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Analysing the Impact of Auditing on Corporate Cost of Debt and Innovation: A comparative Study between Audited and Non-Audited Italian Companies

Master Thesis
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INTRODUCTION

Research Scope

The importance of auditing has significantly increased during the past three decades, as business have experienced an unprecedented growth in complexity (Schillemans and Van Twist, 2016). The role of the auditor grew with the expansion of the financial markets and the firms' size. Essentially, audit is a third-party, impartial examination of an organization's financial statements. The objective of this activity is to allow the auditor to determine whether the financial statements were produced in compliance with the relevant financial reporting framework in all material respects. Hence, external auditors protect the public interest and for this reason, above certain conditions, are mandated by legislation as they play a pivotal role in balancing the information asymmetry between the stakeholders as whole and the management of the firm, which prepared the financial statements.

When there is information asymmetry, the market fails to offer a Pareto optimum solution, a condition known as 'market failure' (Stiglitz, 2000). Audit activity is what economists refer to as signaling activity, which means that when there is an information asymmetry, an independent third party is required to signal the real quality of the products – essentially distinguishing between good and bad products, as in normal *laissez faire*, the good ones are likely be carried away by the 'lemons' (Akerlof, 1970).

Information asymmetry can have significant implications for market structure and company decision-making in the context of financial markets. In fact, companies often borrow cash to finance initiatives that, according to their Net Present Value (NPV), should yield higher profits than the cost of the borrowed funds. This activity is extremely advantageous to the general economic prosperity of society as it creates new value through the firms' activity. For instance, Halov and Heider (2011) discovered that US corporations often refrain from issuing debt instruments if the market has little information about them, regardless of the underlying project. Instead, Myers and Majluf (1984) claimed that firms' stock prices will eventually fall, and their cost of equity capital will rise if they elect to issue stock securities in a market with severe information asymmetry. In both circumstances, corporations will be forced to abandon initiatives that may have yielded significant profits given the existence of knowledge asymmetry. As a result, a market failure in the global financial markets system might cause a large financial loss to the society.

Audit is an essential activity in fostering trust in the global financial markets as it reduces the information asymmetry between firms and private investors/lenders and improves the quality of their own disclosures (Paprocki & Stone, 2004). This leads to better resource allocation (Watts and Zimmerman, 1983; DeFond & Zhang, 2014), particularly in the debt market (Pittman & Fortin, 2004; Minnis, 2011; Causholli and Knechel, 2012; Hug et al., 2022).

The purpose of this study is to determine if it is accurate to say that audit adds value to the market by examining how audit affects the firm's perceived risk and its level of innovativeness in the Italian private market.

Starting with the relationship with perceived risk, the firms' Cost of Debt (CoD) will be the dependent variable analyzed. In fact, it makes sense that if auditors truly balance the information asymmetry in the market between lenders and companies, their guarantee will enable lenders to reduce their monitoring costs—that is, the costs associated with controlling the firm's management. All other things being equal, if the auditor assurance lowers the lenders' monitoring expenditures, market competition will force financial institutions to pass these cost savings on to borrowers in the form of lower interest rates and thus lower CoD.

Additionally, if it is true that Audit positively impact the firm Cost of Debt (CoD) as it signals to the market the real quality of the firms' Financial Statements, then the extent to which the auditor's activity is viewed as high-quality by the market should likewise have an effect on CoD. De Angelo (1981) found a favorable correlation between the size of the auditing firm and audit quality, indicating that the external auditors' dimensions may be a useful proxy for assessing it. As a result, I also investigated in this study if the firms' decision of being audited by a Big Four affects their own CoD in a sample that solely included audited businesses.

Finally, the second purpose of this study is that of investigating the relationship between the degree of innovation in a corporation and the quality of its audits. Although it may appear contentious because the first is associated with the solution of a financial market's failure, while innovation inherently belongs to the nature of the firm, the two are really more closely related than is often believed. According to the existing literature, companies who choose to pay for an audit service see a notable rise in debt and investments. This suggests that, in general, audited companies are able to secure significantly more funding for their projects than their non-audited counterparts. Therefore, because auditing promotes better financial transparency and trustworthiness (Healy & Palepu, 2001; Beyer et al., 2010), the auditee should have more access to finance, which will allow for higher investments in R&D and innovative projects.

Research Gap

The impact of Audit on Cost of Debt has been only sparsely studied by the literature with limited studies conducted primarily in America, Sweden, Spain and Korea.

Specifically, according to Blackwell et al. (1998), audited US companies pay an average of 25 basis points less in interest on their loans than non-audited companies. This negative effect has been also confirmed by Minnis (2011) who found that US private audited firms enjoy on average 69 basis points lower interest rates

on their debt contracts. According to research conducted by Kim et al. (2011) in the South Korean setting, the average interest cost savings from a voluntary audit range from around 56 to 124 basis points. In Europe, instead, the only two research on this phenomenon comes from Spain and Sweden. Hug et al. (2022) found that the presence of an audit could save to the Swedish private firms 47 basis points on interest rates on average, while Huguet and Gandía (2014) found a modest decline in the Cost of Debt (CoD) by 0.18% in the Spanish market. Regarding the effect that the Audit quality could have on CoD it is worth to mention the research made by Azzali and Mazza (2017) which took into consideration only the audited firms as they analyzed if the presence of a Big Four as auditor could lower the firm's CoD. As a result, there is a lack of detailed study on the possible influence of the Audit on Cost of Debt (CoD) in the Italian private sector, which has prompted me to fill that gap.

Furthermore, the Italian private debt market resulted little studied despite in my opinion it is a very interesting field as private firms are usually more constrained in terms of financing choices. Indeed, in comparison to public enterprises, private firms have limited access to capital market funding as they cannot raise funds through the stock market or issue public bonds. As a result, this constraint limits their investment capability, forcing them to rely on credit market finance and internal resources (Beck et al., 2008). Additionally, because private enterprises account for the majority of economic activity in Italy, I believe it would be highly beneficial to investigate if Audit service may be a viable option for them in terms of decreased interest payments paid on their loans.

Finally, Audit Quality and Innovation represents a completely new scenario for the research. Nobody has, in fact, carried out the same research before in Italy. Innovation over being a pivotal factor in the economic development it is also strictly linked to the overall efficiency of the financial markets. Audit, as I discussed earlier, acts as a lubricant in the financial market because without quality certification, risk-averse investors, who represent the vast majority of investors, would not participate in the market, withholding their surpluses from companies to initiate projects and sustain economic development. In this sense Audit contributes to the overall efficiency of the market which is a necessary but not sufficient condition for the Innovation.

I strongly believe that the results of this research could serve as a catalyst for others and even deeper analysis on these themes which have huge impacts for the economic growth and firms' competitiveness.

LITERATURE REVIEW

Role of External Auditors in Mitigating Information Asymmetry

External audit is an independent and objective examination of an organisation's financial statements and records by an external entity or individual. According to the ISA 200 the primary objective of an audit is 'to enable the auditor to express an opinion on whether the financial statements are prepared, in all material respects, in accordance with an applicable financial reporting framework'. Hence, the external audit assesses the accuracy and reliability of the financial information presented by the organisation, as well as the compliance with applicable laws and general accepted accounting practises (GAAP).

In the following paragraphs I attempt to recapitulate the insights provided by existing literature, focusing on two distinct yet interconnected perspectives that shed light on the role of the auditor and contribute to understanding its function in the contemporary and intricately complex world. I will begin from the ownership separation that the existing literature has identified as the main cause of the agency problem in the corporate governance. The aim of the first part of the literature is that of giving a perspective on the role of auditor in the corporate governance as the safeguard that protects shareholders from potential misalignments of their own interests with those of the management. Subsequently, I will delve into the central theme of this dissertation, that is the auditor as the entity that balances information disclosure between companies and stakeholders by minimizing the information asymmetry typical of the financial markets.

Over the past three decades, since business has seen an unparalleled rise in complexity, the role of auditing has grown dramatically (Schillemans & Van Twist, 2016). During this time, a shift in governance has occurred, moving from a focus on shareholders to a greater emphasis on managers, resulting in what is known as the separation of ownership phenomenon. The first scholars to associate the rapidly companies' growth in USA and the inevitably separation of the property from control with the agency problem were Berle and Means (1932). Although agency problems tend to be more prominent in huge organizations, the current literature has demonstrated it can also exist in smaller, equally complex organizations (Ang, 1992; Hope et al. 2012). According to Jensen and Meckling (1976) the agency relationship can be defined as 'a contract under which one or more persons (the principal(s)) engage another person (the agent) to perform some service on their behalf which involves delegating some decision-making authority to the agent'. The agency problem causes what economists call 'market failure', which is the failure of the market to deliver a Pareto optimal outcome (Stiglitz, 2000). This happens because the agency relationship imposes to the company's owner to bear costs not directly associated with the exchange of goods and services in the market. These regard monitoring costs, bonding costs, and residual loss, that are all the costs associated with the monitoring and assessing of the managers' performance and their decisions' alignment to the owner's interests (Benston, 1985). If the agent possesses more information than the principal in a situation where both parties aim to maximize profits, it results in information asymmetry. Positivist scholars have concentrated on identifying circumstances in which

the objectives of the principle and agent are likely to diverge, in order to explore the governance approaches that restrain the agent's self-serving actions. According to Jensen and Meckling (1976) the more the firm ownership is in the management hands the less the governance will be affected by managerial opportunism. On this theoretical basis, Eisenhardt (1989) formulated that the agent is more likely to operate in the principal's interests when the agreement between them is outcome-based, suggesting that the solution to the ownership separation problem could be resolved by giving stocks to the management as a part of the whole compensation. Nevertheless, management could use its power to alter the financial statement in order to boost its own compensation. This phenomenon is called ‘earnings management’ and according to Schipper (1989) it is the ‘purposeful intervention in the external financial reporting process with the intent of obtaining private gain’. In contrary, Fama (1980) saw the problem from another perspective as he stated that if the capital markets are efficient there is no need to implement any governance instruments as management will naturally behave in the best interests of shareholders. This notion is very logic because the capital markets continuously evaluate management based on the company's performance; this mechanism should motivate them to perform better and raise shareholder value. Making the capital market efficient has long been an unsolved issue, but the external auditor surely plays a crucial role in this way. In fact, it reduces the likelihood that management might override by verifying that the financial statements accurately represent the entity's "true" financial situation and operating outcomes and that they are honestly reported in accordance with GAAP. The existing literature has found that a high-quality audit is anticipated to limit opportunistic earnings management and mitigate information risk associated with material misstatements or omissions in financial reports by also improving the corporate governance quality (Beckeret al., 1998; Myers et al., 2003; Lin et al.,2006; Lin and Hwang, 2010).

Information asymmetry can have important implications for the market setting and the companies’ decision making. According to Akerlof (1970) if information asymmetry exists in the market between buyers and sellers the probability that the good products are swept away by the ‘lemons’ is very high. In fact, since the buyers cannot evaluate the characteristics of the product, they must rely solely on the price. Sellers who know they are selling a lemon are the only ones who can afford to lower the price by driving sellers of a good product, with a higher price, out of the market. The lemons problem is not only related to the exchange of second-hand goods but can be applied also to the financial markets.

My dissertation will focus on the private debt market, where a debt contract delineates the legal rights and obligations for individuals receiving financing (borrowers) and those providing it (lenders). According to Bebczuk (2003) asymmetric information in a debt contract occurs when the borrower can exploit their information advantage to the detriment of the lender as he possesses information that the lender is unaware of or does not have access to. According to the existing literature, the dynamics observed in Akerlof's lemon market parallel the behaviours exhibited by companies in the private debt market. Halov and Heider (2011) studied the private debt market in USA and found that typically companies refrain from issuing debt

instruments if the market has minimal information about them. This is highly logical because the market price of the lender's resources, namely the interest rate, generally correlates with the perceived risk of the company. In turn, this risk is directly proportional to the availability and quality of information in the market (Armstrong et al., 2010). In other words, businesses often postpone issuing debt instruments when there is an information asymmetry in the market because otherwise, they would end up paying a higher cost on their debt. The phenomenon has extensively studied in the capital market, too. In particular, Myers and Majluf (1984) stated that the companies' stock prices will eventually drop, and their cost of equity capital will rise if they decide to issue stock securities when there is a significant level of information asymmetry in the market. Such a situation can lead to a significant loss of value, discarded by the market. In fact, companies typically borrow resources from entities with surpluses, for potentially lucrative and innovative projects. In return, they aim to not only reimburse the lenders with interest but also contribute to the overall economic progress of society by generating new employment opportunities, creating new markets, fostering the competition etc. If the capital markets do not work efficiently, companies that could contribute to the economic wealth end up not receiving sufficient resources, resulting in a loss of growth for society (Stiglitz & Weiss, 1981).

The existing literature have highlighted that the audit of financial statements by an independent external auditor is a crucial factor in fostering trust in global financial systems. The process of improving the quality of their own disclosures plays a pivotal role in balancing information asymmetry between private investors/lenders and firms (Paprocki & Stone, 2004), which results in an enhancement of the resources allocation (Wattsand Zimmerman, 1983; DeFond & Zhang, 2014), especially in the debt market (Pittman & Fortin, 2004; Minnis, 2011; Causholli and Knechel, 2012; Hug et al., 2022). The intuition behind this study is that if auditor assurance decreases lenders' monitoring expenses, market competition will compel financial institutions to transmit these cost reductions to borrowers through lower interest rates, all else being equal.

The research question I address in this dissertation is thus, *'What is the influence of companies' decisions regarding undergoing Audits on their Cost of Debt in the Italian Private Market and how does it impact their Innovation performance?'*

Audit and Cost of Debt

The core idea behind the first hypothesis of my dissertation is that if lenders perceive audited information as having superior quality (Burgstahler et al. 2006), because the information asymmetry is minimized by the rigour opinion of an external and independent actor (Jensen and Meckling 1976), it may result in reduced costs of debt (CoD) for companies that present audited financial statements. Kausar et al. (2016) observed that, generally, firms, which voluntarily pay an audit service, experience a significant increase in their debt,

investment, and operating performance, suggesting that audited firms are generally able to collect much more resources for their projects compared to their non audited peers.

According to Clatworthy and Peel (2013) the likelihood of accounting errors in private companies' unaudited financial statements is twice compared to those companies whose financial statements have been audited. The existing literature commonly agrees that the variability in the quality of accounting information is effectively reflected by the private debt pricing, suggesting that financial institutions take in consideration the high-quality standards of the borrowers' financial statement when formulating debt contracts (Bharath et al., 2008; Spiceland et al., 2016; Baylis et al., 2017). Empirical studies validated the negative relationship between audited financial statements and the Cost of Debt (CoD) at which companies borrow financial resources (Blackwell et al. 1998; Minnis 2011; Kim et al. 2011; Huguet & Cabedo, 2014; Huq et al., 2022).

Even if the existing literature is robust on the negative effect that the external audit has on the interest rate of credit agreements, the size of the effect differs from one study to another. Sequentially, Blackwell et al. (1998) found that audited firms pay, on average, 25 basis point less in terms of interest rate on their loans than non-audited firms. Additionally, they stated that this benefit decreases as the size of the company increases. For example, they estimated a company with one million in total assets could save up to 40 basis points by hiring an external auditor, whereas a company with five million in total assets would only save 12 basis points. According to Minnis (2011) lenders utilize information from audited financial statements more extensively than those from non-audited accounting statements in the debt pricing process. This is evident in the fact that US private audited firms enjoy on average 69 basis points lower interest rates on their debt contracts. Particularly noteworthy is Minnis' additional finding, namely banks offer lower interest rates to audited firms because their cash flows are more predictable than those of non-audited firms, all else being equal. As per Kim et al. (2011), who investigated this phenomenon in the South Korean context, the average interest cost saving resulting from a voluntary audit varies from approximately 56 to 124 basis points. Finally, while Huguet and Gandía (2014) identified a modest decline in the Cost of Debt (CoD) by 0.18% in the Spanish market, Hug et al. (2022), found that on average, the presence of an audit, could lead to a saving of 47 basis points on interest rates for Swedish private firms, aligning closely with prior research findings. As demonstrated by the previous literature, the results are significantly influenced by the particular regulatory context in which the research is conducted, and the specific sample of companies chosen by the researcher.

Therefore, my initial hypothesis is:
H1: *Audited firms are expected to exhibit a lower cost of debt compared to non-audited firms in the Italian private market, all else being equal.*

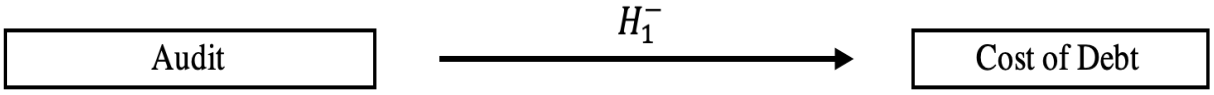

Figure 1 Hypothesis One Theoretical Framework

The dominance of Big Four in the Auditing sector and their role on mitigating the Cost of Debt

The financial audit market is largely dominated by the Big Four accounting firms, namely Deloitte, EY (Ernst & Young), KPMG, and PricewaterhouseCoopers (PwC). In this paragraph, I attempted to summarize the existing literature on how the Big Four firms have defended their supremacy's position for over a century by adding value to the market; why they are expected to provide higher quality services; and what is the effect of their audit opinions on the Cost of Debt (CoD) of the firms. The rationale behind the second hypothesis is that established companies, such as Big Four, with a strong market reputation, skilled workforce, and advanced audit software, provides higher assurance with their services, and are associated with higher audit quality.

One of the most referenced definitions of audit quality in the literature is the one given by De Angelo (1981), who defines it as the 'market-assessed joint probability that a given auditor will both (a) discover a breach in the client's accounting system, and (b) report the breach'. In other words, audit quality is the level of assurance that all the potential material misstatements have been considered by the external auditor in the audit procedures. Companies encounter a significant challenge when selecting an external auditor due to the inherent unobservability of audit quality. Hence, over time, the literature has extensively examined this aspect and endeavored to identify proxies for assessing it.

According to De Angelo (1981) audit quality is positively correlated with the size of the auditing firm, suggesting that the dimensions of the external auditors serve as a suitable proxy for evaluating it. Dopuch and Simunic (1980) provide a logical rationale for this, proposing that larger external auditors have a greater reputation to protect; this imperative compels them to maintain a stronger independence from their clients compared to smaller audit firms. Specifically, previous literature has documented that Big Four audits correlate with reduced levels of discretionary accruals (Becker et al., 1998; Francis et al., 1999), an increased likelihood of issuing modified audit reports (Francis & Krishnan, 1999), and the provision of more indicative signals of financial distress (Lennox, 1999).

Although it may seem controversial, even the level of audit fees has been considered in the literature as a credible proxy for audit quality, as it positively impacts the level of independence that auditors maintain with the auditee (DeFond et al., 2002). The rationale behind this is that higher audit fees necessitate greater effort from auditors to justify the higher costs for the shareholders, thereby potentially leading to higher audit quality (DeFond & Zhang, 2014; Moon et al., 2019). Historically, Big Four were able to charge a premium to the client on their audit fees compared to the other auditing firms, suggesting that Big Four's audit services should be characterized by higher quality (Van Caneghem, 2010; Campa, 2013).

Dye (1993) and Donohoe and Knechel (2013) found that large audit firms exhibit higher accuracy in their audits due to the substantial financial stakes involved in potential litigation. The risk of encountering a legal action has recently increased due to a significant tightening in regulatory pressure on audit firms (Kinney, 2005; O'Regan, 2010). While on one hand, this legislative shake-up has indeed enhanced audit quality, it has disproportionately benefited the Big Four firms, which are more likely to meet quality standards through substantial investments in software development and recruitment efforts (Francis, 2011; W. R. Knechel et al., 2013).

Che et al. (2020) conducted an analysis on the Big Four effect, focusing on the human resources aspect. They identified three sources supporting the idea that Big Four audit firms provide audits of superior quality compared to non-Big Four firms. Firstly, they observed that Big Four offices tend to have higher quality personnel due to the appeal of their brands among graduate students and the implementation of advanced recruitment procedures. These two factors enable them to identify and recruit individuals who are more motivated, better educated, and possess higher innate abilities. Secondly, in comparison to other auditing firms, Big Four offer more resources to new joiners to excel, including larger network of experienced people for daily consultation, opportunities for continuous learning, and infinite carrier possibilities around the world. Thirdly, the authors argued that given the larger client base of Big Four firms, the importance of each individual client diminishes, thereby reducing partners dependence on any single client.

Hence, the existing literature is robust on the idea that Big Four, for the reasons outlined above, typically possess extensive in-house experience in conducting audits which translates into reports of higher audit quality compared to those produced by non-Big Four firms. This phenomenon is not merely a theoretical suggestion, but it has important practical implications in the market. Nichols and Smith (1983) and Kluger and Shields (1991) observed that when a firm switches from a general auditing firm to a Big Four auditor, its stock price is seen to appreciate, suggesting that auditor selection significantly influences the trustworthiness of investors. According to the existing literature, whose most prominent papers analyzed the US public debt market, the Big Four effect translates into a lower cost of debt for the auditees (Pittman & Fortin, 2004; Mansi et al., 2004; Kim et al., 2007). Specifically, Pittman & Fortin (2004) and Kim et al. (2007) discovered that public US firms

with Big Four auditors experience a decrease in the interest rate on their bank loans. Mansi et al. (2004), who focused its analysis on the fixed income market, found that Big Four audits are negative related with the bonds yield (the correlation becomes more significant for high-risk firms). Furthermore, multiple studies indirectly ended up to the same result. For example, Chu et al. (2009) conducted an analysis on the US listed companies' CoD but they replace the Big Four variable with industry expertise. According to their results Cost of Debt is negatively related with auditor's industry expertise. We could also consider the Dhaliwal et al. (2008) outcomes in line with the Big Four effect literature as they found that the Cost of Debt is negatively affected by the audit fees level, which are higher for the Big Four clients. Additionally, evidence from Francis et al. (2005) and Bharath et al. (2006) studies suggest that public firms audited by a Big Four present higher-quality accruals, and this quality is associated with a lower cost of debt capital for the auditees.

Nevertheless, the literature results less robust on the Big Four audit quality differentiation in the European private market. In fact, although studies from Spain (Arnedo-Ajona et al., 2008) and Norway (Che et al., 2020) suggest that appointing a Big 4 auditor should enhance the quality of financial reporting for private firms, multiple other studies fail to establish a significant correlation between auditor selection and financial reporting quality (Gaeremynck et al., 2008; Huguet & Gandía, 2016; Ojala et al., 2014). Regarding the debt market, there are only a limited number of studies which analyze the relationship between auditor and Cost of Debt (CoD). Generally, the scholars agree that the influence of the Big Four increases in environments with high tax alignment, and that their audits provide valuable information for lenders when pricing private debt contracts (Van Tendeloo & Vanstraelen, 2008; Cano-Rodríguez et al., 2008). For instance, Gul et al. (2013) analyzed data from 30 countries spanning the years 1994 to 2006 and discovered that firms audited by BigN auditors experience reduced costs of debt, particularly in nations with robust investor protection regulation. According to Karjalainen (2011) Big Four audits negatively affect the Cost of Debt of auditees in the private Finnish market. What is interesting is that in Europe, the significance of the auditor's opinion is less pronounced compared to the United States in lenders' decision-making processes. This suggest that the reputation of the auditor could hold greater importance than the specific content of the audit opinion in the European private debt market (Karjalainen, 2011).

Hence, drawing from the previous literature my second hypothesis is:
H2: *Firms opting for auditing services from a Big Four accounting firm enjoy lower cost of debt compared to firms that are audited by others, all else being equal.*

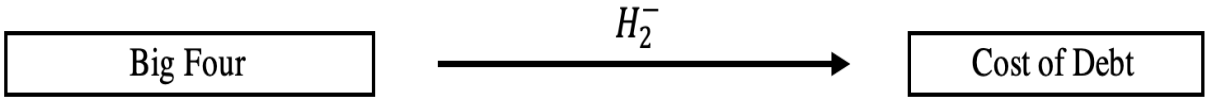

Figure 2 Hypothesis Two Theoretical Framework

Audit Quality and Innovation

According to Solow (1956) technological innovation plays a pivotal role in the long-term economic growth of firms and, more in general, nations. As emphasized earlier, auditing, bridging the gap between firms and capital providers, is fundamental in facilitating the efficient flow of surpluses within financial markets. Hence, it does not merely regards approving financial statements, but auditors preserve the public interest and their action have an impact across various facets of the well-being of an economic system (Knechel et al., 2020). In this paragraph I explore the relationship between the quality of financial reporting and the innovation capabilities of a firm.

Innovation is a multi-stage process, which encompasses the exploration of novel technologies and methodologies that are frequently untested and carry a significant risk of failure (Wolfe, 1994). The concept of it has evolved significantly since Schumpeter's initial definition, and today innovation comprises a myriad of different definitions and theoretical perspectives. Some schools of thought view this phenomenon as a deliberate outcome resulting from the purposeful intent of the company (Nelson & Winter, 1982); conversely, Porter and Stern (2001) argue that each innovation inherently stems from serendipitous origins. According to Damanpour (1996) innovation is a mechanism through which company transform itself, whether in response to shifts in the external environment or as a proactive measure to shape its environment. Although existing literature clearly acknowledges the advantages of innovation, a universally accepted definition remains elusive. Generally, scholars agree on recognizing exploitation and exploration as the two primary ways through which companies innovate. Pisano (2015) demonstrated that innovation manifest through four different variants, according to the specific industry and company's attitude, namely disruptive, architectural, routine, and radical. The distinction between these latter lies in the specific approach taken by the company: some enterprises, in fact, innovate incrementally by gradually improving existing organizational processes, products, or manufacturing technology (exploitation); on the contrary, others completely transform the market by introducing new business models and disruptive technologies (exploration). Controversial, instead, is the position of ambidextrous companies, which are capable of simultaneously pursuing both incremental and disruptive innovation (Tushman & O'Reilly, 1996). Building upon previous studies on the relationship

between innovation and audit quality I will pragmatically define innovation with the capacity of the company to patent its inventions.

Historically, scholars have strived to identify the factors that drives innovation, sparking the discussion on theorizing a universal framework that can assist companies in generating new value in the market through innovation. It is generally accepted by the literature that innovation is positively affected by the size of the firm. Larger firms, in fact, find it easier to establish and sustain a distinct organizational culture based on trust, community and sense of belonging, which trigger human innovation capabilities. One of the main determinants of a firm's innovativeness, in fact, is undoubtedly the ability of individuals to share their knowledge within the organization that is a process largely driven by the organizational culture and investment capacity of the firm (Adams et al., 1998; Darroch & McNaughton, 2002; Taminiau et al., 2009). My dissertation considers the firm's ability to collect financial resources in the market as primary factor of the firm's innovativeness level. In fact, when a firm has substantial resources at its disposal, it can invest more in research and development, cultivate a culture that embraces failure as a learning opportunity, train its workforce effectively, and establish an advanced information technology system for storing and disseminating knowledge (Popov & Roosenboom, 2009; Amess et al., 2016).

The efficient resource allocation in the capital markets strongly depends on the precision with which managers identify and evaluate cash flow prospects (Neamtiu et al., 2014). The inherent unpredictability of innovation makes it exceedingly challenging for capital providers to forecast future cash flows accurately, resulting in a market imperfection where innovative firms often fail to secure financing for all of their positive net present value projects (Mazzucato, 2013). The logic behind the third hypothesis is that, since the literature strongly agree on the fact that audit quality facilitates the firm financing capacity (Choi & Wong, 2007; Chang et al., 2009), both on equity and debt side, it should even improve the level of innovation of the firm. In fact, as auditing fosters greater financial transparency and credibility (Healy & Palepu, 2001; Beyer et al., 2010), the auditee should be empowered with increased access to capital, thereby enabling greater investments in research and development, and innovative initiatives.

Despite the absolute logical clarity of this notion, the empirical findings have been inconclusive and inconsistent as the limited number of studies addressing this topic does not allow to create an hard core in the literature regarding this matter. The discrepancy arises from the context in which the research was conducted, and the proxies utilized to evaluate both audit quality and the level of innovation. For instance, Park (2018) used as audit quality proxy the quantity of discretionary accruals and conducted his research on US firms which registered patents from 1976 to 2006. He found that the higher quality financial reporting is positively related with firm innovation. Litan et al. (2024), in their study focusing on Chinese listed firms, utilized going concern opinions as a proxy for audit quality. Their findings revealed compelling evidence that higher audit quality positively impacts firm innovation. In contrast, Nguyen et al. (2020), who collected data in the US

market from 2000 to 2009 employed a dummy variable distinguishing between Big Four and non-Big Four audit firms as a proxy for audit quality. They surprisingly found that audit quality negatively affects the firm innovation level. A possible explanation for this opposite outcome could be that audit quality increases moral hazard costs of innovation, instead of decreasing it. In fact, it has been demonstrated that firms with high audit quality tend to attract more short-term investors, who base their trading decisions primarily on current or short-term earnings rather than long-term fundamentals. As a result, the management of these firms is more prone to increase current earnings by reducing R&D costs (Porter, 1992).

Hence, the third hypothesis that I test in my dissertation is:
H3: *Companies audited by Big Four accounting firms demonstrate greater levels of innovation compared to companies audited by non-Big Four firms.*

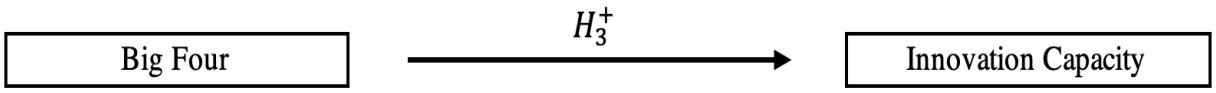

Figure 3 Hypothesis Three Theoretical Framework

RESEARCH DESIGN

In the subsequent paragraphs, I will explain my data collection strategy and methodological approach. I will delineate the sources from which I collected data, as well as the criteria I employed to select my sample. Additionally, I will outline the rationales behind the choice of the variables incorporated in my model and the specific analyses conducted.

Data Collection

The data for this study were collected from the AIDA database, which holds corporate information for all registered limited liability firms in Italy, encompassing both listed and non-listed entities.

In the following paragraph I will explain the restrictions that I imposed to the sample.

Firstly, I focused my research exclusively on unlisted medium and large Italian companies within the Industrial, Commercial and Services (ICS) sector. I deliberately excluded financial enterprises, whose operations heavily rely on liquidity operations of lending and borrowing, and their Cost of Debt (CoD) determination differs significantly from the other firms. Next, I refined my sample further by selecting only the top quartile of companies based on their Total Assets and Tangible Assets. This decision reflects my desire of having companies with a homogeneous capital structure and business model since these latter could affect the Cost of Debt determination. Additionally, I removed all firms with unreported Financial Statements from 2019 to 2022 as well as companies with unknown values for the variables considered in my model.

Sample Selection		
Legal Status:	Active	**1.706.627**
Type of Company:	ICS	**1.369.076**
Unlisted Firms:	Yes	**1.368.700**
Financial Statements:	2014-2022	**1.241.425**
Tangible Assets:	Top Quartile	**310.321**
R&D Expenses:	Top Quartile	**46.497**
Total Assets:	Top Quartile	**11.737**
Number of Patents:	Min 1	**6.300**
Model's Variables:	Only Known Values	**2.341**

Figure 4- Sample Selection

The sample restrictions mentioned above narrow down the scope of my analysis to 2,110 Italian firms, which is completely in line with the sample dimensions used by the previous literature.

As I will explain later, the sample was manipulated for testing the second Hypothesis. Indeed, this latter focused exclusively on audited firms, which constitutes the 84.17% of the original sample, namely 1,776 firms.

Variables Definition

Given the structure of my research, I employed three distinct models to test the three hypotheses even though the variables considered will be the same across all of them. In fact, the first hypothesis' test, which necessitated the use of the entire sample, required a different regression model compared to the second hypothesis one that was specific only for audited firms. The test of the third hypothesis, instead, has involved a reversal of the dependent and independent variables as I conducted an analysis to determine whether the quality of the Financial Statements affects the firm's capacity to innovate.

In the subsequent paragraphs, I will define the variables selected from existing literature to construct my three models, along with the type of analysis adopted. To begin, I will explain the measures I have adopted as proxies for the two dependent variables essential for testing the First/Second and Third hypotheses: Cost of Debt (CoD) and the firm's Patents Value (PV).

Compared to the traditional proxy discussed in the previous, which calculates the Cost of Debt (CoD) by dividing the firm's external interest expenses with its total debt (Blackwell et al., 1998; Minnis, 2011; Kim et al., 2011; Huguet & Cabedo, 2014; Huq et al., 2022), I have decided to utilize the CoD data, directly provided by the AIDA database. This approach deviates from the traditional proxy in absolute terms, however I confirmed that it maintains relative consistency with the literature's proxy. In other words, if one firm exhibits a higher CoD when calculated using the traditional method compared to another firm, this is also reflected in the CoD values provided by the AIDA database.

The second dependent variable, i.e., the firm's registered Patents Value (PV), encompasses the value of all the patents registered by the firm since its inception. There are dozens of proxies on how to measure innovation, and from which proxies are found in the literature, I assumed that from all of them, this one will be the most linear, easily measurable, and understandable. According to Encaoua et al. (2006) intellectual property rights offer both valuable qualitative and quantitative insights into the firm's technological advancements. Indeed, for an invention to be registered, it must demonstrate applicability, novelty, and non-obviousness. Furthermore, the firm's innovation capacity can be measured by the quantitative aspect of the value of patents it has

registered over time. Certainly, I acknowledge the potential limitations of this measure, which I will thoroughly discuss in the research's limitations paragraph. However, it is important to note, at this point, that by selecting this measure, I assumed that patents were consistently registered by the firm over time.

For the independent variable regarding the First Hypothesis, I have adopted the same dummy variable utilized by the previous literature, that is a variable named "Audit," which assumes a value of 1 if the firm has chosen of being audited and 0 otherwise. This variable serves as a proxy for the presence of external assurance mechanisms represented by the external auditor and its potential impact on the Cost of Debt (CoD) and the Patents Value (PV) of the firm. Instead, for the Second and the Third Hypothesis, which focus exclusively on audited firms (those with the Audit variable equal to 1, I have utilized another dummy variable named "Big Four." This variable assumes a value of 1 if the firm is audited by one of the Big Four accounting firms and 0 if not.

In relation to the control variables, I collected all those used in the previous studies concerning the impact of auditing on the firm financial performances. Subsequently, I conducted preliminary tests to determine the variables that exerted a more pronounced impact on the Cost of Debt (CoD). In the final model, following Minnis (2011), Kim, et al. (2011), Koren et al. (2014), and Huq et al. (2022), I included Interest Coverage Ratio (ICR), Property, Plants and Equipment share (PPE_share), log of Total Assets (Ln_TA), Leverage and Return on Assets (ROA).

The ICR is calculated as Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA) divided by Interest Expense. A higher ICR implies that the firm is more capable to meet its interest obligations, thus indicating lower liquidity risk and in turns a lower CoD.

The Property, Plants, and Equipment share (PPE_share) is determined by the percentage of Property, Plants, and Equipment in relation to the Total Assets owned by the firm. The inclusion of PPE_share and Log_Tot_Assets in the model follows the same rationale: the use of Total Assets, in particular the Tangible ones, as collateral in credit agreements. A higher proportion of Tangible Assets implies that the firm can offer more collateral to lenders, thereby reducing its credit risk, and in turns its CoD. The decision to employ the natural logarithm of Total Assets comes from its efficacy in handling datasets that vary significantly in magnitude. In fact, through its mathematical properties I could compress the scale and make patterns easier to discern.

Additionally, it is quite logic that the more a firm leverage on debt to finance itself compared to equity, the greater the associated risks, which in turn positively affect the CoD. I utilized the Leverage ratio directly sourced from the AIDA database, which I confirmed is equivalent to Total Assets divided by Equity.

Return on Assets, instead, measures how much the assets owned by the firm produce in terms of revenues and the logic behind the use of this metric as a control variable is straightforward: the more profitable and efficient a firm is, the greater its resources to fulfill its financial obligations.

Following the approach of Azzali and Mazza (2017), who have carried out an analysis on Big Four in Italy, I have also included Current Ratio (CR) and Size of the firm proxied by the Sales. Current Ratio (CR) assesses a company's capacity to meet its short-term liabilities with its current assets. It has been found by Blackwell et al. (1998) that the Size of the firm is negatively associated with financial risks. Both of these control variables are expected to be negatively related to the CoD of the firm. The firm's degree of independence is the newest variable I have added to my arsenal of control variables; this is a component that has not been used in research of this kind before. The AIDA database is the source of this statistic, and its inclusion is justified by the idea that a company's level of autonomy in making decisions is strongly correlated with its level of independence. A more autonomous business is probably going to give top priority to initiatives that help it reach its primary goals of financial commitments and profitability.

Variables Definitions

Category	Variable	Definition	Proxied by AIDA
Dependent Variables	Cost of Debt (CoD)	The interest rate for year 2022 is calculated by dividing the interest expenses incurred during that year by the average of the interest-bearing debt at the beginning and end of the year 2022,	Yes
	Patents Value (PV)	It represents the value of patents granted to a particular entity within a defined timeframe.	Yes
Independent Variables	Audit	Dummy variables which takes on a value of 1 if the firm has chosen to undergo voluntary auditing and 0 if not	No
	Big Four	Dummy variables which assumes a value of 1 if the firm is audited by one of the Big Four accounting firms and 0 if not	No
Control Variables	Interest Coverage Ratio (ICR)	It is calculated as Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA) divided by Interest Expense	Yes
	PPE_share	It is determined by the percentage of Property, Plants, and Equipment in relation to Total Assets	No
	Log_TA	It is calculated as the natural logarithm of the firm's Total Assets	No
	Leverage	It is calculated as the firm's Total Assets divided by its Equity	Yes
	ROA	It is calculated by dividing the company's Net Income by its Total Assets.	Yes
	Current Ratio (CR)	It is calculated by dividing a company's current assets by its current liabilities.	Yes
	Size of the Firm	I proxied the Size of the Firm with the amount of Revenues	No
	Level of Independence of the Firm	It refers to the degree to which a company operates autonomously and without undue influence from external factors.	Yes

Figure 5 Variables Definition

Empirical Models

As I anticipated in the previous paragraph, I adopted three models more or less similar to test the three Hypothesis. Specifically, I decided to employ an Ordinary Least Squares regression (OLS) analysis while the existing literature used an Endogenous Switching model (ES). In fact, despite the ES method might seem more appropriate for this type of analysis, given that the decision of firms to undergo a Financial Statements audit could be influenced by factors such as the amount of debt, and indirectly, the Cost of Debt (CoD), in the Italian private market the only one experiment, carried out by Azzali and Mazza (2017), employed OLS method. This latter is surely more straightforward and easier to interpret compared to more advanced methods like ES and provides a solid foundation for understanding the relationships between variables without introducing to much complexity. I strongly believe my choice does not impact to much the quality of the results. Indeed, for a master's thesis which aims to lay the groundwork for future and more accurate research on this topic, OLS regression can be a suitable choice in terms of simplicity and robustness of the outcomes.

The final regression equation come from different studies, in fact even if it is very similar to the one used in ES method by Minnis (2011) and Hug et al. (2022) I inserted different control variables as the Italian private debt market structure is different from the American and Swedish one.

Hence, for testing the first Hypothesis the regression equation is:

$$Cost\ of\ Debt\ (CoD) = \beta_0 + \beta_1 Audit + \beta_2 ICR + \beta_3 PPE_{share} + \beta_4 Log_{TA} + \beta_5 Leverage + \beta_6 ROA + \beta_7 CR + \beta_8 Size + \beta_9 Independence$$

To test the second Hypothesis, I used the same model, but I replaced the Audit dummy variable with the Big Four one:

$$Cost\ of\ Debt\ (CoD) = \beta_0 + \beta_1 BigFour + \beta_2 ICR + \beta_3 PPE_{share} + \beta_4 Log_{TA} + \beta_5 Leverage + \beta_6 ROA + \beta_7 CR + \beta_8 Size + \beta_9 Independence$$

Finally, to test the third hypothesis, I changed the dependent variable CoD with Patents Value (PV). As I will detail in the next section on findings and discussion, I investigated the impact of both Audit and Big Four dummy factors on the firm's innovativeness capability. The regression equations for the two will be as follows:

$$Patents\ Value\ (PV) = \beta_0 + \beta_1 Audit + \beta_2 ICR + \beta_3 PPE_{share} + \beta_4 Log_{TA} + \beta_5 Leverage + \beta_6 ROA + \beta_7 CR + \beta_8 Size + \beta_9 Independence$$

$$Patents\ Value\ (PV) = \beta_0 + \beta_1 BigFour + \beta_2 ICR + \beta_3 PPE_{share} + \beta_4 Log_{TA} + \beta_5 Leverage + \beta_6 ROA + \beta_7 CR + \beta_8 Size + \beta_9 Independence$$

RESULTS AND DISCUSSION

In the following paragraphs, I will summarize the findings of my research. I will specifically look at the descriptive statistics for each variable in the three different tests first. After that, I'll use regression analysis and correlation matrices to examine the connections between these variables. This chapter will conclude with a discussion of my preliminary hypotheses and potential reasons for these results.

Descriptive Statistics

In this discussion, I aim to explain the consequences of the sample's restrictions on the variables within my three models.

The First Hypothesis was tested using a sample comprising 2,110 firms. Notably, the natural logarithm of Total Assets exhibits considerable values. This can be noted by a robust mean of 5.01 alongside a notably low standard deviation. This phenomenon arises from my deliberate choice to refine the sample, opting solely for the top quartile of the firms based on Tangible Assets. Consequently, the resulting sample predominantly consists of industrial companies, deviating from the broader spectrum that included both industrial firms and service providers which have surely different Cost of Debt determination. This deviation is further confirmed by the PPE_share variable, which shows a consistent mean of 0.25 and aligns closely with typical figures observed in Italian manufacturing firms, alongside a notably low standard deviation (Azzali & Mazza, 2017). Although the considerable range of the Current Ratio of 7.92, the robust mean of approximately 1.45 indicates that the outlier, represented by the maximum value, is only an aberration that will not significantly impact the findings. Important to highlight is the overall adequacy of firms' resources, evident from the positive mean and minimal standard deviation, because it suggests a sample where firms maintain a consistent balance between current assets and liabilities, thus reducing noise around the CoD, which could otherwise be influenced by extraneous factors. Despite the enforced homogeneity in business models, driven by the selection criteria of Tangible Assets, has strongly influenced the first two variables, the Leverage data have been only slightly affected. In fact, the Leverage goes from -204.19 to 250.59, with a mean of 4.85 and a standard deviation of 9.85. These findings point to a fully sample of indebted and overdebted companies. Eight organizations have more obligations than assets, which leads to negative equity and, as a result, negative leverage. This is the reason for the negative valuations. Because these outliers have such a small weight in the sample of 2,110 enterprises, their effects on the overall results should be negligible. The Return on Assets (ROA) exhibit a moderate dispersion in the sample, showing values ranging from -24.15 to 90.38 with a mean of 4.90 and a standard deviation of 6.05. Although the range statistic is about 114.53, I strongyl believe the

selected sample provides a good approximation of reality as the 95% of the sample falls within -2% and 10%, which is in line with the previous literature in Italy.

As I explained earlier, in the section dedicated to the variables' definition, the independence level is a indicator provided by AIDA. Notably, within the considered sample, this ratio shows a mean of 0.65 and a standard deviation of 0.71. This indicates that the majority of firms in the sample possess a similar Ownership Structure, a variable underscored by Azzali and Mazza (2017) as a control variable and according to Prencipe et al (2011) essential for comprehending the Italian private market dynamics. According to Aslan and Kumar (2012), shareholders weigh the private benefits of control against higher borrowing costs when determining their ownership structure as this latter hugely affects the Cost of Debt determination. Having a sample that is relatively uniform in this variable is crucial to ensure the quality of the results. In fact, by minimizing the variability, triggered by the presence of other factors that could influence the determination of the Cost of Debt, we effectively reduce noise, and in turns, enhance the consistency and reliability of the results obtained.

Sales data were extracted from the 2022 financial statements of firms, and figures are reported in thousands of euros. As indicated in the table below, no specific restrictions were applied to the sample except for those previously mentioned, which I want to underline indirectly impact sales figures, too. Consequently, to this decision, we observe a very high standard deviation, with the sample's mean sales amounting to 145 million EUR.

The independent variable used to test the first hypothesis is "Audit," a dummy variable with a value of either 1 or 0. The sample mean for this variable is 0.84, which indicates that 84% of the organizations that were included have undergone an audit from an outside auditing firm. This percentage is in perfect compliance with the sample limitations since Italian law requires a company to hire an outside auditor if it exceeds one of the following levels for two years in a row: Four million euros in total assets, one million euros in sales, or more than twenty workers. All of the studies that have been evaluated in the literature have used the Interest Coverage Ratio (ICR) since it is thought to be a key factor in determining the Cost of Debt (CoD). In fact, a financial institution typically begins assessing a company's credit risk by examining how well it has covered its interest expenses in the past. In the sample analyzed, the ICR values are quite dispersed, with a mean of 19.22% and a high standard deviation of 31.43.

I anticipate here, but delve into in more details later, that mandatory audit requirements could bias the finding of my research. In fact, the sample comprises of both legally mandated and voluntary auditing firms. Ideally, I would have examined a sample of only those companies that voluntairily choose to be audited by an external subject in order to properly evaluate the impact of auditing decision on their CoD. This is a problem in the Italian market, because since small and medium-sized companies frequently consider audits to be superfluous

expenses, it may be challenging to compile a substantial sample of firms selecting only those that freely decide to deliver their Financial Statements to an external firm for an independent audit.

I found a similarly wide range for the dependent variable, the Cost of Debt (CoD), which is consistent with the prior observations made about other financial variables like the Current Ratio (CR) and Interest Coverage Ratio (ICR). To be more precise, the Italian industrial enterprises that I selected paid an average of 3.64% in cost of distribution (CoD), with a standard deviation of 2.94. Given that 2022 was the year prior to the interest rate rises, it is reasonable assuming that 95% of the sample in that year reported a CoD range from 0.70% to 6.58%.

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Log_Tot_Assets	2110	2.18131111	4.41292814	6.59423925	5.01293377	.006664527	.306133290	.094
Current_Ratio	2110	7.92	.03	7.95	1.4488	.01585	.72804	.530
Leverage	2110	454.78	-204.19	250.59	4.8574	.21450	9.85281	97.078
PPE_share	2110	.990627629	.000463651	.991091280	.246024655	.004857098	.223109517	.050
Return_on_Assets	2110	114.53	-24.15	90.38	4.9056	.13191	6.05939	36.716
Independence_level	2110	12.89	-.91	11.98	.6533	.01535	.70520	.497
Sales	2110	6763833.10	1877.90300	6765711.00	145360.183	6920.12031	317873.902	1.010E+11
Audit	2110	1	0	1	.84	.008	.386	.149
Interest_Coverage_Ratio	2110	398.15	.02	398.17	19.2199	.68422	31.42936	987.805
CoD	2110	19.30	.08	19.38	3.6362	.06405	2.94206	8.656
Valid N (listwise)	2110							

Figure 6 First Hypothesis Descriptive Statistics

The second hypothesis was tested using a subset of only audited firms, whose dimension is 1,776 firms. Personally, I expect that this sub-sample will also exhibit the same structural features as previously described, with regard to the overall mean values and the dispersion of the variables.

However, the first distinction relates to leverage: in reality, the overall degree of indebtedness in this second sample resulted significantly higher than the initial sample. The mean for Leverage in this sub-sample is approximately 5.65, and the standard deviation is higher, suggesting that the dispersion within the second sample is greater compared to the initial one. As discussed in the literature review, numerous studies, affirm that auditing enhances resource allocation, particularly in the private debt market (Wattsand Zimmerman, 1983; Causholli and Knechel, 2012; DeFond & Zhang, 2014). The data from the two descriptive tables below seem to support this assertion. Indeed, in the first sample, firms have a lower Indebtedness ratio, indicating that on average they rely less on external debt.

Furthermore, the subsample of audited firms has shown a higher Return on Assets (ROA) compared to the initial set, that amounts to 4.95, with a higher compression around the mean (i.e. lower standard deviation). These preliminary findings suggest that audited firms are, on average, more efficient in utilizing their assets, a quality that is well-valued by the market, that in turns allocates more resources to them.

The independent variable, which records the presence of a Big Four auditor, shows a mean of 0.33. This indicates that only 33% of the sample is audited by one of the Big Four auditing firms—namely EY, Deloitte, PwC, or KPMG. This percentage does not align well with the market share typically declared by these four auditing firms, which could represent another limitation of this research.

It is important to underline and deepen it later on an initial finding even if still rough: when switching from the sample used for the first hypothesis to this subset of audited enterprises, the Cost of Debt (CoD) drops by around 0.13%, from 3.64% to 3.50%, while the standard deviation stays stable. This remark emphasizes the possible influence of audits on the firm's financial indicators, such as the cost of debt.

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Log_Tot_Assets	1776	2.18132778	4.41291136	6.59423914	4.99104555	.007132257	.300571978	.090
Current_Ratio	1776	7.92	.03	7.95	1.4366	.01755	.73942	.547
Leverage	1776	282.15	-31.56	250.59	5.6461	.28885	12.17309	148.184
PPE_share	1776	.991072984	.000018296	.991091280	.249330597	.005512977	.232331258	.054
Return_on_Assets	1776	96.05	-5.67	90.38	4.9453	.13086	5.51477	30.413
Independence_level	1776	12.89	-.91	11.98	.6374	.01673	.70498	.497
Sales	1776	6764321.93	1389.07300	6765711.00	128815.700	7385.31012	311236.281	9.687E+10
Big4	1776	1	0	1	.33	.011	.472	.223
Interest_Coverage_Ratio	1776	382.30	.02	382.32	17.6283	.66556	28.04861	786.725
CoD	1776	18.65	.08	18.73	3.5017	.06721	2.83257	8.023
Valid N (listwise)	1776							

Figure 7 Second Hypothesis Descriptive Statistics

I divided the third hypothesis into two separate tests because I wanted to analyze the dual indirect effects of Audit and Big4 on the firm's level of innovation, which is proxied by the value of patents on their balance sheet. Essentially, the procedure involved using the two different samples previously utilized for the first two hypothesis tests, while changing the dependent variable from Cost of Debt (CoD) to patent value.

In the first sample, the mean of Patents Value is EUR 551,699.00, which is substantial and aligns with the selection of the sample based on the top quartile of Total Assets. Logically, larger firms tend to have greater resources for innovation and, consequently, more opportunities to secure patents. Nevertheless, this statistic is not robust because there is a dramatic dispersion of data around the mean, evidenced by the fact that the standard deviation is approximately five times the mean value.

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Log_Tot_Assets	2110	2.18131111	4.41292814	6.59423925	5.01293377	.006664527	.306133290	.094
Current_Ratio	2110	7.92	.03	7.95	1.4488	.01585	.72804	.530
Leverage	2110	454.78	-204.19	250.59	4.8574	.21450	9.85281	97.078
PPE_share	2110	.990627629	.000463651	.991091280	.246024655	.004857098	.223109517	.050
Return_on_Assets	2110	114.53	-24.15	90.38	4.9056	.13191	6.05939	36.716
Sales	2110	6763833.10	1877.90300	6765711.00	145360.183	6920.12031	317873.902	1.010E+11
Independence_level	2110	12.89	-.91	11.98	.6533	.01535	.70520	.497
Audit	2110	1	0	1	.82	.008	.386	.149
Interest_Coverage_Ratio	2110	398.15	.02	398.17	19.2199	.68422	31.42936	987.805
Patents	2110	70286.4900	1.02500000	70287.5150	551.699294	55.2073340	2535.93433	6430962.922
Valid N (listwise)	2110							

Figure 8 Third Hypothesis Descriptive Statistics – First Sample

The first preliminary result comes from the descriptive statistics table below, which focuses on the second sample, which only includes audited enterprises, and shows that the mean Patents Value (PV) is larger than in the first sample. This shows that conducting an audit might have an impact on a company's degree of innovation via improving resource allocation. However, similar to the previous sample, the data for the dependent variable remain substantially distributed around the mean, demonstrating significant variation in Patents Value between organizations.

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Log_Tot_Assets	1776	2.18132778	4.41291136	6.59423914	4.99104555	.007132257	.300571978	.090
Current_Ratio	1776	7.92	.03	7.95	1.4366	.01755	.73942	.547
Leverage	1776	282.15	-31.56	250.59	5.6461	.28885	12.17309	148.184
PPE_share	1776	.991072984	.000018296	.991091280	.249330597	.005512977	.232331258	.054
Return_on_Assets	1776	96.05	-5.67	90.38	4.9453	.13086	5.51477	30.413
Sales	1776	6764321.93	1389.07300	6765711.00	128815.700	7385.31012	311236.281	9.687E+10
Independence_level	1776	12.89	-.91	11.98	.6374	.01673	.70498	.497
Big4	1776	1	0	1	.33	.011	.472	.223
Interest_Coverage_Ratio	1776	382.30	.02	382.32	17.6283	.66556	28.04861	786.725
Patents	1776	70286.4710	1.04400000	70287.5150	649.745426	76.1814711	3210.48641	10307223.0
Valid N (listwise)	1776							

Figure 9 Third Hypothesis Descriptive Statistics – Second Sample

Correlation Matrixes

In this paragraph, I will go more into the main point of the debate, concentrating on the connections between the model variables. The framework used here is similar to that of the previous analysis: I will investigate the Pearson correlation matrix for each of the chosen samples.

As I discuss earlier, in the methodology, the variable Log_Tot_Assets rounds the Total Assets of the firm. The Pearson correlation matrix provided below clearly shows that Log_Tot_Assets is positively correlated with Current_Ratio. This correlation is logical because, by the construction of its formula, the Current Ratio includes a portion of Total Assets, specifically the current assets. This relationship is statistically significant at the 1% level, although the strength of the relationship is not particularly strong. The same rationale applies to PPE_share, which exhibits a correlation coefficient that is slightly lower at 0.121. Interestingly, companies with higher Total Assets generally exhibit higher Sales, even though the relationship with Return on Assets (ROA) is negatively correlated and significant at the 5% level.This implies that businesses with large asset bases usually have lower ROAs, which means they use their assets less effectively. This finding draws attention to a possible trade-off between asset growth and operational effectiveness. In addition, because they are legally required to undergo audits due to their perceived higher risk, organizations with higher Total Assets are also more likely to be independent. The independence_level and the audit dummy variable are significantly and favorably impacted by Log_Tot_Assets, as seen by their respective correlation values of 0.337 and 0.185. Moreover, the positive Interest_Coverage_Ratio correlation coefficient of 0.153 suggests that businesses with larger Total Assets often pay their interest costs more successfully. But it doesn't seem to have an impact on the Cost of Debt (CoD), indicating that although larger asset bases improve coverage ratios, they do not necessarily translate to lower borrowing costs.

The Current Ratio is solidly and negatively correlated with Leverage, although the effect is slight, as indicated by the correlation coefficient of about -0.10. Moreover, there is a negative correlation between the PPE_share and the Current Ratio. This makes sense given that industrial enterprises often have more non-current assets than current assets; additionally, property, plant, and equipment (PPE) is not included in current assets. Despite the negative correlation with PPE_share, companies with a higher Current Ratio—that is, a larger percentage of Current Assets compared to Current Liabilities—generally exhibit a stronger Return on Assets (ROA). The correlation matrix below, which displays a significant correlation coefficient of around 0.184 and is consistent with the negative association mentioned in the preceding sentence, highlights this relationship. Notably, neither the Cost of Debt (CoD) nor the conclusion made by the auditing firm are impacted by the Current Ratio. With a correlation value of 0.287, the data table does, however, show a strong and positive relationship with the Independence Level. This makes sense since a company is more likely to be financially independent

if its current assets exceed its current liabilities. The correlation value of 0.15 indicates a positive link with the Interest Coverage Ratio, which makes sense.

The correlation matrix shows that PPE_share, audit decisions, and sales are all unaffected by leverage. It does, however, have a negative impact on Return on Assets (ROA), indicating that organizations with high levels of leverage use their assets less effectively than companies with lower levels of leverage. Leverage has a negative association with both the Interest Coverage Ratio and the Independence Level, which is in line with the previously mentioned correlations. This implies that a company's total strategic independence and its capacity to control interest costs are both impacted by its debt load.

PPE_share has no significant correlation with audit decisions or interest coverage ratio. However, it is substantially connected to the Level of Independence, showing a correlation value of approximately 0.233. The amount of property, plant and equipment (PPE) to total assets has a favorable impact on both return on assets (ROA) and sales, as demonstrated by correlation values of 0.111 and 0.070, respectively. This shows that, on average, organizations with a greater share of PPE in total resources are capable of generating greater sales and are also more efficient in the use of their resources. Furthermore, in line with what is found in the existing literature, the cost of debt is negatively influenced by PPE_share, which implies that financiers consider firms with significant fixed assets less risky.

Return on assets (ROA) shows a significantly positive correlation with both sales and the level of independence. This relationship implies that greater capital efficiency tends to correlate with greater sales and greater financial independence. The analysis also shows the existence of a negative correlation between ROA and the audit dummy variable, although the effect is very small, with a coefficient of approximately -0.01. This suggests that more efficient companies, in terms of resource use, are less likely to be audited, although the impact is minimal. Furthermore, ROA has a positive effect on the interest coverage ratio. This would imply that firms that are more efficient at generating revenue per unit of assets are better able to cover interest expenses.

The Sales variable, selected as a proxy for company size, shows a significant correlation with both Audit and Interest_Coverage_Ratio at the 1% level, therefore significant. Sales are positively related to Audit, as indicated by a correlation coefficient of 0.079. This is in line with regulatory requirements that require auditing to be mandatory for large enterprises due to their specific risk profiles. Interestingly, sales show no effect on the cost of debt (CoD), which in turn would imply that financial institutions do not consider this variable when determining CoD but only efficiency. The Interest_Coverage_Ratio (ICR) shows a high correlation coefficient with the cost of debt (CoD), which stands at 0.207 and is significant at the 1% level. This means that on average, companies with a better ability to cover interest expenses tend to benefit from lower financing costs.

Return on Assets (ROA) shows a significant and positive correlation with both Sales and Independence Level, indicating that higher asset efficiency tends to correlate with higher sales and greater financial independence. Surprisingly, there is also a negative correlation between ROA and the Audit dummy variable, though the effect is very small, with a coefficient of about -0.01. This suggests a slight trend where more efficient firms, in terms of asset utilization, are less likely to be audited, although the impact is minimal. Additionally, ROA has a significant positive effect on the Interest Coverage Ratio. This implies that firms more efficient in generating revenues per unit of assets are better able to cover their interest expenses.

The Sales variable, selected as a proxy for the size of the firm, displays a significant correlation with both Audit and Interest_Coverage_Ratio at the 1% level. Sales are positively related to Audit, as indicated by a correlation coefficient of 0.079. This aligns with regulatory requirements that mandate audits for larger firms due to their specific risk profiles. Interestingly, Sales show no effect on the Cost of Debt (CoD), indicating that financial institutions do not consider this variable when determining CoD. However, the Interest_Coverage_Ratio (ICR) exhibits a high correlation coefficient with the Cost of Debt (CoD), which stands at 0.207 and is significant at the 1% level. It means that on average firms with better ability to cover their interest expenses tend to benefit from lower borrowing costs.

Correlations

		Log_Tot_Assets	Current_Ratio	Leverage	PPE_share	Return_on_Assets	Sales	Independence_level	Audit	Interest_Coverage_Ratio	CoD
Log_Tot_Assets	Pearson Correlation	1	.118**	-.039	.121**	-.046*	.456**	.337**	.185**	.153**	-.001
	Sig. (2-tailed)		<.001	.072	<.001	.033	<.001	<.001	<.001	<.001	.963
	N	2110	2110	2110	2110	2110	2110	2110	2110	2110	2110
Current_Ratio	Pearson Correlation	.118**	1	-.101**	-.082**	.184**	-.034	.287**	-.032	.150**	-.031
	Sig. (2-tailed)	<.001		<.001	<.001	<.001	.118	<.001	.136	<.001	.155
	N	2110	2110	2110	2110	2110	2110	2110	2110	2110	2110
Leverage	Pearson Correlation	-.039	-.101**	1	-.035	-.099**	-.012	-.207**	.005	-.089**	.100**
	Sig. (2-tailed)	.072	<.001		.104	<.001	.588	<.001	.807	<.001	<.001
	N	2110	2110	2110	2110	2110	2110	2110	2110	2110	2110
PPE_share	Pearson Correlation	.121**	-.082**	-.035	1	-.111**	-.070**	.233**	-.035	-.039	-.045*
	Sig. (2-tailed)	<.001	<.001	.104		<.001	.001	<.001	.111	.074	.039
	N	2110	2110	2110	2110	2110	2110	2110	2110	2110	2110
Return_on_Assets	Pearson Correlation	-.046*	.184**	-.099**	-.111**	1	.075**	.068**	-.10**	.456**	.028
	Sig. (2-tailed)	.033	<.001	<.001	<.001		<.001	.002	<.001	<.001	.201
	N	2110	2110	2110	2110	2110	2110	2110	2110	2110	2110
Sales	Pearson Correlation	.456**	-.034	-.012	-.070**	.075**	1	-.009	.079**	.145**	-.037
	Sig. (2-tailed)	<.001	.118	.588	.001	<.001		.683	<.001	<.001	.088
	N	2110	2110	2110	2110	2110	2110	2110	2110	2110	2110
Independence_level	Pearson Correlation	.337**	.287**	-.207**	.233**	.068**	-.009	1	.022	.227**	-.028
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	.002	.683		.308	<.001	.205
	N	2110	2110	2110	2110	2110	2110	2110	2110	2110	2110
Audit	Pearson Correlation	.185**	-.032	.005	-.035	-.099**	.079**	.022	1	-.018	-.034
	Sig. (2-tailed)	<.001	.136	.807	.111	<.001	<.001	.308		.419	.121
	N	2110	2110	2110	2110	2110	2110	2110	2110	2110	2110
Interest_Coverage_Ratio	Pearson Correlation	.153**	.150**	-.089**	-.039	.456**	.145**	.227**	-.018	1	-.207**
	Sig. (2-tailed)	<.001	<.001	<.001	.074	<.001	<.001	<.001	.419		<.001
	N	2110	2110	2110	2110	2110	2110	2110	2110	2110	2110
CoD	Pearson Correlation	-.001	-.031	.100**	-.045*	.028	-.037	-.028	-.034	-.207**	1
	Sig. (2-tailed)	.963	.155	<.001	.039	.201	.088	.205	.121	<.001	
	N	2110	2110	2110	2110	2110	2110	2110	2110	2110	2110

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Figure 10 First Hypothesis Correlations Matrix

In the analysis of the second hypothesis, I will provide a more concise explanation since it is based on a subset derived from the first sample. This implies that most of the relationships discussed in the first sample are likely to be reflected in the subset comprising only audited firms, with more or less the same degree of correlation.

Current Ratio is negatively correlated with Leverage, as evidenced by a correlation coefficient of -0.106, which is statistically significant at the 1% level. This inverse relationship underscores the idea that firms with higher leverage generally maintain lower current assets relative to their current liabilities. Other relationships observed in this analysis are very similar to those discussed earlier. Specifically, the Current Ratio maintains its negative relationship with PPE_share, indicating that firms with a higher proportion of property, plant, and equipment relative to total assets tend to have lower liquidity. Additionally, there is a significant and positive relationship between the Current Ratio and variables such as Log_Tot_Assets, Return on Assets (ROA), Independence Level, and Interest Coverage Ratio.

It is interesting to note that in the sample comprising only audited firms, PPE_share is negatively correlated with Leverage, as demonstrated by a regression coefficient of -0.064, which is significant at the 1% level. This differs from the previous sample where no impact was observed between PPE_share and Leverage. This is probably given by the fact that audited firms, which face more scrutiny, often opt for safer financial practices, including lower debt levels to minimize risk associated with less liquid assets. Furthermore, Leverage is negatively correlated with the Big4 dummy variable, indicating that companies audited by a Big Four auditing firm typically exhibit a lower ratio of Total Assets to Equity. This suggests that firms audited by these prestigious firms often maintain more conservative financial structures, possibly due to stricter scrutiny and governance standards.

Two significant observations concerning PPE_share I believe are worth to underlining: firstly, its negative impact on the Cost of Debt (CoD) is more pronounced in the case of audited firms. This could imply that audited firms provide a more reliable valuation of their assets, which are often used as collateral for loans. Financial lenders perceive this increased reliability as a reduced risk, which is then reflected in lower borrowing costs; secondly, firms audited by the Big Four tend to have a lower proportion of Property, Plant, and Equipment (PPE) relative to their Total Assets compared to others. This could suggest that Big Four-audited firms might prioritize operational and financial strategies that lean less on heavy capital investment in fixed assets. However, this is not confirmed by the relationship between Big4 and Return on Assets (ROA), which is positive but also highly insignificant, with a potential Type I error rate of 29%.

The Log_Tot_Assets has the same correlation features as previously stated. However, there is a new relationship concerning the Big4 clients and their size, which is positive. This means that larger enterprises are more likely to be audited by a Big Four company, which is quite fair given that as businesses develop, they may seek the prestige and certainty of a Big Four audit to coincide with their growing scale and maybe more

sophisticated financial reporting requirements. The same rationale could explain the positive and significant relationship noted among Big4 and Sales.

I would like to underline that companies audited by a Big Four are more autonomous and able to better cover their financial expenses, as demonstrated by the positive correlation coefficients. Also noteworthy is the negative correlation between the Big Four dummy variable and the cost of debt (CoD). While this link may seem deceptively small, the probability of making a Type I error is 5.1%, which is slightly higher than the usual threshold of 5%. This fraction is close enough to be considered marginally significant, meaning that the relationship in question could be relevant to my research: auditing by a Big Four firm reduces financial risk, thus lowering debt rates.

Correlations

		Current_Ratio	Leverage	PPE_share	Log_Tot_Assets	Return_on_Assets	Sales	Independence_level	Big4	Interest_Coverage_Ratio	CoD
Current_Ratio	Pearson Correlation	1	-.106**	-.090**	.125**	.144**	-.041	.273**	.035	.152**	-.020
	Sig. (2-tailed)		<.001	<.001	<.001	<.001	.082	<.001	.135	<.001	.401
	N	1776	1776	1776	1776	1776	1776	1776	1776	1776	1776
Leverage	Pearson Correlation	-.106**	1	-.064**	-.050*	-.082**	-.016	-.219**	-.058*	-.104**	.112**
	Sig. (2-tailed)	<.001		.007	.034	<.001	.489	<.001	.015	<.001	<.001
	N	1776	1776	1776	1776	1776	1776	1776	1776	1776	1776
PPE_share	Pearson Correlation	-.090**	-.064**	1	.160**	-.108**	-.07**	.282**	-.063**	-.024	-.062**
	Sig. (2-tailed)	<.001	.007		<.001	<.001	.005	<.001	.008	.317	.009
	N	1776	1776	1776	1776	1776	1776	1776	1776	1776	1776
Log_Tot_Assets	Pearson Correlation	.125**	-.050*	.160**	1	-.002	.413**	.363**	.312**	.140**	-.013
	Sig. (2-tailed)	<.001	.034	<.001		.936	<.001	<.001	<.001	<.001	.598
	N	1776	1776	1776	1776	1776	1776	1776	1776	1776	1776
Return_on_Assets	Pearson Correlation	.144**	-.082**	-.108**	-.002	1	.081**	.054*	.025	.451**	.034
	Sig. (2-tailed)	<.001	<.001	<.001	.936		<.001	.024	.299	<.001	.150
	N	1776	1776	1776	1776	1776	1776	1776	1776	1776	1776
Sales	Pearson Correlation	-.041	-.016	-.067**	.413**	.081**	1	-.014	.144**	.126**	-.059*
	Sig. (2-tailed)	.082	.489	.005	<.001	<.001		.559	<.001	<.001	.013
	N	1776	1776	1776	1776	1776	1776	1776	1776	1776	1776
Independence_level	Pearson Correlation	.273**	-.219**	.282**	.363**	.054*	-.014	1	.085**	.245**	.016
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	.024	.559		<.001	<.001	.511
	N	1776	1776	1776	1776	1776	1776	1776	1776	1776	1776
Big4	Pearson Correlation	.035	-.058*	-.063**	.312**	.025	.144**	.085**	1	.062**	-.046
	Sig. (2-tailed)	.135	.015	.008	<.001	.299	<.001	<.001		.009	.051
	N	1776	1776	1776	1776	1776	1776	1776	1776	1776	1776
Interest_Coverage_Ratio	Pearson Correlation	.152**	-.104**	-.024	.140**	.451**	.126**	.245**	.062**	1	-.188**
	Sig. (2-tailed)	<.001	<.001	.317	<.001	<.001	<.001	<.001	.009		<.001
	N	1776	1776	1776	1776	1776	1776	1776	1776	1776	1776
CoD	Pearson Correlation	-.020	.112**	-.062**	-.013	.034	-.059*	.016	-.046	-.188**	1
	Sig. (2-tailed)	.401	<.001	.009	.598	.150	.013	.511	.051	<.001	
	N	1776	1776	1776	1776	1776	1776	1776	1776	1776	1776

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Figure 11 Second Hypothesis Correlations Matrix

Regarding the third hypothesis, the correlation analysis has yielded intriguing results. In the first sample, which comprises all 2,110 firms, the value of the Patents is positively and significantly correlated with Log_Tot_Assets, as patents are included in these assets, and with Sales. This suggests that a firm's investments in innovation are reflected in increased sales and, more importantly, in efficient asset utilization. This is demonstrated by the positive correlation with Return on Assets (ROA), which, although modest, is significant with a coefficient of about 0.041. It is very logical that the correlation coefficient between the value of Patents and the firm's level of independence is positive. This implies that firms which have more strategic independence are more likely to innovate because when companies have the autonomy to make their own

strategic decisions without external constraints, they have greater opportunities to invest in and develop new technologies and products.

Finally, central to testing the third hypothesis is the relationship between the Audit variable and the Patents' value which are positively correlated, showing a correlation coefficient of 0.044 that is statistically significant at the 0.042 level. The possible reason for this relationship, which is also the underlying intuition of this research, may be that firms undergoing audits are perceived as more transparent, enhancing their trustworthiness to lenders. The increased transparency can lead to better financing conditions or more access to capital, which in turn may enable these firms to invest more in innovation, resulting in a higher value of patents.

Correlations

		Log_Tot_Assets	Current_Ratio	Leverage	PPE_share	Return_on_Assets	Sales	Independence_level	Audit	Interest_Coverage_Ratio	Patents
Log_Tot_Assets	Pearson Correlation	1	.118**	-.039	.121**	-.046*	.456**	.337**	.185**	.153**	.129**
	Sig. (2-tailed)		<.001	.072	<.001	.033	<.001	<.001	<.001	<.001	<.001
	N	2110	2110	2110	2110	2110	2110	2110	2110	2110	2110
Current_Ratio	Pearson Correlation	.118**	1	-.101**	-.082**	.184**	-.034	.287**	-.032	.150**	.016
	Sig. (2-tailed)	<.001		<.001	<.001	<.001	.118	<.001	.136	<.001	.460
	N	2110	2110	2110	2110	2110	2110	2110	2110	2110	2110
Leverage	Pearson Correlation	-.039	-.101**	1	-.035	-.099**	-.012	-.207**	.005	-.089**	-.026
	Sig. (2-tailed)	.072	<.001		.104	<.001	.588	<.001	.807	<.001	.229
	N	2110	2110	2110	2110	2110	2110	2110	2110	2110	2110
PPE_share	Pearson Correlation	.121**	-.082**	-.035	1	-.111**	-.070**	.233**	-.035	-.039	.021
	Sig. (2-tailed)	<.001	<.001	.104		<.001	.001	<.001	.111	.074	.328
	N	2110	2110	2110	2110	2110	2110	2110	2110	2110	2110
Return_on_Assets	Pearson Correlation	-.046*	.184**	-.099**	-.111**	1	.075**	.068**	-.10**	.456**	.041
	Sig. (2-tailed)	.033	<.001	<.001	<.001		<.001	.002	<.001	<.001	.058
	N	2110	2110	2110	2110	2110	2110	2110	2110	2110	2110
Sales	Pearson Correlation	.456**	-.034	-.012	-.070**	.075**	1	-.009	.079**	.145**	.135**
	Sig. (2-tailed)	<.001	.118	.588	.001	<.001		.683	<.001	<.001	<.001
	N	2110	2110	2110	2110	2110	2110	2110	2110	2110	2110
Independence_level	Pearson Correlation	.337**	.287**	-.207**	.233**	.068**	-.009	1	.022	.227**	.066**
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	.002	.683		.308	<.001	.002
	N	2110	2110	2110	2110	2110	2110	2110	2110	2110	2110
Audit	Pearson Correlation	.185**	-.032	.005	-.035	-.099**	.079**	.022	1	-.018	.044*
	Sig. (2-tailed)	<.001	.136	.807	.111	<.001	<.001	.308		.419	.042
	N	2110	2110	2110	2110	2110	2110	2110	2110	2110	2110
Interest_Coverage_Ratio	Pearson Correlation	.153**	.150**	-.089**	-.039	.456**	.145**	.227**	-.018	1	.041
	Sig. (2-tailed)	<.001	<.001	<.001	.074	<.001	<.001	<.001	.419		.058
	N	2110	2110	2110	2110	2110	2110	2110	2110	2110	2110
Patents	Pearson Correlation	.129**	.016	-.026	.021	.041	.135**	.066**	.044*	.041	1
	Sig. (2-tailed)	<.001	.460	.229	.328	.058	<.001	.002	.042	.058	
	N	2110	2110	2110	2110	2110	2110	2110	2110	2110	2110

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Figure 12 Third Hypothesis Correlations Matrix – First Sample

The virtuous cycle represented by Audit – Transparency – Capital Access – Investments is also evident in the second sample, where the Big4 dummy variable is positively and significantly correlated with the Patents' Value. These initial findings reinforce the idea that the quality of an audit can be a pivotal factor in facilitating a firm's investment in innovation through improved credibility and the subsequent financial opportunities that arise from it.

Correlations

		Current_Ratio	Leverage	PPE_share	Log_Tot_Assets	Return_on_Assets	Sales	Independence_level	Big4	Interest_Coverage_Ratio	Patents
Current_Ratio	Pearson Correlation	1	-.106**	-.090**	.125**	.144**	-.041	.273**	.035	.152**	-.001
	Sig. (2-tailed)		<.001	<.001	<.001	<.001	.082	<.001	.135	<.001	.970
	N	1776	1776	1776	1776	1776	1776	1776	1776	1776	1776
Leverage	Pearson Correlation	-.106**	1	-.064**	-.050*	-.082**	-.016	-.219**	-.06*	-.104**	-.024
	Sig. (2-tailed)	<.001		.007	.034	<.001	.489	<.001	.015	<.001	.322
	N	1776	1776	1776	1776	1776	1776	1776	1776	1776	1776
PPE_share	Pearson Correlation	-.090**	-.064**	1	.160**	-.108**	-.1**	.282**	-.1**	-.024	-.004
	Sig. (2-tailed)	<.001	.007		<.001	<.001	.005	<.001	.008	.317	.866
	N	1776	1776	1776	1776	1776	1776	1776	1776	1776	1776
Log_Tot_Assets	Pearson Correlation	.125**	-.050*	.160**	1	-.002	.41**	.363**	.31**	.140**	.053*
	Sig. (2-tailed)	<.001	.034	<.001		.936	.000	<.001	.000	<.001	.024
	N	1776	1776	1776	1776	1776	1776	1776	1776	1776	1776
Return_on_Assets	Pearson Correlation	.144**	-.082**	-.108**	-.002	1	.08**	.054*	.025	.451**	.070**
	Sig. (2-tailed)	<.001	<.001	<.001	.936		.001	.024	.299	<.001	.003
	N	1776	1776	1776	1776	1776	1776	1776	1776	1776	1776
Sales	Pearson Correlation	-.041	-.016	-.067**	.413**	.081**	1	-.014	.14**	.126**	.000
	Sig. (2-tailed)	.082	.489	.005	<.001	<.001		.559	.000	<.001	.994
	N	1776	1776	1776	1776	1776	1776	1776	1776	1776	1776
Independence_level	Pearson Correlation	.273**	-.219**	.282**	.363**	.054*	-.014	1	.08**	.245**	.020
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	.024	.559		.000	<.001	.398
	N	1776	1776	1776	1776	1776	1776	1776	1776	1776	1776
Big4	Pearson Correlation	.035	-.058*	-.063**	.312**	.025	.14**	.085**	1	.062**	.055*
	Sig. (2-tailed)	.135	.015	.008	<.001	.299	.000	<.001		.009	.021
	N	1776	1776	1776	1776	1776	1776	1776	1776	1776	1776
Interest_Coverage_Ratio	Pearson Correlation	.152**	-.104**	-.024	.140**	.451**	.13**	.245**	.06**	1	.013
	Sig. (2-tailed)	<.001	<.001	.317	<.001	<.001	.000	<.001	.009		.585
	N	1776	1776	1776	1776	1776	1776	1776	1776	1776	1776
Patents	Pearson Correlation	-.001	-.024	-.004	.053*	.070**	.000	.020	.055*	.013	1
	Sig. (2-tailed)	.970	.322	.866	.024	.003	.994	.398	.021	.585	
	N	1776	1776	1776	1776	1776	1776	1776	1776	1776	1776

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Figure 13 Third Hypothesis Correlations Matrix – Second Sample

Regression Analysis

In this paragraph, I will present the results of the regression analysis on the Cost of Debt (CoD) using the Ordinary Least Squares (OLS) model. I will have the discussion articulated with an initial consideration of the model performance, which will be explained by the Model's R statistics, and the meaning of the F change. This establishes a basis for assessing the degree to which the model, when taken into account all the variables, explains the variation in the Cost of Debt (CoD) among various enterprises, demonstrating the resilience of the used regression model. After then, the study will focus on each model coefficient, looking at its statistical significance and the wider ramifications of the results.

To begin from the First Hypothesis test, as shown by the table below the R statistic of the model amounts to 0.283, suggesting that while there is some relationship between the predictors and the Cost of Debt (CoD), this latter is not exceptionally strong. The adjusted R Square is about 0.076 which means that the model explains about 8% of the variance of Cost of Debt (CoD). Although the explicability of model could seem very low, this level of variance explanation is consistent with findings from prior research in this field. For instance, Karjalainen (2011) reported an R Square of 9%, Gul et al. (2013) found 8.8%, and Azzali and Mazza (2017) observed 12.8%. Furthermore, a significant F Change value of 20.314, with a significance level of less

than 0.001, strongly suggests that the inclusion of chosen predictors significantly improves the model's ability to explain CoD.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.283[a]	.080	.076	2.82783	.080	20.314	9	2100	<.001

a. Predictors: (Constant), Interest_Coverage_Ratio, Audit, PPE_share, Leverage, Sales, Current_Ratio, Independence_level, Return_on_Assets, Log_Tot_Assets

Figure 14 First Hypothesis Regression Model Summary

A deeper analysis of particular coefficients of the regression model revealed that the Log Total Assets variable, showing a significant regression statistical coefficient of 0.761, would imply that for each unit increase in the logarithm of total assets, the cost of debt (CoD) increases by approximately 0.76%. This relationship highlights the dynamics associated with larger firms as discussed earlier in the correlations section: larger firms often engage in more extensive financing activities to support their operations and expansions, which may increase perceived risk among financiers.

With a regression coefficient of -0.159 the Current Ratio is negatively associated with the audit, in particular, it would imply that for each unit increase in the Current Ratio, the CoD decreases by approximately 0.16%. Furthermore, in terms of the firm's financial structure, the leverage coefficient is significant at the 0.001 level and positive. This positive relationship indicates that the company's financial structure decision has an influence on its borrowing costs. Specifically, when corporations rely more on debt than equity, the market perceives them as riskier. This impression of heightened risk causes lenders to incur a higher risk premium, which is then represented in the Cost of Debt (CoD).

The PPE_share variable has a significant negative value of -0.817, which means that a 1% increase in PPE_share results in a 0.82% drop in the Cost of Debt (CoD). This link makes sense since tangible assets, like as property, plant, and equipment, are more liquid and transferable than intangible assets. Tangible assets are commonly used as collateral in loan agreements because they provide a clear security measure for lenders. In other words, a firm which has a higher proportion of Tangibles presents a more solid guarantees to back its financial obligations for the lenders.

Interesting to comment is the positive relationship between Return on Assets (ROA) and Cost of Debt (CoD), indicated by a significant coefficient of 0.083. Despite it may initially seem counterintuitive, given the typical association of higher profitability with lower financial risk, the explanation for this phenomenon can be partially understood by referencing the formula for Return on Equity (ROE), which is influenced by financial leverage, as shown in the following Corporate Finance's milestone:

$$Roe = \left[ROIC + (ROIC - CoD)x\frac{NFP}{Equity}\right]x(1-t)$$

This equation shows that if the Return on Invested Capital (ROIC) surpasses the CoD, it becomes financially beneficial for a corporation to grow its leverage, which is effectively borrowing more because the cost of debt is less than the return generated by employing this debt. This leveraged technique improves ROE as long as the ROIC exceeds the CoD. Another crucial finding arises from this framework: the more a corporation leverages its debt, the more risk it bears, possibly raising the CoD and equating it with the ROIC. Although ROIC and ROA are not computed using the same method, they are closely connected since both measures seek to assess the effectiveness of capital allocation. ROA evaluates how efficiently a company uses all of its assets to generate profit, while ROIC focuses specifically on the returns generated from capital that has been invested (which includes also debt or equity). Following this logic, it may be argued that a greater ROA frequently indicates a better ROIC, given that operational efficiencies translate equitably across the organization. When the ROIC, backed up by a good ROA, surpasses the CoD, the firm is encouraged to grow its debt levels. This greater leverage may result in a higher CoD as the risk linked with the company's debt burden rises - lenders want higher returns for higher risks.

Sales variable has an insignificant impact on CoD as its regression coefficient is approximately zero, making any possible comment on it negligible. On the other hand, the positive relationship between Independence Level and CoD is a more complicated and somewhat surprising conclusion. The regression coefficient shows that more autonomous enterprises, presumably in terms of governance or decision-making autonomy, have a higher CoD. One probable explanation is that highly autonomous enterprises prioritize shareholder interests above debtors. This prioritizing might emerge as policies that maximize profits for equity investors while increasing financial risk, such as pursuing ambitious growth plans backed by debt or investing in riskier ventures with greater yields. However, I believe the explanation for this association is fairly debatable and subject to alternative interpretations.

The Interest Coverage Ratio displays a negative regression coefficient, which is strongly significant at the 0.001 level. This finding is quite logical and aligns with the results of the correlation analysis, where a similar relationship was observed. The negative coefficient indicates that as a firm's ability to cover its interest expenses increases—reflected by a higher Interest Coverage Ratio—the Cost of Debt (CoD) decreases. This relationship underscores the principle that firms which can comfortably meet their interest obligations are perceived as lower risk by lenders, given the fact that past performance analysis is deeply rooted in Finance as one of the best practices to assess the risk of the investment.

Expectations have been validated by the independent variable analysis, especially with regard to the link between the Audit dummy variable and the Cost of Debt (CoD). The statistically significant relationship is indicated by the negative coefficient of -0.29, with a p-value indicating a 7% probability of making a Type I error. Although this probability is slightly above the stricter 5% threshold, it is still well below the 10% threshold that is frequently acceptable in broader regression analysis contexts.

This result suggests that borrowing rates for audited enterprises are often lower than those of non-audited firms by about 0.29%. Lenders are reassured about the correctness and dependability of financial accounts by an external audit, according to the negative association found between the Audit variable and CoD. The results are in line with what the previous literature, which as I discussed in the literature review showed a pattern that holds across different countries, emphasizing the universal value of financial audits in enhancing lending conditions. For instance, Hug et al. (2022) observed that audited firms in Spain typically enjoy an average interest rate reduction of 0.47% compared to non-audited firms. Minnis (2011) noted a reduction in the Cost of Debt (CoD) ranging from 0.25 to 1.05 percentage points, with the main model indicating an average decrease of approximately 0.69 percentage points for private American firms. Blackwell et al. (1998) discovered that American firms receive an approximate reduction of 25 basis points in their CoD following an audit. Conversely, Kim et al. (2011) reported the most considerable variance, finding that audited Korean firms benefit from an average CoD reduction ranging from 0.55 to 1.24 percentage points. Unfortunately, I lack a direct comparison from a study conducted in Italy regarding the impact of auditing on CoD.

One of the risks of the selected model was the possibility that there was collinearity between the variables. In fact, these are all part of the financial sphere of the company, which implies, as I discussed previously, high and significant correlation coefficients. However, as can be seen from the table below, the risk of multicollinearity is eliminated by the fact that all VIFs are very close to 1, which implies that my results are not biased by the joint variability of the variables

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	.402	1.212		.331	.741		
	Log_Tot_Assets	.761	.253	.079	3.009	.003	.633	1.580
	Current_RAtio	-.159	.091	-.039	-1.748	.081	.862	1.160
	Leverage	.029	.006	.097	4.508	<.001	.948	1.055
	PPE_share	-.817	.292	-.062	-2.799	.005	.894	1.118
	Return_on_Assets	.083	.012	.170	7.006	<.001	.744	1.344
	Sales	-4.168E-7	.000	-.045	-1.842	.066	.733	1.365
	Independence_level	.192	.104	.046	1.852	.064	.709	1.410
	Audit	-.290	.164	-.038	-1.771	.077	.951	1.052
	Interest_Coverage_Ratio	-.027	.002	-.290	-11.858	<.001	.735	1.361

a. Dependent Variable: CoD

Figure 15 First Hypothesis Regression Coefficients

Regarding the analysis for the Second Hypothesis model summary, the explanations provided previously are also applicable here, given that the model structure remains the same, with the only difference being the independent variable. In this case, the R statistic of the model is 0.287, which indicates a level of explicability that is not exceptionally strong, similar to what was noted in the first hypothesis test. The Adjusted R Square is 8%, suggesting a consistent explanatory power with the initial model. However, the significant F Change value of 17.644 is slightly lower than the F statistics observed in the previous test. This suggests that the inclusion of the Big4 dummy variable has slightly decreased the model's ability to explain variations in the Cost of Debt (CoD).

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.287[a]	.083	.078	2.72011	.083	17.644	9	1766	<.001

a. Predictors: (Constant), Interest_Coverage_Ratio, PPE_share, Big4, Leverage, Sales, Current_Ratio, Return_on_Assets , Independence_level, Log_Tot_Assets

Figure 16 Second Hypothesis Regression Model Summary

The analysis of the Current Ratio in the context of our model reveals a negative coefficient, which is slightly lower than that observed in the first hypothesis test. Notably, the significance level associated with this coefficient in the latest model indicates a probability of committing a Type I Error of 11.8%, which exceeds the commonly used threshold of 10%. Understanding this is essential because it clarifies the many factors that lenders take into account when comparing the Cost of Debt (CoD) for audited vs non-audited enterprises. The influence of auditing on lender evaluations is especially pertinent here because in reality, as part of an audit, the external auditor conducts a going concern test, which is a comprehensive process that includes asking the management questions and assessing several financial parameters including liquidity. Because of this detailed analysis made by the Auditor, lenders rely less on their own assessments of certain financial indicators, such as the Current Ratio, when making loan decisions. Furthermore, this method typically involves consulting with attorneys about any current legal issues that may have an impact on financial stability. The auditors' detailed review seeks to establish that the company can continue to operate as is for the foreseeable future, therefore addressing the going concern assumption. Lenders base less of their lending decisions on their own assessments of specific financial indicators, such as the current ratio, because the audit includes these in-depth inspections. In other words, if an audit has previously affirmed the firm's operational viability, lenders may see their independent examination of liquidity ratios, which are generally used to determine short-term financial health, as less important. This might explain why the association between the Current Ratio and CoD is less substantial when enterprises are audited.

The analysis shows that Leverage is considered a crucial factor in determining the cost of debt (CoD), as evidenced by its significant coefficient of 0.026 at the 0.001 level, confirming previous findings. What I want to underline is the PPE_share's coefficient, which amounts to -1.166. It is notably larger in absolute value compared to the previous sample, indicating a stronger negative impact on CoD, namely a more pronounced effect in samples including only audited firms. Auditing firms often recalculate depreciation and amortization and consult external entities to ascertain asset values based on prevailing market conditions. This is especially crucial in manufacturing firms, where the complexity of asset valuation presents significant challenges as the major of Assets are represented by PPE. This higher assurance is positively valued by the lenders who often consider the possibility of selling these assets as a fallback plan in the event of credit issues with the borrower.

Interestingly, the coefficient for Log_Tot_Assets is positive, indicating a potential counterbalance by intangible assets, despite the large and negative association with tangibles. Studies reveal that lenders often have preconceived notions about intangibles, perceiving companies with a larger percentage of intangible assets as more precarious (Atasoy et al., 2022).This idea is probably based on the reality that these kinds of assets are often illiquid and challenging to assess or liquidate in the event that a corporation files for bankruptcy. Because of this, I think this pattern is due to this bias even if the significance level is greater than 10%.

Return on Assets and Sales maintain the same significant coefficients as previously discussed, applying the same rationale. The coefficient for Independence level shows a stronger positive correlation with CoD, although the explanation linking it to audit effects seems less convincing. With a substantial negative coefficient of -0.27, the Interest Coverage Ratio once again demonstrates its importance in determining CoD. This means that a 1% increase in the ratio might result in a 0.27% reduction in CoD.

The results of the Second Hypothesis test support my hypotheses and indicate that having a Big Four firm audit your company can save a significant amount of money on funding. According to the substantial regression coefficient of 0.29 displayed in the table, a corporation audited by one of the Big Four might possibly cut its CoD by 0.29%. More importantly, the cumulative effect of this choice when compared to an unaudited company implies that being audited by a Big Four firm might reduce borrowing rates by around 0.58%.

Finally, even in this second sample the results are not biased by the joint variability of the variables as the VIFs are all close to 1.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	1.696	1.302		1.303	.193		
	Current_Ratio	-.146	.094	-.038	-1.562	.118	.871	1.148
	Leverage	.026	.005	.113	4.785	<.001	.940	1.064
	PPE_share	-1.166	.301	-.096	-3.875	<.001	.853	1.173
	Log_Tot_Assets	.417	.272	.044	1.531	.126	.623	1.606
	Return_on_Assets	.082	.013	.160	6.173	<.001	.774	1.293
	Sales	-4.886E-7	.000	-.054	-2.067	.039	.770	1.299
	Independence_level	.493	.111	.123	4.441	<.001	.680	1.471
	Big4	-.288	.145	-.048	-1.982	.048	.886	1.128
	Interest_Coverage_Ratio	-.027	.003	-.271	-10.206	<.001	.736	1.359

a. Dependent Variable: CoD

Figure 17 Second Hypothesis Regression Coefficients

Regarding the Third Hypothesis, the model's effectiveness in predicting Patent Value (PV) showed a weak relationship with the dependent variable. In more details, it turns out that this R-square is about 0. 0.28, which represents the fact that the model is able to explain only around 3% of the total variation in the dependent variable. This is up to my expectation as the financial transparency alone does not guarantee innovation, which instead is mainly driven by firm-specific traits such as culture and human capacities. However, the significant F Change value remains significant. It means that although the overall low level of R Statistics, ability of the model to explain variations in the Patents Value (PV) is not compromised.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.167[a]	.028	.024	2506.0035451689396	.028	6.732	9	2100	<.001

a. Predictors: (Constant), Log_Tot_Assets, Leverage, Return_on_Assets, PPE_share, Audit, Current_Ratio, Interest_Coverage_Ratio, Sales, Independence_level

Figure 18 Third Hypothesis Regression Model Summary – First Sample

The lower R-squared statistics is evident from the significance column in the table below. In fact, compared to the previous regression analysis, there are more relationships that appear to be statistically insignificant. This aligns with my expectations: since the model is fundamentally a financial one, it struggles to capture the nuances of innovation as proxied by the Patents Value (PV).

Going deeper into the issue, the Interest Coverage Ratio (ICR) has a negative regression coefficient of -0.95. This means that a one-unit increase in this variable would reduce the Patents Value (PV) by 0.95. This amount, however, is regarded small when compared to the mean value of the dependent variable in the sample, which

is EUR 551,000. Consequently, the relationship between the ICR and the PV is regarded as insignificant, indicating that the impact of a firm's ability to cover its interest expenses on the value of its patents is relatively negligible.

The variable Independence_level shows a positive regression coefficient, which, though marginally insignificant with a threshold of 0.122 that is above the common significance limit of 10% and warrants further examination. In the literature review, I discussed how innovation typically manifests either as disruptive or incremental. Disruptive innovation dramatically changes the competitive environment following the broad adoption of new technologies, whereas incremental innovation focuses on fine-tuning a company's operations. Both forms of innovation need a degree of distinctiveness, allowing a company to outperform competitors by exploiting its better inventive skills.This notion suggests that for a firm to engage in activities that are distinct from its competitors, or to discover new methodologies not yet explored by others, it must think outside the box. Thinking outside the box necessitates a level of freedom to innovate. Although the coefficient for Independence_level is not statistically significant, the positive relationship could be explained by this connection between independence and the freedom to think outside the traditional limits. As a result, higher degrees of independence inside a corporation may promote more inventive thinking and activities, hence increasing the value of breakthroughs such as patents, even if the statistical significance of this specific sample is not strong.

Sales have no influence on Patent Value (PV), demonstrating that the company's size does not restrict its ability to innovate. In other words, even small firms can accumulate significant assets through their patents.
Return on Assets (ROA) presents an intriguing aspect, as it demonstrates a positive and significant regression coefficient at the 0.081 level despite Sales, namely the Gross measures where profits come from, was not significant. This connection between profitability and innovation can be linked to the fact that highly prosperous businesses tend to reinvest the major part of their profits in improving their processes or goods. In contrast, a company's capacity to innovate may lead to increased market share, reduced competition, higher pricing, and, eventually, larger profits. The findings addressing the minor influence of Sales on Patent Value and the favorable effect of Return on Assets (ROA) are consistent with the features of the sample employed in this study, which was limited to manufacturing enterprises. These companies typically pursue incremental advances that improve the efficiency of their manufacturing processes rather than attempting to distinguish their products in order to charge higher prices and increase sales.

The positive regression coefficient for PPE_share, while statistically insignificant with a probability of 48% to make the Type I error, is an intriguing topic for debate, particularly the coefficient value of 180.45. It is fairly surprising, given that patents, which are intangible assets, result in a rise in overall assets. Logically, as patents increase the proportion of intangible assets, the total assets should also rise, thereby reducing the PPE_share, which is calculated as the ratio of tangible assets to total assets. Although the coefficient for

PPE_share is statistically insignificant, one potential explanation for the observed positive relationship could relate to the investment behaviors of manufacturing firms that innovate. Companies that innovate, particularly in manufacturing, may need to invest in new physical technology, such as new factories or production methods. While they may copyright some features of their discoveries, remaining competitive frequently necessitates significant investment in fixed assets. Thus, a company with a greater Patent Value (PV) is likely to be actively inventing in its industry. This innovation not only adds to the firm's intangible assets via patents, but it also likely needs higher investment in tangible assets to support and deploy new technologies and procedures.
Leverage and Current Ratio are not significant, indicating that in innovation financing, the source of funds may not matter. This observation partially contradicts my hypothesis, which proposed that market transparency could enhance a firm's financial attractiveness and facilitate the raising of investment capital for innovation. In fact, according to my intuition, a firm that is overleveraged or has a low Current Ratio should be less appealing in the market, and this limited availability of funds should also affect its level of innovativeness.

The regression coefficient for Log_Tot_Assets is positive and significant, which is quite reasonable, as previously discussed, because this effect is completely attributable to accounting practices, since the value of patents (PV) directly influences Total Assets, of which they are a component.

The response to the Third Hypothesis is essentially unfruitful, as the regression coefficient for the Audit dummy variable is insignificant, with a 21% probability of making a Type I error. Although the coefficient is positive, it does not statistically impact the dependent variable, indicating that audited firms experience the same level of innovation as non-audited firms. However, this suggests a potential positive relationship that could be explored further with a different model. As I will discuss in the limitations section, for simplicity, I maintained the same model across all three hypotheses. Nonetheless, it should be noted that the control variables might need to be adjusted depending on the dependent variable being analyzed.

Regarding the third hypothesis, I did not test for multicollinearity. In fact, the same variables were found to have no joint variability in the two previous tests. Furthermore, the value of the Patents was poorly correlated with all the variables, implying a joint non-variability between the model variables and the dependent one.

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	-2610,161	1074,483		-2,429	,015
	Log_Tot_Assets	544,140	224,065	,066	2,428	,015
	Current_Ratio	-16,272	80,732	-,005	-,202	,840
	Leverage	-2,847	5,689	-,011	-,500	,617
	PPE_share	180,454	258,631	,016	,698	,485
	Return_on_Assets	18,239	10,440	,044	1,747	,081
	Sales	,001	,000	,103	4,082	<,001
	Independence_level	142,245	91,881	,040	1,548	,122
	Audit	181,658	145,012	,028	1,253	,210
	Interest_Coverage_Ratio	-,950	2,026	-,012	-,469	,639

a. Dependent Variable: Patents

Figure 19 Third Hypothesis Regression Coefficients – First Sample

In the second sample, which includes only audited firms, the model's explanatory power is lower, as indicated by the R Square statistic which reports that the model explains only about 1% of the variance of Patents Value (PV). Despite this very low level of explicability, the F Change remains significant, which suggests that while the model explains only a small portion of the variation in PV, some of the variables it does include should have a statistically significant effect on the dependent variable.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics R Square Change	F Change	df1	df2	Sig. F Change
1	.108[a]	.012	.007	3199.87065335956050	.012	2.319	9	1766	.014

a. Predictors: (Constant), Interest_Coverage_Ratio, PPE_share, Big4, Leverage, Sales, Current_Ratio, Return_on_Assets, Independence_level, Log_Tot_Assets

Figure 20 Third Hypothesis Regression Model Summary – Second Sample

The research shows that the Current Ratio is not significant, but it is interesting to notice that the sample of exclusively audited companies has a more prominent negative regression coefficient. This shows that among this group, the Current Ratio has a higher negative impact on Patent Value (PV). Furthermore, the regression coefficient's significance level has improved from around 0.84 in the first sample to 0.37 in the second sample. The Interest Coverage Ratio in this second sample, which includes only audited firms, reveals an interesting trend: the regression coefficient has increased in absolute terms to -3.65. Although it remains statistically insignificant with a significance level of 0.247, this change is notable compared to the previous sample comprising all firms. The shift in both the magnitude of the coefficient and the improved (though still not significant) level of significance suggests that the impact of the Interest Coverage Ratio might be more pronounced in audited firms.

Leverage shows a similar trend to that of the Current Ratio and Interest_Coverage_Ratio, intensifying its negative effect when the analysis is restricted to audited firms. Specifically, its coefficient shifts from -2.84 to -4.63, though with a significance level of 0.47, making it difficult to draw definitive conclusions about this negative relationship. The important finding, though, is that financial factors were more prevalent in the audited businesses sample than they were in the whole sample. This implies that by elucidating the computation of certain variables and offering a higher level of assurance regarding their accuracy, auditing might potentially improve the visibility of some connections. Increased investment and innovation might result from a company's increased investor attractiveness due to the increased certainty that audits bring.

In the sample of audited enterprises, the PPE_share variable loses significance, but surprisingly, its regression coefficient changes to a negative value of -126.216. This is a legitimate modification because the denominator in the calculation formula is the Patent Value (PV) in mathematics. Log_Tot_Assets, which has a Type I Error probability of around 3%, is nonetheless very important when analyzing audited corporations. Furthermore, its coefficient is almost 26% greater than the value obtained from the initial sample of all enterprises. This implies that compared to non-audited corporations, audited firms can, on average, have a larger percentage of patents in their overall assets. This early finding is consistent with the original concept that audited enterprises may have greater levels of innovation, as evidenced by a higher value of patents, due to their unique asset structure. This finding supports the hypothesis that a more customized model would demonstrate a strong correlation between auditing and patent value, indicating new directions for investigation into the potential effects of auditing on the valuation of individual patents.

In this second sample, it is also observed that Sales are not significant, with a regression coefficient close to zero, suggesting that sales figures do not necessarily correlate with the value of patents. On the other hand, Return on Assets (ROA) is strongly significant, with a regression coefficient of 50. These apparently controversial results can be explained by the same rationale used above, namely that manufacturing firms typically focus on incremental innovation, aiming to enhance their processes and thereby improve their ROA over their Sales.

The variable Independence_level shows a substantially lower regression coefficient in this second sample of exclusively audited businesses, going from 142 in the first sample to just 4. The likelihood of committing a Type I Error also increases dramatically from 12% to 97%. The decline in significance and coefficient size indicates that the degree of independence within audited enterprises has little bearing on the degree of innovation inside the firm. According to this conclusion, the existence of an external auditor essentially acts as a stand-in for independence, guaranteeing that the company follows procedures that put shareholder interests first and lessen the requirement for strong internal independence as a catalyst for innovation. Since this sample differs greatly from the earlier results, it offers insightful information regarding the Third Hypothesis. The Big4 dummy variable in this analysis exhibits a noticeable move toward significance, whereas

the Audit dummy variable in the first sample was very unimportant. With a risk of generating a Type I Error that is quite near to the commonly acknowledged threshold of 10%, it is just marginally inconsequential. Furthermore, the coefficient is positive, amounting to 264.63, which suggests that firms audited by one of the Big Four accounting firms have, on average, an additional EUR 264,000 in assets in the form of patents. This increase in patent assets implies, according to the proxy chosen, a higher capacity of the firms audited by Big Four to innovate. This finding lends credence to the idea that audit quality and innovation do, in fact, have a relationship that would merit future research using a more tailored model. However, it offers some early evidence that improved audit quality might improve a company's marketability and funding prospects. These latter, namely the higher financial resources made possible by this improved credibility may be used to fund more R&D projects, recruit more highly qualified employees, and expand the number of patent applications.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-2799,991	1531,597		-1,828	,068
	Current_Ratio	-97,721	110,049	-,023	-,888	,375
	Leverage	-4,630	6,436	-,018	-,719	,472
	PPE_share	-126,216	354,032	-,009	-,357	,722
	Log_Tot_Assets	685,016	320,225	,064	2,139	,033
	Return_on_Assets	50,626	15,659	,087	3,233	,001
	Sales	,000	,000	-,037	-1,364	,173
	Independence_level	4,729	130,665	,001	,036	,971
	Big4	264,630	171,026	,039	1,547	,122
	Interest_Coverage_Ratio	-3,652	3,157	-,032	-1,157	,247

a. Dependent Variable: Patents

Figure 21 Third Hypothesis Regression Coefficients – Second Sample

CONCLUSIONS

In this final chapter of my dissertation, I will summarize the conclusions from my study that were presented in the previous parts. The study supported important predictions and shed light on how specific financial variables, such as Audits, affect both Cost of Debt (CoD) and Patents Value (PV). Despite the successes, the relatively new topic of research faced various hurdles, for instance the sample and the model selection, potentially limiting my work. These limitations emphasize areas for care when interpreting the data, and also pave the way for future research. I will go over these limits in depth to provide a better grasp of the complexity involved and to stimulate more investigation into this field which see the Audit, portrayed as a sort of lubricant of the free market, playing a central role in a phenomenon that has been little studied.

Summary of the results

The findings from the First and Second Hypothesis are consistent with my predictions. I want to underline the care used in choosing an adequate sample and model for this investigation. A wide number of factors determine the Cost of Debt (CoD), including the firm's industry and the financial institutions engaged in lending. These factors include macroeconomic conditions, market perceptions of risk, the firm's creditworthiness, and the current regulatory framework. Given the complicated network of factors that impact the CoD, the low R Square values reported in the first two models should be interpreted in the context of the complex domain under investigation. In my opinion, this scenario emphasizes the limitations of precisely forecasting COD and the relevance of the careful methodological choices made in this study.

The central idea behind my dissertation's First Hypothesis was that if lenders perceive audited information to be of higher quality, because the information asymmetry is reduced by the rigour opinion of an external and independent actor, audited financial statements may result in lower costs of debt (CoD) for companies. This intuition has been validated with a negative regression coefficient of Audit dummy variable of -0.29. Its statistical significance at the 0.07 level demonstrates that a company's decision to undertake an audit can be extremely advantageous to its financial health. Hence, transparency is always valued in the market because, logically if auditor assurance reduced lenders' monitoring charges, market competition would push financial institutions to pass on these cost savings to borrowers in the form of reduced interest rates, all other things being equal.

In addition to the primary discovery, several relationships have gained significance. The Current Ratio, for example, with a regression coefficient of -0.159, has validated the negative link mentioned in the correlation section. This shows that when the Current Ratio rises, which in turns means an increased in liquidity, the cost of debt falls. According to this result firms with higher portion of current assets relative to their current liabilities enjoy a discount on their CoD. Similarly, the PPE_share validates the logical rationale that a

company with tangible assets may provide lenders a stronger assurance of financial recovery. Its large negative regression coefficient, which implies that a higher proportion of tangible assets in a company's total assets might result in lower borrowing rates, makes this clear. Furthermore, the positive regression coefficient of ROA gives me the possibility to test in practice one of well-known Corporate Finance milestones, that is the formula which put in the relationship ROE, ROIC and CoD. Essentially, the formula implies that the firm is encouraged to expand its debt levels when the ROIC, backed up by a good ROA, surpasses the CoD. Because lenders seek greater returns on higher risks, increasing leverage may result in a higher CoD as the risk connected with the company's debt load grows. This seemingly conflicting relationship between ROA and quantity of debt explains the positive regression coefficient. Finally, the principle that firms which can easily meet their interest obligations are perceived as lower risk by lenders, has been confirmed by the significant negative regression coefficient of Interest_Coverage_Ratio. At this point, I want to underline that these confirmations evaluated the model's predictability as well. When a link is well-established and supported by current literature, a robust model should corroborate what earlier research has shown. In this case, I was able to validate the first hypothesis, and the findings were pretty respectable when compared to other regression coefficients reported in the literature. Furthermore, the logical correlations between the control variables were constant and adequate.

The Second Hypothesis findings are consistent with previous research and with my initial assumptions. According to De Angelo (1981), there is a positive association between audit quality and auditing firm size, showing that the Big Four generate higher-quality audit reports than others. This assumption is supported by various studies such as Dopuch and Simunic (1980), who emphasize the importance of reputation in the auditing field. The Big Four are linked with prestige and the major part of their success is given by the fact that the remedy to a market failure caused by information asymmetry between market operators and enterprises is expressed in an informationally asymmetric service, called Audit service. Because the quality of the services is not easily understood or measured, the audit industry essentially survives on reputation, which is built over time. As a result, the market and businesses alike greatly depend on the power of brands, the company's history, and how people see its business practices as a whole. This dynamic explains why new firms have overtaken established players in various industries, such as Apple overtaking Nokia, Canon overcoming Kodak, and Tesla taking on Toyota. But in the audit industry, the Big Four have survived for decades with little to no challenge, precisely because of their deeply ingrained dependence on established procedures and reputation. Hence, the Second Hypothesis was built upon the intuition that also the market, which is only the collective perception of society, should recognize the Big Four's prestigious reputation. Building on previous research, I believed that this improved reputation not only corresponds with increased audit fees, as found by Van Caneghem (2010) and Campa (2013) but also lowered the perceived risk among lenders and other market participants, which in turns lowered businesses' Cost of Debt (CoD).

The model showed that selecting one of the Big Four auditors may have an impact on the cost of debt (CoD). In fact, the regression coefficient resulted negative and amounts to -0.29 which means that the only fact that the firm's choice of hiring a Big Four as external auditor should allow it to save 0.29% on its CoD. If we cumulate this latter result with the previous one, we arrive to a conclusion more pronounced: a Big Four audited firm may save an average of 0.58% on its cost of debt (CoD) in comparison to an unaudited one. This result raises an interesting question: can lower interest rates counterbalance auditing fees in the Italian private market? The key question is whether corporations can successfully arbitrage their COD by choosing the right auditor. Although there is a research gap, this study focused solely on the impact of audit quality on CoD and innovation. I encourage readers to investigate the interaction between auditors and companies, including not just the absolute savings in CoD but also the relative savings in comparison to audit fees.

Among the primary finding, as shown by the Big 4 regression coefficient, there are several noteworthy connections discovered with control variables. For example, the Current Ratio looked significantly negligible when compared to the first sample of all enterprises. My reasoning for this observation is logical and quite reasonable. It originates from ISA 570's requirement that auditors undertake a Going Concern examination. Specifically, ISA 570 states that "The auditor's responsibility is to evaluate the appropriateness of management's use of the going concern assumption in the preparation of the financial statements and conclude whether there is a material uncertainty about the entity's ability to continue as a going concern that needs to be disclosed in the financial statements." As part of this procedure, auditors question management about any events or situations that might cast serious doubt on the going concern assumption. They also undertake quantitative testing, such as determining if the Current Ratio is greater than one in the financial statements. Hence, the presence of Auditors transfer lenders' emphasis from the lenders' assessments to those supplied in the audit report. In the second sample of audited enterprises, the Current Ratio did not significantly impact lenders' estimate of CoD, possibly due to the substance of ISA 570.

Furthermore, PPE_share's coefficient of -1.166 is much higher in absolute value compared to the first sample, indicating a bigger negative influence on CoD. Auditors have the ability, as we noted earlier, to influence lenders' approach in CoD determination. In fact, auditing firms must recalculate depreciation and amortization and confer with other parties to determine asset values based on current market circumstances. Additionally, manufacturing organizations have complicated asset valuation issues due to the high proportion of PPE assets. Furthermore, given the fact that the majority of the firms in the sample were from manufacturing sector, this made the relationship with PPE_share more sensible and regression coefficient bigger in absolute value. In other words, lenders value the additional security offered by the reputational value of auditor claims on asset valuation since it allows them to sell these assets as a backup plan in the case of credit concerns with the borrower.

In addition to this conclusion, it is interesting to note that the coefficient for Log_Tot_Assets was positive, indicating a possible counterbalance provided by intangible assets. According to Atasoy et al. (2022), firms' stakeholders have preconceived beliefs about intangibles and see enterprises with a higher ratio of intangible assets as risky. This assumption is most likely based on the fact that these types of assets are frequently illiquid and difficult to analyze or dispose in the event that a company declares bankruptcy. The fact that Log_Tot_Assets has a positive regression coefficient, together with the negative PPE_share regression coefficient, may indicate that an Intangible bias exists.

The Third Hypothesis has been more complicated to prove than the previous two, as there was no significant association between Audit and Innovation. Previous research suggests that auditing can improve a firm's liquidity by reducing the risk of fraud in financial statements and, in turns, the information asymmetry between lenders and borrowers (Kausar et al., 2016). Therefore, audited firms generally experience increased debt, and investments. The underlying intuition behind this third regression analysis was the following: if audit, particularly its quality, positively impacts a company's overall attractiveness in the financial market, enabling it to raise more funds easily, then it should be able to invest more in innovation. Thus, a positive association should exist between the two previously utilized dummy variables, Audit and Big4, and the innovation proxy, Patents_Value (PV).

Actually, this association proved fruitless because the Big4 and Audit regression coefficients were not significant in any sample. However, I believe there were some interesting findings in the regression coefficients, especially when it came to their significance. The Audit dummy variable in the first sample showed a positive coefficient of 181.66 with a p-value of 0.21, making it statistically insignificant. The Big4 variable, however, showed a higher regression coefficient in the second sample (264.63), despite the relatively negligible p-value of 0.12. This raises a crucial point: there may be a correlation of some kind between corporate innovation and audit quality. This is especially clear in the second sample, where the p-value is getting close to the standard 10% cutoff point that's often used to determine significance. Furthermore, I would like to emphasize that this association was shown also in the correlation matrices as significant and positive for both the Big4 variable and the Audit. In particular, Big4 had a positive correlation coefficient of 0.55 significant at the 0.021 level, whilst Audit and Patents Value (PV) demonstrated a positive correlation coefficient of 0.044 statistically significant at the 0.042 level. I am quite confident that the lack of significance in the regression findings does not suggest the absence of the link, but is determined by the model itself. . In fact, Innovation is influenced by a myriad of factors that need being taken into account, above all when you choose a proxy that can only partly capture the level of innovativeness of a firm. Hence, the inherent complexity surrounding innovation creates substantial noise, making it challenging to accurately capture it. In this case, I chose Patents Value (PV) as a proxy for innovation and although it can represent a limitation as it incorporates many assumptions, I found a relationship between Audit quality and Innovation which was only slightly insignificant. To whom wants to analyze this phenomenon in more details, I suggest to adjust the

model and experimenting with various proxies for innovation in order to fit the particular dependent variable. Improving the research overall requires adhering to the iterative procedure that was utilized to create the model for the first two hypotheses.

Results Summary				
H1:	*Audited firms are expected to exhibit a lower cost of debt compared to non-audited firms in the Italian private market, all else being equal.*			Confirmed
	Audit Regression Coefficient	-0.29	p-value	0.077
H2:	*Firms opting for auditing services from a Big Four accounting firm enjoy lower cost of debt compared to firms that are audited by others, all else being equal.*			Confirmed
	Big4 Regression Coefficient	-0.288	p-value	0.048
H3:	*Companies audited by Big Four accounting firms demonstrate greater levels of innovation compared to companies audited by non-Big Four firms.*			Not Confirmed
	Audit Regression Coefficient	181.66	p-value	0.21
	Big4 Regression Coefficient	264.63	p-value	0.12

Figure 22 Summary of the Results

Limitations of this Research

In this final paragraph I will discuss about the potential limitations of my research. With this, I hope to describe in full the difficulties faced throughout the investigation, with the goal of paving the road to whom wish to further examinate these phenomena.

Firstly, I want to emphasize my effort to homogenize as much as possible the sample in order to respect “all else being equal” criteria present in the hypothesis. Cost of Debt (CoD) is a financial metric that is determined by a variety of factors, and it is important to have similar firms within the sample as the CoD determination could be affected by the specific business model of the firm, its dimensions etc. As I have said throughout the dissertation, the primary purpose of the researcher is to isolate the phenomena in order to decrease noise, which is represented by factors not taken into account by the model. In order to isolate as much as possible, the ties with CoD, I decided to place some constraints on the sample, which has yielded a set with more or less only manufacturing enterprises, thus with the same business model and with similar dimensions. Nevertheless, the first constraint might be expressed by the 'all else being equal' condition. Indeed, in my opinion, it is challenging to strike a balance between the sample's large number of firms and its relative homogeneity. Despite the fact that I added certain constraints to the sample, I would recommend to those who wish to

investigate the CoD determinants in Italy working more on the sample's homogeneity, maybe adding also some constraints regarding the firm ownership structure.

Another restriction might be that the sample I picked consisted of firms who voluntarily conduct audits and firms that were required by law for their size to employ an external auditor. The literature faced the same issue as the law requirements for audit are quite strict in Europe, making it impossible to create a substantial sample consisting only of companies that voluntarily undergo audit. Specifically in Italy, where the private debt market is underdeveloped in comparison to the US and audit is perceived as a mere cost without a real benefit for the firms, this is also more difficult. I firmly believe that such study should be conducted exclusively on enterprises who willingly choose to be audited since this allows us to understand the influence that a firm's freely determined decision can have on CoD.

Furthermore, as I said before when presenting the data for the Second Hypothesis, the Big4 descriptive statistics mean was 0.33, implying that 33% of the sample was audited by a Big Four auditing firm. Although Italy is a unique audit sector in that the Big Four have a smaller market share than they do in the rest of Europe or America, the market share recorded in my sample seem being too smaller. This is, in my opinion, a limitation of my study since the fact that market share could not match the total population data, the sample may not be representative of the entire population, and so the conclusions may not be relevant to all private Italian enterprises.

The last constraint is indicated by the proxy used to evaluate the firm's level of innovativeness. As I described in the literature review and in the research design section, innovation is an undefinable notion that touches on many aspects of the organization and manifests itself through a variety of indicators. The one chosen, namely the Patents' value presented in the Balance sheet, has advantages and disadvantages, which I will address here in order to provide the reader with a thorough understanding of what the usage of this variable may mean. Starting with the pros, patents value indicates the cumulative value that the business recorded on its balance sheet as registered patents; hence, it is a quantifiable metric that can be easily employed in a regression study. Furthermore, the relationship between this measure and the firm's level of innovativeness is straightforward: the more the firm is able to innovate, the higher the value it can record in its BS. I want to emphasize that the Patents value can reflect both the increase in the number of registered patents and their relative relevance in terms of value.

To be honest, using this variable as a proxy for evaluating the firm's level of innovativeness implies a crucial assumption: it makes no difference whether the invention originates directly from the firm or from an acquired company. In fact, if my intuition is correct, audited firms have far more liquidity than others; they should utilize this liquidity either to directly innovate or to acquire other companies who have previously invented

and registered their patents in their BS. Both the scenarios resulted in an increment of the Patents value even if in the case in which the firm acquires a prominent company it does not directly innovate.

These were the constraints I encountered during my investigation. The field, as I mentioned in the introduction, is very new, and no study has been conducted in Italy on this subject. This made things extremely tough since I had to compare what had been done elsewhere and try to replicate it as much as possible in the circumstances of the Italian private market. I believe it is critical to openly communicate their own concerns in this section since it may be useful for others who wish to go deeper into this topic and address the limitations of this research in order to refine the scope and techniques of analysis.

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