (2023) underline how numerous studies have highlighted the fact that risks deriving from OI can emerge at different stages of the innovation process. According to the authors, one critical step is represented by the ideation phase of the innovation. At this fundamental stage, firms often find themselves in the situation of dealing with the task of not only generating innovative ideas, but also identifying the wide range of participants who possess the necessary knowledge to see these ideas through to execution. According to the authors, the complications that can arise during the ideation phase are diverse. Companies could, in fact, face challenges in identifying the potentially helpful stakeholders among a vast number of potential contributors. Moreover, this initial issue can be further intensified by the evolving nature of the stakeholders ecosystem, wherein new actors emerge continuously, making the existing one go under changes in their knowledge capacities. The consequence of this environment is that firms need to be able to move in an environment characterized by uncertainty and fluidity, where an optimal, well-defined configuration of stakeholders capable to contribute to the innovation phase is very difficult to find. Madanaguli et al. (2023), moreover, underline how the risk inherent in the ideation phase goes beyond the mere identification of the stakeholders. Firms have, in fact, to deal with the ambiguity and the utility related the knowledge possessed by stakeholders. Further complications could arise also by the different natures of expertise distributed among multiple actors. Firms could face substantial difficulties in understanding which particular knowledge are pertinent to stakeholders' ideas. A wrong evaluation and use of this knowledge could not only lead to to a waste in terms of ideas, but also put the overall innovation development at risk. (Madanaguli et al., 2023).

Madanaguli et al. (2023) identify another relevant risk in the amount of information that can be obtained during the collection of data. In such a rich of stimuli environment, the amount of potentially usable and exploitable ideas is vast. The potentially improper control and protection policies, in the governing phase of the massive amount of data collected from the contributors, could have a major impact on the realization of the

innovation, making the attention towards this phase pivotal in the development of the process.

According to Madanaguli et al. (2023), there are other several risks to consider when using OI. In their analysis, the authors have classified the risks in five different types, developing the Risk in Open Innovation (RIO) framework. According to the authors, all risks are interdependent and can have an impact on each other or even co-exist simultaneously. The five different risk categories are the following: *Data-related risks*, *People-related risks*, *Firm-level risks* and *Outcome risks*.

The *data-related risks* are deviations from the ways in which data are meant to be collected, received or appropriated. These risks can reduce trust and willingness to contribute to the open innovation process, potentially diminishing the brand image. The risks identified under this category are the following: *data privacy risks*, *data distortion risks*. (Madanaguli et al., 2023)

The *people-related risks* result from the interactions arising in the open innovation process and occur when employees refuse to adopt the external knowledge due to the fact that it was not invented or shared directly inside the company. The risks identified under this category are the following: *contributor motivation-related uncertainties*, *coordination risks*. (Madanaguli et al., 2023)

The *firm-level risks* occur due to a potential lack of skills, resource and managerial capabilities within the firm, that leads to an improper management of the knowledge obtained. The risks identified under this category are the following: *lack of adequate firm resources and skills*, *lack of adequate managerial capabilities*. (Madanaguli et al., 2023)

The *outcome risks* occur once the innovation process has already reached the final implementation stages and the early marketing stages. These kind of risks are not related to the research of knowledge , but with the implementation of the final innovation. Relevant decisions will be made concerning how and where commercialize

the innovation and who owns what part of the intellectual property. The risks identified under this category are the following: *market-oriented risks, intellectual property rights-associated risks*. (Madanaguli et al., 2023)

2.5 Hypotesis development

Based on the previously analyzed empirical studies, theoretical frameworks and industry trends, OI and financial performances can be linked both positively and negatively.

A series of studies (Huang & Rice, 2009; Faems et al., 2010; Cheng & Shiu, 2015; Caputo et al., 2016) have underlined how OI and financial performances can be linked in a negative way. Specifically, Caputo et al. (2016) underline how innovation processes outside company's boundaries results to be not beneficial for innovation performances. Particularly, the productivity of Research & Development (R&D) and patents marketability, two indicators used to measure the degree of openness of the companies analyzed, results to have a negative correlation with innovation performances and the level of financial performances.

This perspective is confirmed by Cheng & Shiu (2015), whose research underlines how, even if the effect of OI activities on performance has received particular attention by the literature in the past, the nature and the relationship between OI and company's performances remain inconsistent and inconclusive. Moreover, Cheng & Shiu (2015) highlight the fact that the role that OI has on competitive advantage is not clear. In fact, according to the authors, even if the literature provides several perspectives on how implementing OIPs leads to a potentially useful competitive advantage, a proper understanding of phenomena is still lacking.

Faems et al. (2010) confirm this perspective by showing that OIPs have a negative on financial performances. Moreover, the authors provide relevant insights about the relationship between company's innovation performances and OI, showing a negative, significant correlation.

On the other hand, numerous analysis (Zhang et al., 2023; Caputo et al., 2016; Vincenzi & da Cunha, 2021) together with a series of case studies (Cheng & Huizingh, 2014; Remneland-Wikhamn et al., 2011; Rohrbeck et al., 2009) have highlighted the positive impact of the implementation of OI activities on firms' performances and strategic perspectives. Firms can not possess all the different typologies of external knowledge and possibilities to create the innovations they want (Cassiman & Veugelers, 2006; Chesbrough, 2007). Consequently, the possibility to acquire external knowledge from third parties, to look among customers and competitors to develop a further understanding of the market and to explore through universities new directions to explore, represents a game-changing possibility (Cheng & Huizingh, 2014). Firms which have opened their boundaries to external stimuli have gained, over the years, improvement in terms of performances.

Moreover, OI results to impact not only firms' financial performances, but also a series of other factors. A series of studies, (e.g. Le & Dang, 2018) have highlighted how the development of a competitive advantage can be translated in long-lasting benefits which can impact positively companies' financial performances in a direct way. Furthermore, other analysis (Prahalad & Ramaswamy, 2004b; Martinez, 2014) have underlined how highly qualitative interactions between companies and consumers can have a direct impact on the development of new ideas, representing a fundamental element in companies' value creation.

The value generated by these relationships can be translated into a relevant source for the elaboration of new potential sources of competitive advantage. Numerous studies (e.g. Vargo & Lusch, 2004; Prahalad & Krishnan, 2008) have, in fact, analyzed how interactions with external, prepared stakeholders are a relevant source of competence, that can add significant value to companies' products and services, leading to a potential significant raise in terms of financial performances.

The literature provides several, diversified insights on this intricate relationship. However, given the theoretical background seen and analyzed, it is reasonable to think

about a potentially positive correlation between OI and financial performances, even if there are conflicting results in the analysis deepened.

Therefore, the following hypothesis has been developed:

HP1: *Open innovation and financial performances have a positive relationship*

3. Methodology

In order to develop a methodology section, it has been fundamental to further analyse the literature to effectively understand the direction of the previous studies. Moreover, the approach used to collect the data, including the choice of the database, the way through which data have been analysed the determination of the variables to be collected and the choice of the analysis to develop were found to be pivotal to the development of this paper.

The methodology for this quantitative paper involves a well-defined and structured approach, with the objective to investigate the impact of OI on the financial performances of companies in the Italian market.

A quantitative analysis has been chosen. Peng & Hengartner (2002) and Clemence & Lorenzi-Cioldi (2014) underline how quantitative analysis represents a great opportunity to understand the correlation between variables which can be expressed through quantitatively measurable factors. With financial performances and levels of OI expressed through numbers, a quantitative analysis results to best fit with the necessities required by this kind of study.

To properly develop this quantitative analysis, a longitudinal approach has been used, studying the variables investigated over a detailed period of time. Finally, a precise structure has been defined for the analysis. The methodology, in order to provide not only a mere description about the existing literature framework, but also a specific analysis about the way in which data have been chosen, collected and analysed, encompasses four main components: sample definition, variable definition, analysis and analysis' limitations.

3.1 Sample definition

The hypothesis are tested and the study is developed by analysing a sample of 268 listed companies on the Italian market, operating in different sectors. The starting sample was of 429 companies. This number represents the exact amount of listed companies in Italy. Then, a series of companies have been removed from the database. In fact, only

companies with available data for three years (2022,2021,2020) about the dependent, independent and control variable have been considered. Italy has been chosen as country of reference in order to provide a perspective which have not been analysed under the OI point of view yet, filling the research gap previously underlined and answering the research question proposed.

3.1.1 Data

This study employs panel data analysis to investigate the impact of OI on financial performances. Panel data, characterized by the combination of cross-sectional and time-series dimensions, enables the exploration of dynamic relationships and longitudinal trends regarding the impact of OI on financial performances. By incorporating different observations over multiple time periods, this approach permits an examination of temporal changes.

To develop this analysis, only listed companies have been chosen. The reason behind this choice is strictly related to the availability of data. In fact, the majority of the databases used were significantly more complete when providing data about listed companies compared to non-listed ones. Among all the companies, only those with three years of available data have been chosen (2022, 2021, 2020).

Data have been downloaded from two databases *Orbis* and *aida*. Different databases have been used in order to obtain comprehensive and complete data. Then, an integrated dataset containing all the different data have been built, providing orderly and complete insights for all the different years analysed.

3.2 Variable definition

To properly develop this study, dependent, independent and control variables have been defined. Literature has contributed to the development of this analysis, providing fundamental evaluations and different perspectives about the way to effectively measure both OI and financial performances. Moreover, a list of 2 digits *Nomenclature statistique des Activités économiques dans la Communauté Européenne* (NACE) codes

has been included, in order to understand the sectors of employment of the different companies analysed.

3.2.1 Independent variable

Literature has helped in the development of several perspectives about the impact of OI on financial performances. However, the literature lacks a proper and well-defined index to effectively measure the level of OI among companies.

Caputo et al. (2016), for example, underline how OI activities generate revenues for a company and costs for another one, creating an openness index which considers intangibles, R&D and costs and revenues deriving from open operations. On the other hand, Al-Belushi et al. (2018) has developed a single quantitative metric to measure OI, considering both breadth and depth dimensions.

There are, in short, several potential metrics which have tried to measure the level of OI in quantitative research. However, the data used to develop each of the indicators result to be very difficult to find, especially for such a vast sample. Moreover, the majority of indexes were developed to match with specific characteristics that samples had, making them inapplicable to this quantitative research.

In order to be able to find a solution to this problem, a specific OI index has been created for this analysis. The index has been created considering three different variables which evaluate different aspects of OI. The variables considered are:

- Intangible assets
- Intellectual Property (IP)
- Research & Development (R&D) expenses

Intangible assets encompass a wide range of non-physical assets. In an OI context, intangible assets can indicate openness because they capture the collaborative knowledge creation, brand and reputation enhancement, market positioning and resource efficiency associated with cooperation with external partners in innovation activities. In fact, intangible assets include brand reputation, customer relationships,

knowledge and human capital. Intangible assets have been obtained by companies' balance sheets (BS). By looking at the BS, it has been possible to obtain the value, in thousand US Dollars (USD) of the intangible assets that, in order to be evaluated, must be identifiable and clearly defined among companies' boarders. Bagna et al. (2021) have already used intangible assets to measure the levels of OI. The authors have developed a metric to evaluate the intensity of intangible assets as a facet of the overall level of innovation.

R&D expenses reflect the resources allocated by firms to research, develop and introduce new products, services and processes. In OI, firms cooperate with external partners to access new sources, ideas and capabilities which are then complemented by the internal R&D effort. Therefore, R&D expenses may indicate an higher emphasis on innovation and collaboration with external stakeholders. R&D expenditure have been analysed and used as a metric to measure OI in numerous studies (Balsalobre-Lorente et al., 2021; Vincenzi & da Cunha, 2021; Widianingsih et al., 2023). Specifically, both Balsalobre-Lorente et al. (2021) and Widianingsih et al. (2023) link the levels of R&D spending are used as a proxy to measure innovation, underlining how these types of expenditures are crucial for sustaining innovation activities that can influence firms' performances.

IP can be measured through the number of patents. In this specific case, the number of patents considered refers to the overall number of patents developed by all the companies analysed, during the overall company's life. IP rights provide a legal protection for innovations. When companies engage in OI, they cooperate with external partners, sharing their IP and developing new IP jointly. The presence of an high number of patents can be directly translated in the fact that innovation is occurring, and its protection results to be fundamental for incentivizing knowledge sharing and collaboration in OI ecosystems. Numerous studies have used IP in the measurement of openness' level. Ponta et al. (2021), for instance, have developed a specific measure of innovation performances: the innovation patent index. This metric was developed considering both the qualitative and quantitative sides of patents, providing a coherent measurement of OI. Holgersson & Granstrand (2022) have also developed a study that

explores the role of patent rights within OI markets, highlighting the critical role of patents in enabling firms to capture value from their innovations. The authors discuss how patents, as legal tools, make the exchange and commercialization of innovation easier, making them crucial for obtaining effective financial results from their OI efforts.

The three variables chosen to measure the level of OI of the companies' analysed all represent proxies of level of openness and interaction with external stakeholders. The data related to the different components analysed have all been obtained through the database *Orbis*. To each of the variables above a score has been given. Specifically, a mean over three years (2022, 2021, 2020) has been considered for both the variables intangible assets and R&D expenses. For the variable IP, on the other hand, the overall number of patents developed during the whole company's life has been considered. The maximum possible score for each variable has been set to 5, while the minimum possible score for each variable has been set to 1. The different ranges of value used are shown in tables 1,2 and 3.

Table I: Values assigned to Intangible assets according to the threshold considered

<i>Value</i>	<i>Treshold</i>
1	0
2	70000
3	200000
4	350000
5	500000

Table II: Values assigned to R&D expenditures according to the threshold considered

<i>Value</i>	<i>Treshold</i>
1	0
2	1000
3	2500
4	5000
5	7500

Table III: Values assigned to number of patents according to the threshold considered

<i>Value</i>	<i>Treshold</i>
1	0
2	500
3	1000
4	1750
5	2500

Once obtained a score for every company, each of the values has then been summed. Doing this, an open innovation index (OII) has been developed and has been defined as follows:

$$OII = \text{value given to intangible assets} + \text{value given to IP} + \text{value given to R\&D expenses}$$

The maximum value deriving from the total sum of the values given to the different components is 15, while the minimum is 3. Therefore, the developed OI index can reach the value of 15 in the case of companies obtaining the highest possible value for the three measures which are part of it and 3 in case of obtaining the lowest possible one.

Overall, the OII represent a way to measure the level of OI in a company, because it integrates both three critical dimensions to obtain e comprehensive measure of company's engagement in OI. By doing this, the OII integrates both input and output metrics of innovation activities, providing a coherent overview of a company's innovation landscape. Through the combination of intangible assets, IP and R&D expenses, the OII evaluates relevant aspects of OIPs, trying to effectively measure openness propension. Through this index it has been possible to include the effort towards innovation, providing an overall picture of a company's innovation prowess. Moreover, it has been possible to balance both qualitative and quantitative measurements, helping in the assessment of the effectiveness and efficiency of OIPs.

Finally, this index represents a framework for assessing companies' engagement in OI, by examining critical dimensions that contribute to the successful implementation and commercialization of innovative ideas and technologies.

3.2.2 Dependent variable

Financial performances of companies are defined as the dependent variable of the model. To properly measure financial performance, the following indicator has been considered:

- Return on Asset (ROA)

ROA can be used as a measure to evaluate and leverage financial performances. In fact, ROA is widely used for assessing company's profitability, by measuring how efficiently it generates profits from its assets. There are, moreover, several research through which ROA has been used as a dependent variable in the evaluation of financial performances (Hansen & Wernerfelt, 1989; Mahmood & Mann, 1993; Chhibber & Majumdar, 1999; Barbosa & Louri, 2005; Chandrapala, & Knápková, 2013).

In this sense, ROA plays a pivotal role in measuring companies' financial performances. This indicator considers both the income statement (IS) and the BS evaluating respectively the value of the net income and total assets, providing control variable that reflect both profitability and asset utilization. Moreover, ROA reflects long-term performances, since it assesses the profitability of assets over a period of time. Through the utilization of ROA as a way to measure the control variable, it is possible to evaluate both the impact of OIP on a firm's financial performance and a company's ability to generate profits relative to its asset base.

This indicator has been chosen as proxy for companies' financial performances. However, taken by itself, this indicator can only show a small piece of the overall financial status of a company (Nissim, 2019; Moreno, 2021). It is, in fact, necessary to provide a combination of the metric with a series of control variables and indicators to comprehensively assess and analyse a company's financial situation. Moreover, different aspects have been considered while evaluating the impact of OI on the dependent variable.

3.2.3 Control variables

Prior studies suggest that there are relevant factors that need to be considered while analysing the impact of OI on financial performances. These variables are defined as *control variables* and are the following:

- Total Asset
- Compound Annual Growth Rate (CAGR) of Revenues
- Earning Before Interest & Taxes (EBIT)

The value of companies' total assets represents a proxy for firms' size, which may have an impact on financial performances independently of OI activities (Utama, 2012; Utami, 2017). In fact, larger companies might have a vaster amount of resources and capabilities to develop OI activities compared to smaller firms. This variable has been chosen because, according to previous research (Hung & Chiang, 2010; Caputo et al., 2016) the size of a company impacts the levels of OI.

A series of authors (Andjarwati et al., 2021; Averkyn, 2019; Zhong et al., 2017) have highlighted the relevance of revenues in evaluating, measuring and leveraging financial performances. Revenues reflect the capability of a company to generate profits from its products and services. Revenues' growth measures the rate at which company's sales are increasing over time. By including a CAGR of revenues as a control variable, it is possible to control for external factors that may influence financial performances other than OI. These factors, for instance, could include changes in market conditions, economic trends or industry-specific changing aspects. Moreover, is important to consider that different firms may have different growth trajectories even before implementing OIP. Through this variable it will be possible to account for these different trajectories and isolate the specific aspects of OI on financial performances.

Finally, several authors (Grifell-Tatjè et al., 2018; Ramachandran & Janakiraman, 2009) have underlined how EBIT can represent a company's financial situation. EBIT, in fact, represents a company's operating profitability. This ratio reflects the earnings generated from its core operations before accounting for interest expenses and taxes. It is a relevant variable and represents an optimal control variable in evaluating the impact of

OI on companies' financial performances because it provides insights about the ability of companies to generate profits from their primary activities. An higher EBIT shows strong operating performances and efficiencies, which are relevant indicators of financial health.

Overall, the inclusion of these variables helps to enhance the robustness and validity of the analysis, including factors that may represent an influence on financial performances. All the variables considered and the ways through which have been measured are summarized in the following table.

Table IV: Summary of the variables and related studies

Variables	Related Studies
<i>Independent variable - components of the OII</i>	
Intangible Assets	<i>Bagna et al. (2021)</i>
Intellectual Property	<i>Ponta et al. (2021)</i> <i>Holgersson & Granstrand (2022)</i>
Research & Development expenses	<i>Balsalobre-Lorente et al. (2021)</i> <i>Vincenzi & da Cunha (2021)</i> <i>Widianingsih et al. (2023)</i>
<i>Dependent variable - financial performances</i>	
Return on Asset (ROA)	<i>Hansen & Wernerfelt (1989)</i> <i>Mahmood & Mann (1993)</i> <i>Chhibber & Majumdar (1999)</i> <i>Barbosa & Louri (2005)</i> <i>Chandrapala, & Knápková (2013)</i>
<i>Control variables</i>	
Total Asset	<i>Utama (2012)</i> <i>Utami (2017)</i>
Earning Before Interest & Taxes (EBIT)	<i>Griffell-Tajè et al. (2018)</i> <i>Ramachandran & Janakiraman (2009)</i>
Compound Annual Growth Rate (CAGR) of Revenues	<i>Andjarwati et al. (2021)</i> <i>Averkyn (2019)</i> <i>Zhong et al. (2017)</i>

3.3 Analysis

The analysis has been conducted by using the statistical software *Stata*. The analysis developed refer to three different years of data. By obtaining panel data that refer to three different years (2022, 2021, 2020) it has been possible to effectively calculate the means for each value, By using three years, it has been possible to account for the temporal stability of the variables, reducing the impact of anomalous data (like the 2020 ones which could have been affected by Covid-19 pandemic) that may occur in a single year. Moreover, by averaging variables over three years improves accuracy and precision, providing a clearer picture of the underlying trends and patterns.

Furthermore, creating an average that refer to three different years enhances the generalizability of study's findings. In fact, it allows the analysis to cover a broader time frame, which is fundamental in order to capture the nature of economic and social trends affecting the variables.

3.3.1 Descriptive Analysis

The first part of the analysis has been the descriptive one. By conducting a descriptive analysis, a basic summary of the data's characteristic and an understanding of macro trends across data has been provided. This analysis includes an evaluation of means, variances, standard deviations and Pearson Correlation. By representing the first part of the overall analysis conducted, the descriptive analysis has been helpful in identifying potential errors or anomalies in the data, such as missing values or data entry errors. Moreover, it has been helpful in providing a clear understanding of data's nature and the context in which the variables operate. The descriptive analysis has been key in understanding data distributions, guiding the development of the overall analysis.

3.3.2 Regression Analysis & Hypothesis Testing

The correlation between the variables and the validity of the hypothesis have been in-depth by the development of two Ordinary Least Squares (OLS) regression. OLS regression results to be particularly helpful in evaluating the relationship between dependent and independent variables in a linear regression model (Yu & Yao, 2017; Harezlak et al., 2018). Linear regressions quantify the strength and the nature of the relationship between different variables. It helps in understanding not only the potential positive relationship between them, but also the how strong that relationship is (Su et al., 2012; Montgomery et al., 2021). Moreover, by running an OLS it has been possible to include several control variables, understanding the impact of them on the overall analysis.

The regression has been developed for the dependent variable that represent a proxy for the financial performances. Specifically, as previously stated, the variable considered is:

- Return on Asset (ROA)

The development of the regression by including several control variables has been carried out to compare and understand the different potential results occurring. In fact, relationships between different variables could be complex and non-linear. Even studying the impact of OI on financial performances, is fundamental to consider the fact that several factors could impact this kind of relationship. Furthermore, is important to evaluate the possible collinearity between the variables. If two or more variables are strongly related between each other, it could be complex to distinguish the specific effect of each variable on the independent one.

By conducting two OLS regression considering the OII and the ROA, a positive relationship could indicate the fact that OI leads to a better use of companies' assets, enhancing product development or improving market responsiveness. Moreover, such analysis could change according to industry and market conditions, since smaller companies might have different results compared to larger ones.

Overall, the regression has been conducted to effectively provide a complete and coherent vision of the impact of OI on financial performances, capturing different aspects of the companies analysed. For the regression developed, a series of elements have been studied in order to obtain a coherent vision of the analysis. The elements studied are:

- R-squared. In a linear regression, R-squared represents the coefficient of determination. It is a way to measure the goodness of fit of the regression model, measuring the proportion of variance in the dependent variable that is explained from the independent one. R-squared can obtain any value from 0 to 1. The nearer R-squared is to 1, the higher the portion of the variance of the dependent variable explained by the independent.
- r . In an OLS linear regression, r is used to test the hypothesis. By assuming values from -1 to 1, a confirmation of the hypothesis developed is verified in case of positive r values. Vice versa, a negative r value leads to the rejection of the hypothesis.
- P-values. In this analysis, p-values have been used to evaluate the statistical significance of the regression. Specifically, the analysis have been considered

significant if the p-values are less or equal than a predetermined significance level, set at 0.05.

3.4 Analysis' limitations

Despite the specifications previously provided, a series of limitations could emerge from this analysis, which opens up opportunities for future research.

3.4.1 Focus on a specific market

Firstly, due to time constraints, the focus has been only on the Italian market. By doing this, a sample selection bias might occur. These companies may not be representative of firms developing OI activities in Italy. Therefore, the findings may not be generalizable also to non-listed companies, to other industries apart from the ones represented in the stock market or to other companies operating in other Countries. Moreover, despite efforts to obtain reliable data from trustworthy sources, there may be inconsistencies across the different databases used.

Endogeneity could also represent a potential limitation. For instance, high-performing listed companies may be more inclined to engage in OI compared to smaller firms. However, this consideration will be faced by introducing the variable of total assets in the set of control variables, considering it as a proxy of the dimension of the company.

3.4.2 Focus on large companies

Despite the overall Italian business landscape is characterized by SMEs, this analysis has been conducted only on listed companies. Therefore, it has not really been possible to understand how SMEs operate, since listed companies represented are, in the vast majority, big companies. These factors make the analysis complex to generalize towards smaller companies, since SMEs operate in a different environment compared to listed ones. These factors, taken together into account, may make the results non generalizable to the overall Italian business environment.

3.4.3 Measurement of Open Innovation

Furthermore, it is important to point out that developing a framework to measure OI poses its own set of challenges. The construction of appropriate metrics and indicators to capture the multifaceted nature of OI practices could be complex. For these and other reasons, like time constraints and the lack of a well-defined framework by the literature, a more simplified approach has been developed. The metric used could result in being too simplistic, potentially missing on some relevant facets of the independent variable. The limitations related to the definition of OI could potentially have an impact on the comprehensiveness of the analysis.

Moreover, OI is defined as a long-term process, which could impact company's performances in a not yet analysed future. In fact, data could not reflect when the development of OI have started, with companies that are not seeing the effects of the process since they are in the in the beginning of it. For these reasons, OI may not be reflected in the data analysed, even if the companies are implementing OIP.

3.4.4 Technological advancements

It is relevant to highlight that, in a topic as OI, the rapid evolution of technology can have major impacts on the measurement of the independent variable (Gassman et al., 2010). The technological environment in which companies operate is in continuous shifting, with the emergence of new tools and platforms which could potentially change the way through which collaboration among stakeholders happen. For this reason, the exclusion of a way to measure technological evolution could lead to a potential underestimation of OI capabilities of companies. Furthermore, technological evolution could affect scalability and rapidity of OIPs, aspects that are crucial in sustaining competitive advantages in rapidly changing markets.

4. Findings

The following chapter presents the empirical findings from this study, through which the impact of OI on the financial performances of Italian listed companies has been analysed.

A comprehensive dataset that includes financial metrics and components of the OII from a diverse set of companies across multiple industries has been used. This rich dataset permits an in-depth exploration of the potential financial benefits that OIP may deliver. By examining these dynamics, this study seeks to provide empirical evidence on the efficacy that OI has in the contemporary business environment.

The analysis has been divided into two different sections that provide a coherent understanding of the phenomena analysed. The first section is about the sector's division, then there is the descriptive statistics' section, which provides a preliminary examination and understanding of the dataset. Subsequently, the main analysis section delves deeper, using linear regressions to investigate the relationship and the strength of the interactions among the variables.

4.1 Sector's division

Through the OLS regressions run, it has been possible to provide a division among the different sectors according to NACE codes. NACE codes are used in Europe as part of a standardized European system to identify and classify economic activities. In Europe, every company is listed according to its main economic activity. In this sense, the utilization of these codes is helpful for the analysis of economic statistical data and for the definition of a series of rules that can change according to the activity sector.

In the *table VI* a list of the NACE codes, with its relative sector is provided.

Table V: Observations per sector according to NACE code

Sector	Freq.	Percent	Cum.
1 <i>Crop and animal production, hunting and related service activities</i>	3	0.34	0.34
6 <i>Extraction of crude petroleum and natural gas</i>	3	0.34	0.67

9	<i>Mining support service activities</i>	3	0.34	1.01
10	<i>Manufacture of food products</i>	6	0.67	1.68
11	<i>Manufacture of beverages</i>	3	0.34	2.01
13	<i>Manufacture of textiles</i>	15	1.68	3.69
14	<i>Manufacture of wearing apparel</i>	15	1.68	5.36
15	<i>Manufacture of leather and related products</i>	9	1.01	6.37
16	<i>Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials</i>	3	0.34	6.70
18	<i>Printing and reproduction of recorded media</i>	18	2.01	8.72
19	<i>Manufacture of coke and refined petroleum products</i>	6	0.67	9.39
20	<i>Manufacture of chemicals and chemical products</i>	12	1.34	10.73
21	<i>Manufacture of basic pharmaceutical products and pharmaceutical preparations</i>	24	2.68	13.41
22	<i>Manufacture of rubber and plastic products</i>	3	0.34	13.74
23	<i>Manufacture of other non-metallic mineral products</i>	18	2.01	15.75
24	<i>Manufacture of basic metals</i>	6	0.67	16.42
25	<i>Manufacture of fabricated metal products, except machinery and equipment</i>	6	0.67	17.09
26	<i>Manufacture of computer, electronic and optical products</i>	37	4.13	21.23
27	<i>Manufacture of electrical equipment</i>	42	4.69	25.92
28	<i>Manufacture of machinery and equipment n.e.c.</i>	57	6.37	32.29
29	<i>Manufacture of motor vehicles, trailers and semi-trailers</i>	12	1.34	33.63
30	<i>Manufacture of other transport equipment</i>	18	2.01	35.64
31	<i>Manufacture of furniture</i>	6	0.67	36.31
32	<i>Other manufacturing</i>	18	2.01	38.32
33	<i>Repair and installation of machinery and equipment</i>	6	0.67	38.99
35	<i>Electricity, gas, steam and air conditioning supply</i>	54	6.03	45.03
39	<i>Remediation activities and other waste management services</i>	3	0.34	45.36
42	<i>Civil engineering</i>	6	0.67	46.03
43	<i>Specialised construction activities</i>	6	0.67	46.70
45	<i>Wholesale and retail trade and repair of motor vehicles and motorcycles</i>	9	1.01	47.71
46	<i>Wholesale trade, except of motor vehicles and motorcycles</i>	54	6.03	53.74
47	<i>Retail trade, except of motor vehicles and motorcycles</i>	33	3.69	57.43
49	<i>Land transport and transport via pipelines</i>	6	0.67	58.10
52	<i>Warehousing and support activities for transportation</i>	15	1.68	59.78
55	<i>Accommodation</i>	3	0.34	60.11
58	<i>Publishing activities</i>	18	2.01	62.12
59	<i>Motion picture, video and television programme production, sound recording and music publishing activities</i>	12	1.34	63.46
60	<i>Programming and broadcasting activities</i>	3	0.34	63.80
61	<i>Telecommunications</i>	27	3.02	66.82
62	<i>Computer programming, consultancy and related activities</i>	39	4.36	71.17
64	<i>Financial service activities, except insurance and pension funding</i>	28	3.13	74.30

65	<i>Insurance, reinsurance and pension funding, except compulsory social security</i>	3	0.34	74.64
66	<i>Activities auxiliary to financial services and insurance activities</i>	42	4.69	79.33
68	<i>Real estate activities</i>	33	3.69	83.02
70	<i>Activities of head offices; management consultancy activities</i>	33	3.69	86.70
71	<i>Architectural and engineering activities; technical testing and analysis</i>	6	0.67	87.37
72	<i>Scientific research and development</i>	6	0.67	88.04
73	<i>Advertising and market research</i>	20	2.23	90.28
74	<i>Other professional, scientific and technical activities</i>	6	0.67	90.95
77	<i>Rental and leasing activities</i>	3	0.34	91.28
78	<i>Employment activities</i>	3	0.34	91.62
79	<i>Travel agency, tour operator and other reservation service and related activities</i>	9	1.01	92.63
80	<i>Security and investigation activities</i>	6	0.67	93.30
81	<i>Services to buildings and landscape activities</i>	3	0.34	93.63
82	<i>Office administrative, office support and other business support activities</i>	6	0.67	94.30
84	<i>Public administration and defence; compulsory social security</i>	9	1.01	95.31
85	<i>Education</i>	3	0.34	95.64
86	<i>Human health activities</i>	12	1.34	96.98
90	<i>Creative, arts and entertainment activities</i>	6	0.67	97.65
93	<i>Sports activities and amusement and recreation activities</i>	15	1.68	99.33
94	<i>Activities of membership organisations</i>	6	0.67	100.00
Total		895	100.00	

The sector analysed with the highest number of observations is the number 28. With 57 observations, the sector “*manufacture of machinery and equipment n.e.c.*” represent the 6.37% of the sample. After the number 28, the sector 46 “*wholesale trade, except of motor vehicles and motorcycles*” and the 35 “*electricity, gas, steam and air conditioning supply*” both represent the 6.03% of the total, with a number of observations of 54. On the other hand, the sectors *crop and animal production, hunting and related service activities, extraction of crude petroleum and natural gas, mining support service activities, manufacture of beverages, manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials, manufacture of rubber and plastic products, remediation activities and other waste management services, accommodation, programming and broadcasting activities, insurance, reinsurance and pension funding, except compulsory social security, rental and leasing activities, employment activities, services to buildings and*

landscape activities and *education*, respectively associated with the NACE code number 1, 6, 9, 11, 16, 22, 39, 55, 60, 65, 77, 78, 81, 85 represent the sectors least observed, representing only the 0.34% of the overall sample each, with 3 observations.

4.2 Descriptive Statistics

Descriptive statistics are shown in *table V*. By analysing descriptive statistics and dataset, it is not possible to understand any specific pattern.

Table VI: Summary of descriptive statistics

Variables	Obs	Mean	Std. Dev.	Min	Max	p1	p99	Skew.	Kurt.
ROA	895	.675	11.299	-76.805	76.437	-45.795	22.642	-1.772	14.903
OI Index	895	6.404	1.837	3	13	3	11	.38	3.771
Ebit	895	128000	1010000	-2810000	18600000	-131000	1460000	13.482	206.744
Tot Assets	895	2830000	16600000	185.746	2.340e+08	1781.748	66200000	10.81	131.546
CAGR revenues	895	.168	.392	-.866	3.214	-.479	2.687	4.258	28.426

The ROA shows a mean of 0,675%. This underlines the fact that, overall, listed companies on the Italian stock market tend to have positive returns compared to their investments and their assets, even if the values results to not be particularly high.

The mean of the EBIT, which is expressed in thousands USD, is substantial and aligns with the sample selection of Italian listed companies. Overall, companies with high EBIT values tend to have a significative amount of resources which can be spent to develop innovation both inside and outside of companies. However, this statistic is not robust since there is a huge dispersion around the mean, highlighted higher value of the standard deviation. This is confirmed by the mean value of the total assets. In fact, the mean results to be of 2830000, underlining what previously stated in terms of available resources. However, also in this case the huge value of standard deviation make the statistic not robust.

The OII, over 895 observations and 268 companies, show a mean of 6.4. With the OII that can reach a maximum of 15, a mean of 6.4 underlines that the companies analysed in the sample are aligned on an average focus on OI. This can be seen also by the standard deviation, that, with a value of 1.84 underline a not so relevant dispersion around the average value of the index.

In terms of revenues, the average CAGR, evaluated on three years (2022, 2021, 2020) show that the sample has seen a growth. In fact, a mean of 0.17%, with a not so strong standard deviation, indicate that the value is coherent and that, overall companies have performed positively in terms of revenues.

4.2.1 Pearson correlations

Through the *table VI* it is possible to observe the Pearson correlations. These correlations permit to effectively understand the relationship among different variables. The correlation coefficient of 0.223 between OII and EBIT, with a p-value < 0.01, shows a moderate, positive correlation that's statistically significant. As OI activities increase, there tends to be a noticeable positive impact on EBIT, suggesting the fact that

OIPs contribute to an improvement in terms of operational efficiency, generating higher sales volumes.

This evaluation is confirmed by the correlation between total asset and EBIT, underlining how companies with larger assets bases have higher EBIT, consequently having more resources to spend in innovation activities. The higher spending possibilities are underlined also by the positive (0.294), significative correlation between OII and total asset, reflecting the fact that larger companies can afford higher substantial investments to develop OI.

Table VII: Pearson Correlations

<u>Pearson correlations</u>					
Variables	ROA	OII	EBIT	Total Asset	CAGR revenues
ROA	1.000				
OII	0.051	1.000			
EBIT	0.050	0.223***	1.000		
Total Asset	0.019	0.294***	0.817***	1.000	
CAGR revenues	0.074**	-0.050	0.012	0.001	1.000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Moreover, by looking at these correlations it is possible to understand the presence of collinearity. Values below 0.6 suggest the absence of collinearity. Therefore, the results underline the absence of potential distortion on coefficients caused by strong correlations.

4.3 Main Analysis

This section of the thesis evolves into the testing of the hypothesis developed in the literature review, utilizing OLS regression as part of the regression analysis to effectively explore the relationships between the variables of interest. The main analysis is structured into two main parts in order to ensure an exploration of data and to test the hypothesis developed. Initially, the hypothesis testing is outlined. Following this, the results of the OLS regressions are shown. This structured approach not only ensure clarity in the analysis, but also provides a certain level of validity and reliability of the obtained results.

4.3.1 Hypothesis testing

HP1: Open innovation and financial performances have a positive relationship

The hypothesis has been tested by analysing the results of the OLS regressions. The results are shown in *table VIII*.

The regressions show a positive r value among OII and ROA, meaning that as the levels of OI increase, so do financial performances. By considering ROA as a dependent variable, r is positive. The positive value shown suggest a positive relationship between variables.

Moreover, by looking at the magnitude of r , we can understand the strength of the relationship. In this case, the regression shows a value of r of 0.482 and 0.525 across the OLS. With 1 being the maximum value that r can obtain, the results show a positive and strong relationship between OI and financial performances.

For these reasons, the *HPI* is coherent with a part of the literature analysed and is verified.

Table VIII: r values for OLS regression

VARIABLES	(1) ROA	(2) ROA
OI Index	0.482** [0.232] (0.038)	0.525** [0.239] (0.029)

pval in brackets
*** p<0.01, ** p<0.05, * p<0.1

4.3.2 ROA & OII

The OLS presented provides results from two OLS regressions, assessing the impact on the previously analysed variables on ROA, while controlling Year and Industry Fixed Effects.

By looking at the correlations among variables, we can understand the impact of each component on the ROA. The OLS regressions run shows a significative and strong

correlation, as previously underlined, between OII and ROA. The CAGR of revenues shows a significant positive impact on ROA, with coefficient of 2.278 and a p-value < 0.05. This implies that higher growth in revenues are strongly associated with higher ROA. On the other hand, EBIT and Total assets result to have a non-statistically significant relationship with ROA. This means that the two control variables do not have an impact on the relationship with ROA.

By looking at the model statistics we can analyse the R-squared values. In the case of this OLS regression, the model shows a result of 0.127 and of 0.134, which is not particularly high. Both the model's regressions result to be statistically significant, presenting a p-value < 0.05. The value of R-squared shows that the model doesn't fit the data in an exceptional way. However, in quantitative studies these values are typical since many unexplained factors could impact on both variables. The adjusted R-squared are 0.060 and 0.064, which, again, is relatively low. This underlines that, while the model explains some variance in ROA, a substantial amount of variability in ROA remains unexplained by the model. The constants are negative in both OLS regression (-3.394 and -6.245) without being, however, statistically significant since they present quite high p-values (0.603 and 0.349).

The results of the OLS regression are underlined in the following table.

Table IX: Results of the OLS regression

VARIABLES	(1) ROA	(2) ROA
OI Index	0.482** [0.232] (0.038)	0.525** [0.239] (0.029)
Tot Assets		-0.000 [0.000] (0.211)
Ebit		0.000 [0.000] (0.155)
Revenues CAGR		2.278** [1.085] (0.036)
Constant	-3.394 [6.530] (0.603)	-6.245 [6.664] (0.349)
Observations	895	895
Year FE	YES	YES
Industry FE	YES	YES
R-squared	0.127	0.134
R-squared Adj.	0.060	0.064

pval in brackets
 *** p<0.01, ** p<0.05, * p<0.1

5 Discussion

This chapter explores the complexities and insights derived from examining the complex relationship between OI and the financial performances of Italian companies.

This chapter aims to analyse how the findings from the thesis not only match with the literature, but also extend the actual academic dialogue on OI. The objective of this chapter is, in fact, to provide relevant information about the obtained results. This will be done by commenting them and by understanding the theoretical implications of this analysis on the existing literature framework.

Therefore, this chapter has been divided into four different sectors: introduction of key findings, interpretation of results, theoretical implications, and contribution to future research.

5.2 Introduction of key findings

Table X provides a summary of the results obtained in the previous chapter.

Table X: Summary of the results

VARIABLES	(1) ROA	(2) ROA
OI Index	0.482** [0.232] (0.038)	0.525** [0.239] (0.029)
Tot Assets		-0.000 [0.000] (0.211)
Ebit		0.000 [0.000] (0.155)
Revenues CAGR		2.278** [1.085] (0.036)
Constant	-3.394 [6.530] (0.603)	-6.245 [6.664] (0.349)
Observations	895	895
Year FE	YES	YES
Industry FE	YES	YES
R-squared	0.127	0.134
R-squared Adj.	0.060	0.064

pval in brackets

The analysis carried on resulted in two major findings: OI is positively correlated with ROA and, therefore, with financial performances. This positive correlation shows that, by implementing OIPs companies are able to improve their financial performances. As well as from the two positive regressions, these theoretical evidences are reinforced by the verification of *HPI*, which underlines even more how OI and financial performances are positively linked.

5.3 Interpretation of results

The overall analysis conducted in this master's thesis puts light on the complex relationship between OI and financial performances. The positive correlation found between OII and the dependent variables underline the substantial impact that OIPs have on enhancing firms' financial situation.

The findings' chapter highlights how companies with higher value in OII, which basically have an higher engagement in OIPs, tend to show higher financial performances. This is underlined particularly by the significant association between OII and ROA, suggesting that OIPs are not just a support, but results to be pivotal in driving profitability. These findings support the existing innovation management literature (Meyer, 2007; Aghion & Jaravel, 2015) that emphasize how relevant it is to leverage external knowledge and collaborations to obtain substantial financial growth. The results underscore the relevant, strategic value of the integration process of external innovations ideas to optimize financial competitiveness.

Moreover, the positive relationship between OII and other financial indicators used as control variables, such as total assets provides relevant information into how OI can influence both resource allocation and financial structure. In fact, companies that successfully implement OIPs are potentially positioned in a better way, compared to other firms, to respond to market changes and capture new opportunities. This results also in the positive relationship that OII has had with the CAGR of revenues.

Substantially, this study underlines how OI is a relevant determinant of financial success and that companies that develop and implement OIPs more result to have improved financial performances.

5.4 Theoretical implications

The positive relationship found between OI and financial performances considering Italian listed companies contributes in a significant way to the theoretical framework surrounding OI.

Chesbrough (2003), who has the merits of introducing the concept of OI, underlined that using both external and internal ideas could enhance a company's technology base and, therefore, its performances. The analysis provided in this thesis aims at supporting and expanding upon Chesbrough's model by showing that OI not only facilitates technological development among companies (Chesbrough, 2003) but also directly improves financial performances by enhancing financial metrics such as ROA and revenues growth in specific market conditions. This thesis takes as a reference a concept introduced 20 years ago and gives it a new perspective by understanding its impact on a different variable.

The findings from this study also offer empirical support to the theoretical evidence proposed by West & Bogers (2017). The authors, in their work, underline how OI leads to an improved competitive advantage through increased innovation capabilities. The findings chapter shows that Italian firms benefit from this strategy, aligning with West & Brogers' (2017) findings about the strategic benefits of OI.

Moreover, this thesis enriches Dahlander & Gann's (2010) findings. The authors underline how the motivations behind engaging OIPs, ranging from obtaining missing capabilities to the possibility to explore new markets, can influence the outcomes of such initiatives. This thesis expands on previous research by linking these incentives to particular financial outcomes and demonstrating how crucial it is for OI to strategically align with business objectives in order to increase profits.

This research thus not only confirms theoretical perspectives about the positive impact of OI on financial performances (Rohrbeck et al., 2009; Remneland-Wikhamn et al., 2011; Cheng & Huizingh, 2014; Caputo et al., 2016; Vincenzi & da Cunha, 2021; Zhang et al., 2023), but also extend them by providing a new perspective about the Italian economic structure. This thesis highlights the necessity of for a nuanced application of OI theories by considering the size of the firms and the market dynamics, which can differ significantly from the contexts in which the theories have been initially developed.

5.5 Contribution to future research

Overall, the understanding of these results encourages future research to analyse the impact of OI on financial performances considering different environments and perspectives. For instance, future studies could broaden the scope of research by including a different range of industries beyond the ones that are traditionally associated with high innovation intensity.

Future research could also focus on other countries. With the unique business environment that Italy has, characterized by a prevalence of SMEs and traditional industries, other studies could highlight the possible differences among countries in terms of application of OIPs. By doing this, there would be the possibility to underline cultural and economic factors that influence the effectiveness of OIPs, providing a broader understanding of both global and local environments.

Moreover, this study focuses on current data, providing a snapshot of the actual situation among Italian listed companies. However, OI could be studied in a longitudinal way, tracking change over time of both financial performances and levels of OI. An effective way to do this could be to analyse data coming from a broader time horizon. By doing this, it would be possible to provide a perspective on how financial performances evolve according to changes in terms of market conditions.

Finally, future literature could implement qualitative data to support the analysis. As highlighted in the limitations sector of this thesis, measuring levels of OI is not easy.

Therefore, the implementation of interviews, case studies and eventual ethnography research, in the data available for the selected companies, could provide more clear highlights about the mechanisms behind the impact that the implementation of OIPs has on companies' financial performances.

6 Conclusion

This thesis embarked on an overall exploration of the complex and rapidly evolving relationship between OI and financial performances within the context of Italian listed companies. Starting from a wide range of academic literature, this study was developed to fill a significant gap and has done it by integrating a quantitative analysis and a theoretical discussion to understand the dynamics and implications of OI. These conclusion's chapter aims at providing an overall summary of the areas analysed, answering also to the research question. Therefore, this chapter has been divided into 3 different sections: summary of the project, answer to the research question and final considerations.

6.2 Summary of the project

The concept of OI has been analysed in the literature review, methodology and findings/discussion chapters. The literature review has provided insights about the evolution of the concept of OI. Starting from Chesbrough (2003), relevant perspectives about the both the limiting factors and risks of OI have been provided. Moreover, the different typologies of OIPs have been underlined, creating also an analysis of how OI can lead to the development of a sustainable competitive advantage.

Throughout the methodology chapter, a specific OII that considers the most relevant aspects of companies' openness degree was created. Through this OII, it has been possible to summarize the level of OI among Italian listed companies in a number. OI is not the only variable that has been analysed. In fact, regarding the analysis of financial performances, the investigation of several financial indicators has led to the understanding of Italian listed companies' situation. Once that the key variables have been defined, a series of regressions have been carried on, with the aim of understanding the relationship between them, evaluating the impact of the developed OII on companies' performances.

After the development of the regressions, it has been possible to understand the results. Both the results and discussion chapter, in fact, have underscored the positive correlation between the adoption of OIPs and enhanced financial performances. The

developed empirical analysis revealed that firms engaging in active way in OI not only develop a competitive edge, but also improve their profitability and market responsiveness. By understanding this, a positive correlation has been found also in terms of size of the companies analysed, as well as for the CAGR of revenues.

Overall, the topic has been broadly analysed, highlighting a series of facets and perspectives that have emerged and the different insights that have been obtained. On the basis of this, the next section aims at answering the previously developed research question.

6.3 Answer to the research question

This master's thesis has been developed with the aim of answering the following research question:

"How does open innovation impact financial performances in Italian listed companies?"

The findings from this study unequivocally show and demonstrate that OIPs have a positive influence over financial performances. The extensive quantitative study underlined a significant correlation between the OII and a series of financial metrics like the ROA. This outcome suggests that companies that engage in active way OIPs tend to experience better financial results. The study highlights the value generated by the integration of OI into core companies' strategies, highlighting its role not only as a complementary strategy, but as a central component of successful financial management in the competitive Italian market. Moreover, the study also explored the impact of OI on other financial metrics like EBIT and revenue growth. The findings indicate that companies engaging in OI not only manage their assets in a more efficient way, but also tend to achieve higher profitability and revenues growth. This broader improvement under a financial perspective can be linked also to the improved capabilities and efficiency obtained through external collaborations and the adoptions of external innovations.

Therefore, the answer to the research question is that OI impacts financial performances in a positive way. As previously underlined, the analysis reveals that companies with higher levels of OI show improved financial metrics, including ROA, EBIT and CAGR of revenues. These findings suggest that integrating OIPs not only enhances assets efficiency, but also boosts overall companies' profitability and revenue growth. This is how OI impacts financial performances in the Italian market.

6.4 Final considerations

In conclusion, this thesis reaffirms the relevance of OIPs as a fundamental tool for enhancing financial performances. This research represents a relevant step into a deeper and more complete investigation into the strategic implementation of both OIPs and collaboration across different sectors, situations, and environments.

However, this study is not without its limitations. The exclusion of certain variables, such as the evolution of technology, and the lack of previously used metric to evaluate the levels of OI represent limiting factors, which could be solved in future research.

Overall, I believe that the development of this master's thesis has helped me in increasing my knowledge on topics that constitute a relevant aspect of my academic formation. The understanding of different facets, perspectives and concepts has enriched my knowledge and my interest towards these elements.

In order to conclude this project, I would like to provide a quote that perfectly summarizes the concept of OI and explains my interest in the topics of collaboration among innovation processes.

"Collaboration is important not just because it's a better way to learn. The spirit of collaboration is penetrating every institution and all of our lives. So learning to collaborate is part of equipping yourself for effectiveness, problem solving, innovation and life-long learning in an ever-changing networked economy."

Don Tapscott

Business executive, author, and consultant

Figures

Figure I: Framework including all the different typologies of Open Innovation

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