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Financing Policies of Innovative Italian SMEs: Who Finances Business Innovation?

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Abstract Financial constraints are among the causes of the innovative gap that characterized Italian SMEs in the last decades, and that contributed to stagnant productivity and a low growth rate. Despite the relevance of the problem, relatively few studies have indagated the innovative gap of firms in Italy just focusing on their financing issues. Therefore, the paper analyses the financing policies of Italian innovative young firms. The aim is twofold: to observe the main sources of capital and verify whether the capital structure of innovative firms is conditioned by their life cycle and innovativeness; to identify the firm-specific factors influencing the choices of financing sources. A sample of 1289 Italian startups and SMEs, identified among those registered in the appropriate section of the Italian "business register", has been analyzed. A two-step regression analysis has been performed to assess the influence of several firm-specific factors on corporate financing policies. The evidence indicates that the level and composition of debt vary with the innovation degree of the firms considered. The high variability of the financial structure ratios does not allow a univocal interpretation of the influence of the business life cycle; this is also due to the impact of other firm-specific factors on corporate funding policies. The results of the research allow some early insights into the ability of Italian young innovative companies to adapt their capital structure to the evolving conditions of the business.

Keywords: • innovative firms • SMEs • financing policies • capital structure • business life cycle

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1 Introduction

There's no doubt of the importance of innovation in helping businesses navigate their way out of the pandemic crisis. Most businesses have had to adapt, quickly seizing new opportunities in order to survive. This is what innovation is all about: a change in products or processes that adds value for entrepreneurs and stakeholders. It will certainly play a significant role in getting businesses back to growth and value creation. In a post-pandemic economy, the search for competitiveness brings a rethinking of business strategies and policies, which should be mainly based on the ability to innovate. The latter requires advanced knowledge, continuous renewal of know-how, highly qualified human resources, and structural R&D activities (Subramaniam & Youndt, 2005; Paoloni et al., 2020). In other terms, innovation at the same time requires and generates a strong intellectual capital (Gennaro et al, 2019). Moreover, innovation and flexibility are strictly required for firms to be reactive and resilient in turbulent markets (and in times of crisis), their knowledge and networks represent strategic components of their business model and value proposition system (Buenechea-Elberdin et al., 2017). Indeed, the vitality, strength, and resilience of a business model depend on the company's ability to innovate by generating distinctive knowledge resources and adapting them to the dynamics of the competitive environment (Cabrilo and Dahms, 2018).

Institutional debate, mainly in countries like Italy where economic growth is a problem to face, is increasing. In recent decades, Authorities (Consob, Bank of Italy, etc.), universities and research centers (Mediobanca, Prometeia, etc.) have addressed the problems of the competitiveness and growth of Italian SMEs. Policymakers have considered these problems by often placing them at the center of their economic policy choices. Since the early 90s, the Italian economic and industrial system has faced relevant changes due to the globalization of trade, the EU integration process, and the ITC development. More recently, other important factors of change have been added, such as digital innovation, environmental and social sustainability of business activities, and circular economy. New business opportunities and business models arose, and new business risks arose as well. That increased competitive pressure for SMEs and shifted their balances between internal or external growth, economies of scale or scope, transaction costs or agglomeration economies. With the outbreak of the pandemic crisis, global value chains showed their fragility, and membership in international supply and production networks, which in the 2000s was considered a key strategic driver for business development, was called into question.

Several issues limit the ability of Italian small and medium-sized enterprises to innovate. Low level of entrepreneurship, poor managerial culture, and lack of well-defined innovation processes are among the main reasons. Alongside these, certainly, there are financing problems (European Commission, 2019 and 2022; OECD, 2021). The financial needs for innovation are evident: building and regenerating intellectual capital require investments, which call for adequate sources of capital.

The financing policies of Italian non-financial SMEs have been observed in several research from the Bank of Italy, which outline the peculiarities of their capital structures, and the effectiveness of public measures devoted to fostering access to financial markets (equity side or debt side). De Socio e Russo (2016) found that in the run-up to the financial crisis Italian firms significantly increased their debt in absolute terms and in relation to equity. The positive gap in firms' leverage between Italy and other euro-area countries has widened in recent years, despite the outstanding debt of Italian firms has decreased since 2011. Authors document the magnitude of this gap using both aggregate macro data and firm-level information: controlling for several firm-specific characteristics (i.e. age, profitability, asset tangibility, asset liquidity, turnover growth), they find that the leverage of Italian firms is about 10% higher than in other euro area countries. Differences are systematically larger among micro and small firms. In the period before the financial crisis, as a result of low-interest rates and abundant liquidity, Italian non-financial corporations increased their financial debt considerably, particularly their debt levels with banks.

The condition of low capitalization and low financial independence of Italian small and medium-sized enterprises highlights financial problems that might worsen when companies have innovative business models. New or young enterprises, despite their high technological content and strong growth potential, may suffer limits in accessing capital markets, rationing in bank credit, financial constraints, etc. However, startups and innovative SMEs represent an important factor in the innovation and development of the country and are considered one of the key points of Italian economic policy. With legislative decrees no. 179/2012 and 3/2015 Italian government defined innovative startups and innovative SMEs and introduced some specific measures to support these companies to support them during their life cycle (birth, growth, maturity). With these regulatory interventions, the Italian policymakers intend to develop a dynamic and competitive "innovation ecosystem", to create new opportunities for doing business and encourage employment and promote sustainable growth strategies. To achieve the status of innovative firms, Italian startups and SMEs must have the following objective [Table 1] and subjective [Table 2] requirements.

Table 1: Objective requirements for innovative young Italian companies

OBJECTIVE REQUIREMENTS	INNOVATIVE STARTUPS (Legislative Decree n. 179/2012)	INNOVATIVE SMEs (Legislative Decree n. 3/2015)
• new company or established for no more than 5 years	✔	
• resident in Italy, or in another country of the European Economic Area but with a production site or branch in Italy	✔	✔
• annual turnover of less than 5 million euros	✔	
• not listed on a regulated market	✔	✔
• no dividend payout	✔	
• exclusive or prevalent corporate purpose the development, production and commerce of a product or service with a high technological value	✔	
• not be the result of a merger or spin-off	✔	
• latest financial statements certified by an independent auditor		✔

Source: Authors' elaboration.

Table 2: Subjective requirements for innovative young Italian companies

SUBJECTIVE REQUIREMENTS	INNOVATIVE STARTUPS (Legislative Decree n. 179/2012) at least 1 of the following subjective requirements	INNOVATIVE SMEs (Legislative Decree n. 3/2015) at least 2 of the following subjective requirements
• R&D and innovation expenses	at least 15% of the higher value between cost and total value of production	at least 3% of the higher value between turnover and cost of production
• Qualified personnel	at least 1/5 PhDs, PhD students or researchers, or at least 1/3 with master's degrees	at least 1/3 PhDs, PhD students or researchers, or at least 2/3 with master's degrees
• Intellectual property	ownership or licensing of at least one patent or one registered software	ownership or licensing of at least one patent or one registered software

Source: Authors' elaboration.

Innovative startups, after entering the special section of the "Business register" dedicated to innovative firms, can enjoy tax and financial benefits within 5 years of their establishment. Since Italian policymakers consider innovative SMEs as the second evolutionary stage of the innovative startups mature and ready for the consolidated growth phase, startups can transform themselves into SMEs without losing the benefits.

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Through fiscal and financial incentives, Italian policymakers have attempted to create an ecosystem favorable to the birth and consolidation of innovative companies. The focus of our research is the financial policies and financing choices of Italian companies recognized as innovative in accordance with the aforementioned legislative decrees. Our study, therefore, attempts to provide some first answers to the following research questions:

- *RQ1* Does the financial structure of Italian innovative companies depend on the stage of their life cycle and on their degree of innovation?
- *RQ2* What are the firm-specific factors, among those already identified and investigated in the literature, that most influence the financial choices of innovative companies?

The paper is organized as follows. The literature review on intellectual capital disclosure and measurement is presented in Section 2. Sample, dataset, and methodology are presented in Section 3, while in Section 4 evidence is shown and results are also analyzed and discussed in detail. Section 5 presents final remarks on the results, limitations of the research, and future implementations.

2   Literature overview

Since the fundamental work of Modigliani and Miller (1958), financial literature has been discussing if financing policies affect the firm's value, if an optimal capital structure does exist, and what variables can affect the financing choices of companies, which result in sub-optimal capital structure and no-maximized corporate value (Myers, 1984). Scholars and practitioners studied and tried to explain several phenomena that affect the firms' financial management like financing lacks or constraints, external financing preferences, and debt overhang, just to name a few.

Based on the well-known revised "M&M propositions" (Modigliani and Miller, 1963), the conceptual model called "Trade-off Theory" (ToT) was built and tested. It specifically focuses on the link between capital structure, insolvency risk, and corporate value, considering disruption costs and default costs related to financial debt (Copeland et al. 2005). The ToT affirms the existence of an optimal financial structure reachable by balancing advantages (tax savings) and disadvantages of financial debt (bankruptcy costs; agency costs). The tax shield makes convenient the increase of debt until a further increase would lead to a rising in default probability and related costs which result in a reduction in the firm value. Limits of the TOM for practical uses are several. The identification of an optimal structure requires an estimation of the default probability, related costs, and methods to be considered in the firm valuation process.

From this theoretical model various lines of research have been derived which aim to investigate the following aspects: dynamics of the financial structure and adjustment

costs; firm-specific factors that contribute to defining the optimal financial structure or condition its realization; impacts of the business life cycle and business innovation on financing policies; relationships between governance structures, ownership structures, and financial structure.

Optimal leverage tends to vary over the lifecycle of a company (birth, growth, maturity, and decline). Each phase is characterized by different levels of financial distress, insolvency risk, and recovery probability, and therefore influences financing policies and changes in the capital structure of a firm (Koh et al. 2015). The relationship between optimal capital structure and cash flow risk has also been explored. Several studies focused on the role of systematic risk, finding that firms with riskier assets choose a lower net leverage, given their higher expected financing costs; less risky firms, with lower expected financing costs, optimally choose to issue more debt to exploit a tax advantage (Palazzo 2019). Other studies focused on the role of operating leverage as a risk factor, finding that firms with lower levels of operating cash flow have a positive and significant relationship between cash flow risk and debt levels, while firms with higher levels of operating cash flow have no significant relationship between cash flow risk and debt levels (Harris and Roark 2018).

Financial studies paid a specific attention to this kind of issue when referring to SMEs. The issue of SME financing is well known and under massive investigation for decades (Cressy and Olofsson, 1997; Beck and Demirguc-Kunt, 2006; Berger and Udell, 2006; Ebiringa, 2011). There is no doubt that access to finance is of crucial importance for the growth and profitability of SMEs, through its role in facilitating the creation of new businesses and nurturing the innovation process. Several studies have discussed that SMEs are financially more constrained than large firms and are less likely to have access to formal finance. There is a general consensus that financial markets do not function well when it comes to small and medium firms; the main reasons for market failures considered in financial literature are information asymmetries and external benefits (eg. spillovers), that are more relevant for SMEs' than for large enterprises.

Al-Zoubi et al (2018) analyzed the relationship between business cycles, financial cycles and capital structure. They find evidence that firms' leverage is both persistent and cyclical, a result supported by the trade-off, pecking order, and market timing capital structure theories. Although market timing theory research supports persistence, previous literature dictates that the trade-off and pecking order theories may predict either persistent or mean reverting leverage. In addition, the Authors examine whether firms change their capital structure as a result of business and financial cycles. Since financial cycles last longer than business cycles, financial cycles should have a long-term effect on leverage.

The presence of market failures (informational issues and externalities) implies that the size and the number of SMEs tend to be not optimal, with respect to what would be an

efficient market organization and a competitive firm's dimension in dynamic and innovative industries. Indeed, limited access of SMEs to the capital market could represent a serious impediment to their expansion strategies and investment (also in R&D) policies. In the framework of market failures, financial literature deeply analyzed the factors that matter in the determination of the availability and the cost of capital resources, and of the financing policies of SMEs. A significant part of the literature has focused on the intrinsic characteristics of SMEs, such as size, age, ownership and governance structures, and management team (Abdulsaleh and Worthington, 2013). In this field, specific attention is paid to the role of age (Kieschnick and Moussawi, 2018), and to the dynamics of the determinants of SMEs capital structure across their lifecycle (Matias and Serrasueiro, 2017; Martinez Cillero et al., 2019). Other studies have focused on the economic environment's impacts (Xia et al., 2019), searching for context elements able to affect the financial decisions of SMEs, not only related to credit policies of banks or sector dynamics, but also to the supply-chain network (Song et al., 2016) and tax regulation. Relatively poor is the literature that considers the relationships between the financial policies of SMEs and financial innovation; in this context, an interesting line of studies has investigated the impacts of securitization operations (Casey and O'Toole, 2014; Kaya and Masetti, 2019).

3 Research

The aim of the research is to verify whether financing policies of Italian innovative companies are influenced by their business life cycle and innovativeness degree. We focused on young and small or medium-sized enterprises because, unlike large companies, they encounter greater constraints in accessing some sources of finance, that the public intervention aims to remove.

The relationship between financing choices and business life cycle has been analyzed through the capital structures of a sample of young innovative companies of different ages, being the firm's age equal to the number of years since the start of the business activity. We have considered the age of a firm as an objective indicator of its life-cycle stage. Indeed, without specific information, different indicators (e.g., revenue growth rate, breakeven point of EBITDA, etc.) would have led to classification or comparison problems. This research approach has led to the cross-sectional analysis illustrated below, which makes it possible to compare the capital structure that the sampled innovative companies had at the end of 2021. The use of cross-sectional data certainly limits the possibility to control for time-variation in firm-specific variables but has the advantage that the analysis is not influenced by time variations in macroeconomic or context variables, which could affect the financial choices of companies in different ways depending on the age.

To build an adequate sample a clear definition of an innovative company is required. Available definitions in managerial literature converge on the concept of business

innovation as the ability to design new products and processes or to implement new business models that allow a firm to strengthen its competitiveness generating value for its stakeholder. This definition includes various forms of innovation, for which the criteria for identifying innovative companies may be different and may require information that is often not available in the case of unlisted SMEs. Therefore, we have considered the criteria envisaged by the aforementioned Decrees to define and identify a sample of Italian innovative companies. Therefore, the startups and SMEs registered in the special section of the Italian "Business Register" created for innovative firms were analyzed. From the website (https://startup.registroimprese.it/isin/home) it is possible to download the list of registered startups and SMEs and obtain information on the headquarters, sector, size, and innovativeness requirements. As of September 30, 2022, there are 14.716 innovative startups and 2.372 innovative SMEs registered in this Register, an increase compared to the first quarter of 2022. Considering only incorporated companies (joint-stock and limited liability companies), and excluding firms in liquidation or with incomplete data, we identified 14.989 innovative firms, representing our study's reference population. For these companies, information is available on the age, the subjective requirements [Table 3], the amount of equity [Table 4], and the belonging sector [Table 5].

Table 3: Innovative Italian companies at July 1, 2022 – Age and innovation requirements

AGE (years)	INNOVATION REQUIREMENTS			Total	
	1	2	3		
less than 3	6.136	272	51	6.459	43,09%
3	2.148	157	24	2.329	15,54%
4	1.808	131	25	1.964	13,10%
5	1.407	173	32	1.612	10,75%
6	464	231	22	717	4,78%
7	96	238	42	376	2,51%
8	14	256	34	304	2,03%
9	4	183	28	215	1,43%
10	1	120	25	146	0,97%
more than 10	7	712	148	867	5,78%
Total	**12.085**	**2.473**	**431**	**14.989**	*100,00%*
	80,63%	*16,50%*	*2,88%*		

Source: Authors' elaboration.

Table 4: Innovative Italian companies at July 1, 2022 – Age and equity

AGE (years)	EQUITY								Total	
	⪷ 10 k/€	⪷ 50 k/€	⪷ 100 k/€	⪷ 250 k/€	⪷ 500 k/€	⪷ 1 mln/€	⪷ 2,5 mln/€	> 2,5 mln/€		
less than 3	4.097	1.506	350	270	124	57	32	23	6.459	43,09%
3	1.289	590	173	127	79	33	29	9	2.329	15,54%
4	1.046	539	134	110	55	40	26	13	1.963	13,10%
5	787	444	148	98	56	37	27	15	1.612	10,76%
6	318	214	62	54	32	18	11	8	717	4,78%
7	109	126	36	40	25	16	12	12	376	2,51%
8	78	103	35	38	28	11	5	6	304	2,03%
9	48	79	21	24	10	12	16	5	215	1,43%
10	28	47	21	19	11	9	6	5	146	0,97%
more than 10	94	219	166	144	75	68	57	44	867	5,78%
Total	**7.894**	**3.867**	**1.146**	**924**	**495**	**301**	**221**	**140**	**14.988**	100,00%
	52,67%	25,80%	7,65%	6,16%	3,30%	2,01%	1,47%	0,93%		

Source: Authors' elaboration.

Table 5: Innovative Italian companies at July 1, 2022 – Age and sectors

AGE (years)	SECTORS					Total	
	SERVICES	INDUSTRY/H ANDICRAFT	COMMERCE	TOURISM	AGRICULTU RE/FISHING		
less than 3	5.231	925	211	45	47	6.459	43,09%
3	1.826	380	80	21	22	2.329	15,54%
4	1.537	341	63	13	10	1.964	13,10%
5	1.207	300	65	23	17	1.612	10,75%
6	534	141	33	4	5	717	4,78%
7	278	69	27	1	1	376	2,51%
8	229	59	12	3	1	304	2,03%
9	155	46	14	-	-	215	1,43%
10	105	31	8	2	-	146	0,97%
more than 10	600	216	49	1	1	867	5,78%
Total	**11.702**	**2.508**	**562**	**113**	**104**	**14.989**	100,00%
	78,07%	16,73%	3,75%	0,75%	0,69%		

Source: Authors' elaboration.

We used the subjective requirements indicated by the Italian Decrees to assess the degree of innovation of the companies examined: the number of possessed requirements is a proxy of the innovativeness degree of a firm. Companies that have 3 requirements are considered very innovative; those that have 2 are considered on average innovative; those that have only 1 are considered less innovative. The latter category is most of the reference population and tends to correspond to smaller companies in the start-up stage.

For each company included in our reference population, we downloaded from the database AIDA (Bureau van Dijk)[1] the accounting data and the financial ratios of the last available financial statement (fiscal year 2021 or, in few cases, 2020). Unfortunately, the accounting data of just 3792 companies was available, ie 25% of the total of firms reported in the section of Business Register for innovative startups and SMEs. This did not make it possible to extend our analysis to the entire population of young Italian innovative firms. To answer our research questions, for companies with available data,

we collected 7 accounting indicators of capital structure [Table 6], 7 accounting indicators of solvency, profitability, intangibility, and size [Table 7], and 3 variables expressing the ownership structure of firms [Table 8].

Table 6:   Capital structure indicators

Firm characteristic	Variables	Financial ratios
Capital Structure	Financial leverage	$\dfrac{financial\ debt}{net\ worth}$
	Net Financial leverage	$\dfrac{net\ financial\ position}{net\ worth}$
	Equity to debt ratio	$\dfrac{net\ worth}{total\ debt}$
	Financial independence	$\dfrac{net\ worth}{total\ assets}$
	Debt maturity	$\dfrac{short-term\ debt}{total\ debt}$
	Bank debt incidence	$\dfrac{bank\ debt}{revenues}$
	Equity magnitude	$\dfrac{equity}{net\ worth}$

Source: Authors' elaboration.

Table 7: Firm-specific indicators for solvency, profitability, intangibility and size

Firm characteristics	Variables	Financial ratios
Solvency	Current ratio	$\dfrac{current\ assets}{current\ liabilities}$
	Debt Coverage Ratio	$\dfrac{financial\ debt}{ebitda}$
Profitability	Ebitda Margin	$\dfrac{ebitda}{revenues}$
	Return on Assets (ROA)	$\dfrac{ebit}{net\ assets}$
Intangibility	Intangible asset	$\dfrac{intangible\ assets}{total\ assets}$
Size	Capital invested	*Total assets*
	Turnover	*Operating revenues*

Source: Authors' elaboration.

Table 8: Variables for ownership structure

Firm characteristics	Variables	Specifications
Ownership structure	Equity Concentration	*Number of Shareholders*
	Type of First Shareholder	*- Natural person or member of the entrepreneurial family* *- Insurance* *- Banks* *- Pension or mutual funds* *- Hedge funds* *- Private capital funds (venture capital or private equity)* *- Non-financial corporations* *- Financial companies* *- Others*
	Control of First Shareholder	*percentage of ownership of first shareholder/quotaholder*

Source: Authors' elaboration.

Among the indicators of capital structure composition, we included the ratio between equity capital and net worth. Since the latter includes reserves deriving from non-monetary revaluations and retained earnings, the incidence of the company equity reflects the ability of a firm to raise capital from external sources.

Excluding companies with missing data or incomplete information on the ownership structure, we obtained a sample of 1.289 innovative companies, both startups and SMEs. Our sample, therefore, contains all the young innovative Italian companies reported in the specific section of the Business Register, whose accounting data are complete and available in the AIDA database. It represents an adequate portion of the reference population (8.60%), but its composition is different from that of the entire population since the lack of some accounting data in AIDA, especially those of smaller and younger companies [Table 9 and Table 10]. Since this lack, any sampling technique would have led to a much smaller sample.

Table 9: Sample of innovative Italian companies – Age and innovation requirements

| AGE (years) | INNOVATION REQUIREMENTS | | | Total | % of population |
	1	2	3		
less than 3	45	7	2	54	0,84%
3	85	20	1	106	4,55%
4	95	31	3	129	6,57%
5	78	40	3	121	7,51%
6	26	64	7	97	13,53%
7	4	67	10	81	21,54%
8	2	71	7	80	26,32%
9	-	65	7	72	33,49%
10	-	40	10	50	34,25%
more than 10	2	426	71	499	57,55%
Total	337	831	121	1.289	8,60%
% of population	2,79%	33,60%	28,07%	8,60%	

Source: Authors' elaboration.

Table 10: Sample of innovative Italian companies – Age and sectors

| AGE (years) | SECTORS | | | | | Total | % of population |
	SERVICES	INDUSTRY/H ANDICRAFT	COMMERCE	TOURISM	AGRICULTU RE/FISHING		
less than 3	35	14	4	1	-	54	0,84%
3	67	30	7	2	-	106	4,55%
4	81	37	10	1	-	129	6,57%
5	83	28	9	1	-	121	7,51%
6	69	20	7	1	-	97	13,53%
7	53	20	7	1	-	81	21,54%
8	49	23	6	2	-	80	26,32%
9	46	20	6	-	-	72	33,49%
10	33	11	5	1	-	50	34,25%
more than 10	322	143	33	1	-	499	57,55%
Total	**838**	**346**	**94**	**11**	**-**	**1.289**	*8,60%*
% of population	*7,16%*	*13,80%*	*16,73%*	*9,73%*	*0,00%*	*8,60%*	

Source: Authors' elaboration.

The following tables provide the main statistics relating to the age, innovativeness, capital structure [Table 11], ownership features, and other firm-specific indicators [Table 12] of the firms included in the sample.

Table 11: Statistics of age, innovativeness, and capital structure of innovative firms in the sample

DESCRIPTIVE STATISTICS	AGE	INNOVATION REQUIREMENTS	FIN.DEBT on NET WORTH	NFP on NET WORTH	NET WORTH on TOT.ASSET	NET WORTH on TOT.DEBT	St DEBT on TOT.DEBT	BANK DEBT on REVENUES	EQUITY on NET WORTH
Mean	11,44	1,83	1,44	0,63	34,99	1,12	0,73	23,80	0,22
Standard error	0,28	0,02	0,15	0,11	0,62	0,05	0,01	0,67	0,01
Median	8,00	2,00	0,46	0,04	33,49	0,61	0,74	17,17	0,08
Most frequent value	4,00	2,00	0,00	n.a.	37,30	0,24	1,00	0,00	n.a.
Standard Deviation	9,91	0,57	5,29	4,03	22,29	1,82	0,22	24,20	0,48
Sample Variance	98,14	0,33	27,96	16,28	496,73	3,32	0,05	585,83	0,23
Curtoris	9,15	-0,19	132,09	94,44	-0,06	57,62	-0,67	0,26	109,20
Asimmetry	2,35	0,01	9,78	7,80	0,21	5,87	-0,47	1,02	4,87
Range	95,00	2,00	121,06	85,23	139,86	28,41	0,93	99,35	14,26
Minimum	1,00	1,00	-26,78	-24,33	-43,35	-0,78	0,07	0,00	-5,97
Maximum	96,00	3,00	94,28	60,90	96,51	27,63	1,00	99,35	8,29
Count	1289,00	1289,00	1289,00	1289,00	1289,00	1289,00	1289,00	1289,00	1289,00
Confidence level of Mean (95%)	0,541	0,031	0,289	0,220	1,218	0,100	0,012	1,323	0,026

Source: Authors' elaboration.

Table 12: Statistics of solvency, profitability, intangibility, size, and ownership structure of innovative firms in the sample

DESCRIPTIVE STATISTICS	CURRENT ratio	FIN.DEBT/EBITDA ratio	EBITDA on REVENUES (%)	RETURN ON ASSET (%)	INT.ASSET on TOT.ASSET	LN(Tot.Asset)	LN(Revenues)	N° of SH	TYPE of FSH (dummy)*	Control of FSH (dummy)**
Mean	2,04	3,01	5,23	3,64	0,17	15,02	14,72	11,33	0,54	0,58
Standard error	0,04	1,00	1,41	0,50	0,01	0,03	0,03	1,16	0,01	0,01
Median	1,55	1,06	10,18	3,95	0,12	14,86	14,51	3,00	1,00	1,00
Most frequent value	1,04	0,00	7,53	2,26	0,00	n.a.	n.a.	2,00	1,00	1,00
Standard Deviation	1,57	35,78	50,58	18,08	0,18	1,13	1,12	41,58	0,50	0,49
Sample Variance	2,48	1280,53	2557,97	326,97	0,03	1,28	1,26	1728,81	0,25	0,24
Curtoris	5,03	351,67	123,91	9,84	1,30	-0,14	0,56	126,24	-1,98	-1,88
Asimmetry	2,03	14,99	-9,45	-1,56	1,29	0,50	0,49	10,16	-0,15	-0,35
Range	9,65	1160,11	1095,29	233,03	0,89	6,92	8,85	684,00	1,00	1,00
Minimum	0,11	-335,98	-808,15	-152,98	0,00	12,17	9,62	0,00	0,00	0,00
Maximum	9,76	824,13	287,14	80,05	0,89	19,10	18,46	684,00	1,00	1,00
Count	1289,00	1289,00	1289,00	1289,00	1289,00	1289,00	1289,00	1289,00	1289,00	1289,00
Confidence level of Mean (95%)	0,086	1,955	2,764	0,988	0,010	0,062	0,061	2,272	0,027	0,027

Source: Authors' elaboration.

Preliminarily, grouping the sampled companies by age and innovativeness, the distribution of the average value and the standard deviation of the capital structure ratios was examined. Through a simple graphic analysis, the trends of these financial ratios were identified and studied, to evaluate their significance and degree of representativeness of the entire reference population. We then proceeded with the regression analysis.

It is a common approach for multi-country studies to perform analysis on both pooled data and data from individual countries (Antoniou et al., 2008; Fan et al., 2012). This methodology enables the researcher to determine the impacts of firm-specific factors by assessing the significance of country effects on corporate financing policies. In our research, we applied this approach by performing a two-stage analysis to find out the drivers that impacts on financing choices of Italian innovative firms.

In the first stage, data on the entire sample are considered, and regression analysis is performed with pooled data from all sectors to detect the effects of life cycle and innovativeness on corporate financing policies. Therefore, the leverage is regressed just over the age and innovation requirement as the independent variables and dummies for sectors represent just control variables, as specified below:

$$LEV_i = \beta_0 + \beta_1 \cdot AGE_i + \beta_2 \cdot IR_i + \beta_3 \cdot D_i + \varepsilon_i \qquad [3.1]$$

where LEV_i is a measure of the level of debt of firm i, AGE_i is the number of years from its incorporation, IR_i is the number of innovative requirements a firm has, D_i is a vector of sector dummies, ε_i is the error term. Subsequently, the regression analysis was carried out by adding, consistent with the ToT, financial ratios and ownership variables:

$$LEV_i = \beta_0 + \beta_1 \cdot AGE_i + \beta_2 \cdot IR_i + \beta_3 \cdot AR_i + \beta_4 \cdot OS_i + \varepsilon_i \qquad [3.2]$$

where AR_i is a vector of firm-specific variables related to solvency, profitability, intangibility, and size, OS_i is a vector of firm-specific variables related to the ownership features. All these variables have been already defined and specified above. In this stage, the analysis has been carried out on both pooled data of the entire sample and data of sub-samples composed of firms of individual sectors. It is necessary also to specify that to perform the regression analysis:

- the natural logarithm of the dimensional indicators (total assets, total revenues) was used;
- variables relating to the ownership structure have been transformed into dummy variables as follows [Table 13].

Table 13: Dummies for ownership structure information

| Firm characteristics	Variables	Dummy
Ownership structure	Type of First Shareholder (dummy)	*1 if the first shareholder (with the highest percentage of ownership) is a natural person or a member of the entrepreneurial family;* *0 if the first shareholder is of another type (financial, company, trust, fund, etc.)*
	Control of First Shareholder (dummy)	*1 if the first shareholder is the controlling shareholder (percentage of ownership > 50,1%;* *0 if the first shareholder is not the controlling shareholder (percentage of ownership more < 50,1%*

Source: Authors' elaboration.

4 Discussion

By observing the mean values of the capital structure ratios by age and innovativeness groups, it can be seen that level and composition of debt vary along with the life cycle and the degree of innovation. However, the variations in the capital structure among the groups show different dynamics depending on the observed financial ratio.

The ratio between financial debt and net worth decreases with the age of the companies: the average value of this financial ratio goes from 4.04 for firms with less than 3 years, to 0.8 for firms with more than 9 years. Not considering outliers, a clear deleveraging trend could be observed.

The same indicator seems sensitive to the degree of innovation, although a clear and univocal trend is not observable. In fact, its average value first increases from 0.3 to 4.99 and then decreases to 2.14 [Figure 1].

Figure 1: Financial leverage by age and innovation requirement of firms
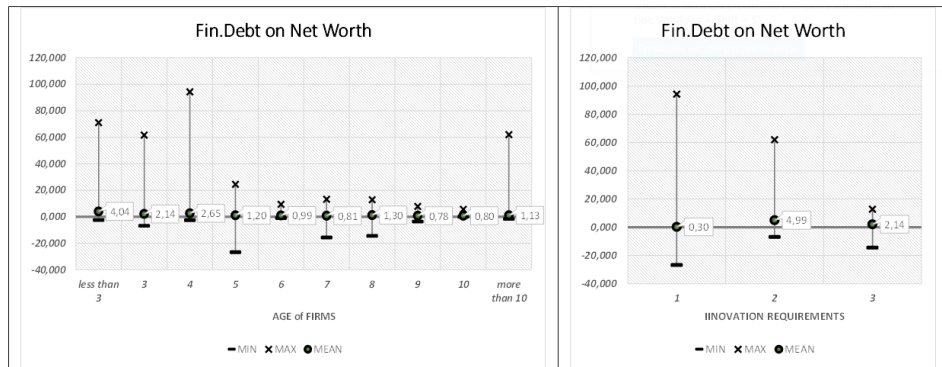
Source: Authors' elaboration.

As expected, similar evidence arises from observing the dynamics of the net financial position on net worth [Figure 2].

**Figure 2:** Net financial leverage by age and innovation requirement of firms
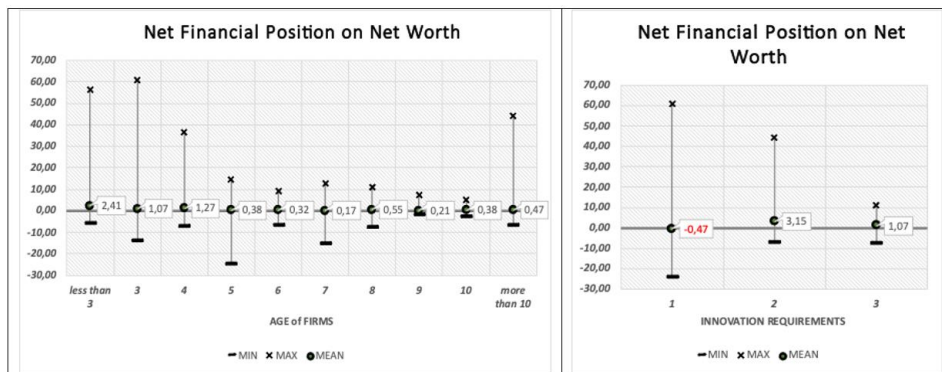
Source: Authors' elaboration.

The firms' financial independence, measured as net worth over total assets, shows, on average, values that tend to increase with the age of the sampled companies. So, it appears to follow an evolution consistent with that of financial leverage [Figure 3].

Figure 3:   Financial independence by age and innovation requirement of firms
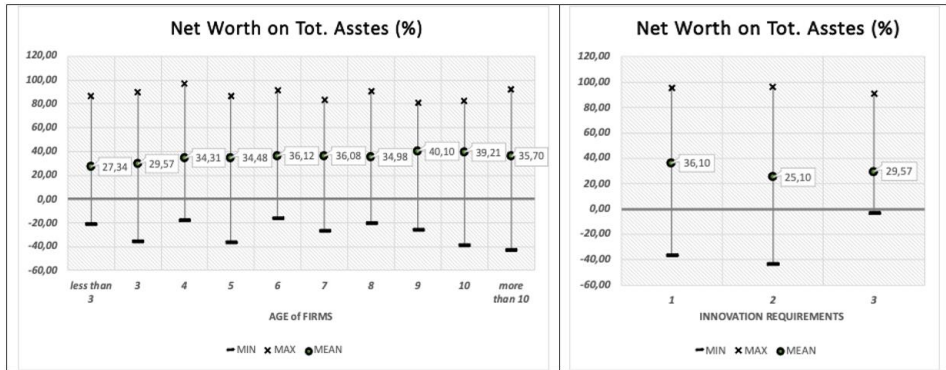
Source: Authors' elaboration.

Considering its trade payables and fiscal debt as well as its financial exposure, it is not possible to identify clear relationships between capital structure, age, and degree of innovation for the sampled firms. The ratio of net worth to total debt initially increases and then decreases, showing relevant swings [Figure 4].

Figure 4:   Financial strength by age and innovation requirement of firms
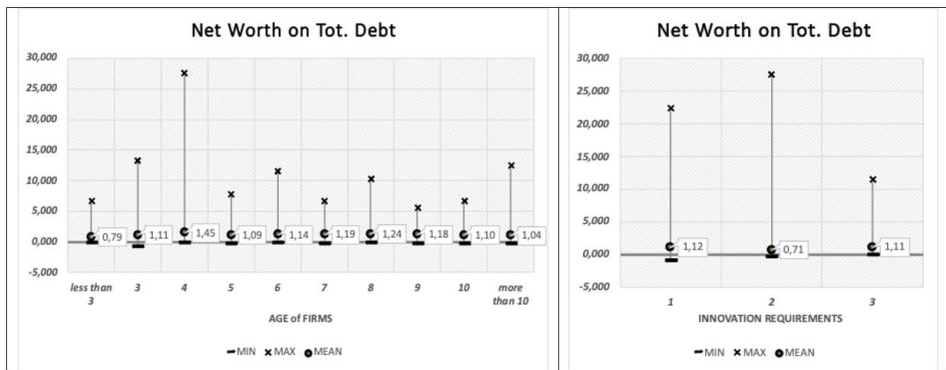
Source: Authors' elaboration.

Average values and ranges of the ratio of short-term debt to total debt clearly show that sampled firms tend to consolidate their debt exposure during their life cycle. It seems that this consolidation trend is also due to, or linked to, the degree of innovation [Figure 5].

Figure 5:   Short-term debt relevance by age and innovation requirement of firms
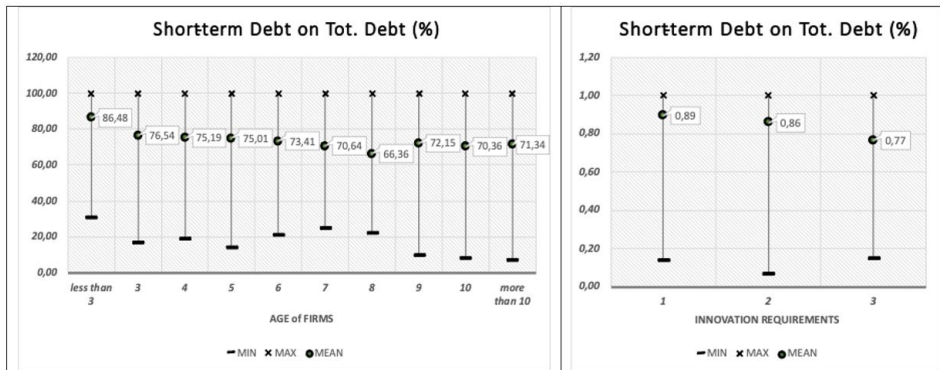
Source: Authors' elaboration.

Observing the exposure to the banking system, it emerges that bank loans increase with the age and the innovation requirements of the sampled companies [Figure 6]. This evidence is consistent with the financial literature. Indeed, the observed trend is probably due to the fact that, during the life cycle, firms increase information disclosure allowing banks to better understand their asset quality, competitive positioning, and corporate profitability.

Figure 6:   Bank loans relevance by age and innovation requirement of firms
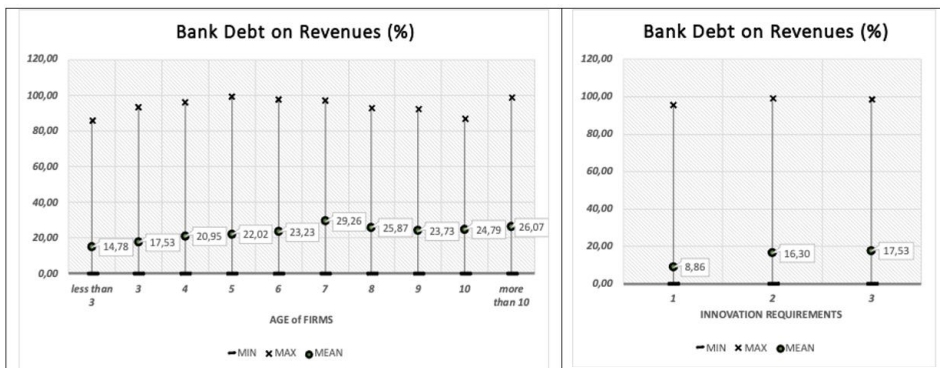
Source: Authors' elaboration.

The incidence of equity on net worth does not show any evidence that could suggest a link between the ability to attract capital, life cycle, and degree of innovation [Figure 7]. It is necessary to consider that the consolidation of the competitive position and profitability of innovative companies during their life cycle, by increasing their self-

financing capacity, could not make evident, through the sample averages, any capital increase subscribed by external investors.

Figure 7:   Equity capital relevance by age and innovation requirement of firms
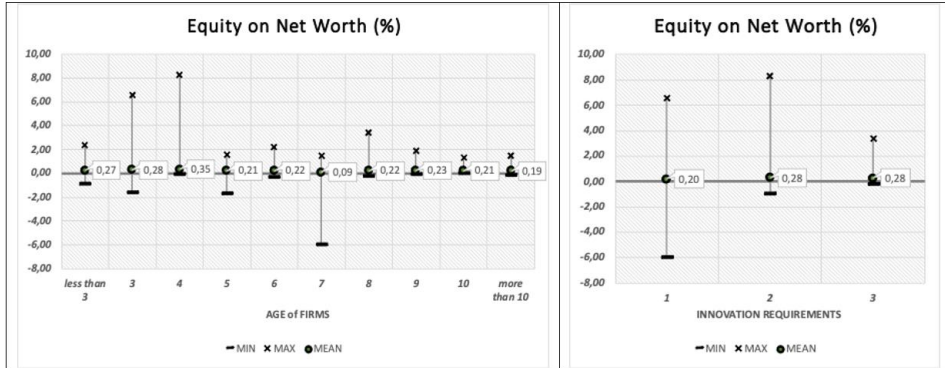
Source: Authors' elaboration.

Since the variance of previous accounting ratios is high in all classes of age or innovation requirements, the observed means and trends require further analysis to be correctly and carefully interpreted. In fact, the high variability and wide variation ranges of some ratios leave doubts about the effective ability of sampled innovative companies to increase their financial independence strengthening their "equity shoulders" and reducing their short-term exposure during the life cycle. This makes it difficult to draw general conclusions about the financial behavior of young Italian innovative firms. Unfortunately, as we have already clarified, the AIDA database does not contain the financial statements of 75% of the companies reported in the Business Register; therefore, it doesn't allow us to carry out a complete analysis of the entire reference population.

To overcome this problem and verify the significance of the previous empirical evidence, we performed a statistic test using the *Student's t-distribution* (*t*-test) to estimate the margin of error of mean financial ratios. Assuming a confidence level of 99%, we observed that the margins of error of net worth/total assets, short-term debt/total debt, and bank loans/revenues allow us to consider the average values and trends of these ratios representative of the entire population [Table 14].

Table 14: Margins of error

SUB_SAMPLE	CAPITAL STRUCTURE RATIOS	FIN.DEBT on NET WORTH	NFP on NET WORTH	NET WORTH on TOT.ASSET	NET WORTH on TOT.DEBT	St DEBT on TOT.DEBT	BANK DEBT on REVENUES	EQUITY on NET WORTH
Age	mean	4,036	2,413	27,340	0,791	0,865	14,784	0,266
Less than 3y	std.dev.	12,37	10,45	23,56	1,38	0,17	22,92	0,43
N. of firms	Margin of error*	4,497	3,801	8,566	0,501	0,061	8,332	0,158
54	margin of error on mean (%)	111,41%	157,52%	31,33%	63,43%	7,08%	56,36%	59,38%
Age	mean	2,139	1,072	29,565	1,113	0,765	17,530	0,277
3 years	std.dev.	7,66	6,94	26,99	2,12	0,25	22,20	0,77
N. of firms	Margin of error*	1,953	1,768	6,876	0,540	0,063	5,658	0,196
106	margin of error on mean (%)	91,28%	164,85%	23,26%	48,50%	8,22%	32,28%	70,56%
Age	mean	2,646	1,268	34,309	1,452	0,752	20,953	0,347
4 years	std.dev.	9,54	5,16	24,60	3,60	0,22	24,08	0,81
N. of firms	Margin of error*	2,197	1,188	5,663	0,828	0,050	5,545	0,187
129	margin of error on mean (%)	83,02%	93,68%	16,51%	57,05%	6,61%	26,46%	54,05%
Age	mean	1,198	0,376	34,484	1,093	0,750	22,021	0,213
5 years	std.dev.	4,14	3,42	25,20	1,51	0,23	25,61	0,35
N. of firms	Margin of error*	0,984	0,813	5,996	0,359	0,054	6,093	0,083
121	margin of error on mean (%)	82,13%	216,40%	17,39%	32,84%	7,26%	27,67%	38,76%
Age	mean	0,986	0,321	36,118	1,140	0,734	23,229	0,219
6 years	std.dev.	1,64	1,93	22,58	1,67	0,22	25,08	0,40
N. of firms	Margin of error*	0,438	0,516	6,025	0,445	0,059	6,693	0,106
97	margin of error on mean (%)	44,40%	160,64%	16,68%	39,03%	8,07%	28,81%	48,53%
Age	mean	0,808	0,172	36,084	1,194	0,706	29,258	0,093
7 years	std.dev.	2,96	2,72	24,83	1,53	0,22	27,93	0,74
N. of firms	Margin of error*	0,866	0,797	7,281	0,447	0,064	8,190	0,218
81	margin of error on mean (%)	107,23%	463,39%	20,18%	37,45%	9,07%	27,99%	235,03%
Age	mean	1,305	0,552	34,978	1,244	0,664	25,866	0,216
8 years	std.dev.	3,09	2,13	23,83	1,97	0,22	24,36	0,46
N. of firms	Margin of error*	0,913	0,630	7,031	0,582	0,066	7,187	0,136
80	margin of error on mean (%)	69,99%	114,10%	20,10%	46,75%	9,93%	27,79%	63,05%
Age	mean	0,780	0,207	40,102	1,180	0,722	23,725	0,228
9 years	std.dev.	1,40	1,34	21,82	1,15	0,22	23,44	0,38
N. of firms	Margin of error*	0,438	0,417	6,807	0,360	0,068	7,313	0,119
72	margin of error on mean (%)	56,09%	201,32%	16,97%	30,50%	9,47%	30,82%	52,05%
Age	mean	0,795	0,381	39,207	1,095	0,704	24,794	0,209
10 years	std.dev.	1,16	1,04	20,97	1,20	0,23	24,61	0,35
N. of firms	Margin of error*	0,441	0,396	7,947	0,456	0,089	9,329	0,132
50	margin of error on mean (%)	55,39%	103,85%	20,27%	41,61%	12,59%	37,63%	62,82%
Age	mean	1,131	0,472	35,705	1,038	0,713	26,072	0,195
more than 10y	std.dev.	3,28	2,66	18,59	1,29	0,22	23,21	0,25
N. of firms	Margin of error*	0,379	0,307	2,152	0,149	0,025	2,686	0,029
499	margin of error on mean (%)	33,54%	65,13%	6,03%	14,39%	3,52%	10,30%	14,73%

*Confidence level 99%

Source: Authors' elaboration.

Limits of the previous outcomes require completing the analysis by applying the regression models.

The following correlation matrix shows modest levels of correlation between the capital structure ratios, age, and innovativeness of the companies in the sample [Table 15a]. It is noted that the age of the examined companies has low levels of correlation with all the financial ratios, except for the incidence of bank loans. On the contrary, the degree of innovation has more relevant correlations with almost all capital structure ratios. The same matrix also shows the degree of correlation between the capital structure indices and firm-specific variables representing the solvency, profitability, intangibility, size, and ownership structure of the sampled companies. Financial structure indices have relevant correlations only with the current ratio, intangibility, and size when measured in terms of

total assets. The relationships between capital structure and other accounting ratios are controversial and unclear. As we expected, the number of shareholders has a significant positive correlation with the level of financial independence, while other aspects of the ownership structure do not seem to be significantly influencing the financing policies of sampled firms.

Table 15a: Correlation matrix

	FIN.DEBT on NET WORTH	NFP on NET WORTH	NET WORTH on TOT.ASSET	NET WORTH on TOT.DEBT	St DEBT on TOT.DEBT	BANK DEBT on REVENUES	EQUITY on NET WORTH
FIN.DEBT on NET WORTH	100,00%						
NFP on NET WORTH	88,17%	100,00%					
NET WORTH on TOT.ASSET	-26,37%	-24,13%	100,00%				
NET WORTH on TOT.DEBT	-13,39%	-12,42%	71,66%	100,00%			
St DEBT on TOT.DEBT	-6,46%	10,86%	17,17%	22,10%	100,00%		
BANK DEBT on REVENUES	15,34%	23,53%	-23,40%	-24,35%	-59,82%	100,00%	
EQUITY on NET WORTH	26,60%	31,46%	-14,41%	-8,39%	-7,53%	11,17%	100,00%
AGE	-6,14%	-4,01%	4,83%	-0,92%	-7,36%	10,93%	-3,49%
INNOVATION REQUIREMENTS	-10,66%	-8,05%	13,02%	3,95%	-14,29%	11,53%	-2,96%
CURRENT ratio	-12,90%	-15,28%	57,88%	63,26%	-12,36%	-17,78%	-13,62%
FIN.DEBT/EBITDA ratio	3,72%	-0,08%	-1,86%	-2,47%	-2,49%	4,67%	-1,38%
EBITDA on REVENUES (%)	1,09%	1,98%	-3,18%	-11,52%	1,18%	-1,74%	-0,95%
RETURN ON ASSET (%)	-1,16%	-1,69%	16,76%	3,43%	13,96%	-17,69%	-2,56%
INT.ASSET on TOT.ASSET	-5,16%	0,71%	8,69%	11,95%	-15,55%	23,19%	5,16%
LN(Tot.Asset)	0,19%	2,91%	12,39%	8,58%	-17,06%	24,53%	-2,17%
LN(Revenues)	0,58%	1,59%	-3,99%	-8,41%	-3,89%	-1,20%	-2,90%
N° of SH	-2,10%	-1,92%	12,00%	10,87%	-1,82%	0,96%	-1,91%
TYPE of FSH (dummy)	5,95%	6,14%	-5,95%	-7,02%	0,97%	1,92%	-9,61%
Control of FSH (dummy)	-4,48%	-3,54%	-6,29%	0,51%	5,81%	-5,08%	3,99%

Source: Authors' elaboration.

A second correlation matrix shows that the analysis is not affected by regressor collinearity problems [Table 15b].

Table 15b: Correlation matrix – multi-collinearity

	AGE	INNOVATION REQUIREMENTS	CURRENT ratio	FIN.DEBT/EBITDA ratio	EBITDA on REVENUES (%)	RETURN ON ASSET (%)	INT.ASSET on TOT.ASSET	LN (Tot.Asset)	LN (Revenues)	N° of SH	TYPE of FSH (dummy)	Control of FSH (dummy)
AGE	100,00%											
INNOVATION REQUIREMENTS	40,03%	100,00%										
CURRENT ratio	3,35%	13,03%	100,00%									
FIN.DEBT/EBITDA ratio	2,49%	2,66%	-2,63%	100,00%								
EBITDA on REVENUES (%)	10,58%	-0,90%	-1,72%	0,67%	100,00%							
RETURN ON ASSET (%)	8,19%	-2,45%	13,01%	-0,05%	49,12%	100,00%						
INT.ASSET on TOT.ASSET	-12,62%	4,96%	-17,26%	2,37%	-13,40%	30,36%	100,00%					
LN(Tot.Asset)	39,16%	32,35%	-1,20%	-1,27%	-5,44%	-9,42%	8,61%	100,00%				
LN(Revenues)	37,22%	23,39%	-9,32%	-2,96%	16,50%	8,94%	-15,99%	77,06%	100,00%			
N° of SH	-5,95%	-1,82%	1,13%	-1,10%	-8,45%	22,07%	15,38%	2,87%	1,14%	100,00%		
TYPE of FSH (dummy)	4,87%	-4,63%	-2,28%	5,60%	9,63%	13,08%	10,66%	-21,47%	13,12%	-1,07%	100,00%	
Control of FSH (dummy)	2,28%	0,10%	-1,53%	-0,86%	4,00%	11,78%	-2,38%	-2,68%	-1,86%	16,99%	18,56%	100,00%

Source: Authors' elaboration.

We then tested the theoretical explanatory models of the financial behavior of the sampled innovative firms through OLS regressions. First, we applied *3.1* to verify whether life cycle and innovativeness significantly influence financial structure choices. We used dummy variables to test the significance of the model and control for sectors in which the companies operate [Table 16]. The degree of innovation has negative and significant coefficients when the financial structure is expressed by financial leverage or by net financial leverage, while it has a positive and significant coefficient when considering financial independence. Sector belonging seems to explain the choices of capital structure just if we focus on the net financial leverage and the financial independence level.

Table 16: Regression statistics for capital structure choices

ENTIRE SAMPLE	FIRM-SPECIFIC VARIABLE											
REGRESSION STATISTICS	*FINANCIAL DEBT on EQUITY*			*NET FINANCIAL POSITION on EQUITY*			*NET WORTH on TOTAL ASSET*			*NET WORTH on TOTAL DEBT*		
R multiple	13,81%			16,35%			19,06%			11,88%		
R2	1,91%			2,67%			3,63%			1,41%		
R2 adjusted	1,45%			2,22%			3,18%			0,95%		
Standard Error	524,72%			398,78%			2192,13%			181,40%		
Observations	1.289			1.289			1.289			1.289		
VARIANCE ANALYSES	*df*	*SS*	*MS*	*df*	*SS*	*MS*	*df*	*SS*	*MS*	*df*	*SS*	*MS*
Regression	6,0	686	114,4	6,0	560	93,4	6,0	23.245	3.874,2	6,0	60	10,1
Residual	1.283,0	35.325	27,5	1.283,0	20.403	15,9	1.283,0	616.539	480,5	1.283,0	4.222	3,3
Total	1.289,0	36.011		1.289,0	20.963		1.289,0	639.784		1.289,0	4.282	
F - Test	4,985	***		7,046	***		9,674	***		3,676	***	
VARIABLES ANALYSES	*Coeff.*	*P-values*	*Std. Er.*	*Coeff.*	*P-values*	*Std. Er.*	*Coeff.*	*P-values*	*Std. Er.*	*Coeff.*	*P-values*	*Std. Er.*
Intercept	3,121	***	0,724	1,661	***	0,550	26,185	***	0,803	0,754	***	0,250
AGE	-0,019	n.s.	0,016	-0,012	n.s.	0,012	0,025	n.s.	0,004	-0,003	n.s.	0,006
INNOVATION REQUIREMENTS	0,844	***	0,280	0,469	**	0,212	4,793	***	0,089	0,144	n.s.	0,097
COMMERCE	-	n.a.	-	-	n.a.	-	-	n.a.	0,039	-	n.a.	-
SERVICES	-0,215	n.a.	0,571	0,413	n.a.	0,434	1,739	n.a.	0,002	0,282	n.a.	0,197
INDUSTRY	0,827	n.s.	0,613	0,909	*	0,466	-4,717	*	0,001	0,138	n.s.	0,212
TOURISM	-0,139	n.s.	1,673	0,489	n.s.	1,272	-14,720	**	0,005	0,573	n.s.	0,578

*Significance level: * p < 0,1; ** p < 0,5; *** p < 0,01*

Source: Authors' elaboration.

The regression analysis confirms that the innovativeness degree pushes the consolidation of the debt exposure, and positively affects the possibility of accessing bank credit. It is also confirmed that the business life cycle does not influence the choices of financing forms [Table 17].

Table 17:   Regression statistics for capital structure composition

ENTIRE SAMPLE	FIRM-SPECIFIC VARIABLE								
REGRESSION STATISTICS	**SHORT_TERM DEBT on TOTAL DEBT**			**BANK DEBT on REVENUES**			**EQUITY on NET WORTH**		
R multiple	20,48%			25,56%			6,89%		
R2	4,19%			6,53%			0,47%		
R2 adjusted	3,74%			6,09%			0,01%		
Standard Error	21,84%			2344,53%			48,14%		
Observations	1.289			1.289			1.289		
VARIANCE ANALYSES	df	SS	MS	df	SS	MS	df	SS	MS
Regression	6,0	3	0,4	6,0	49.306	8.217,6	6,0	1	0,2
Residual	1.283,0	61	0,0	1.283,0	705.240	549,7	1.283,0	297	0,2
Total	1.289,0	64		1.289,0	754.545		1.289,0	299	
F - Test	11,234	***		17,940	***		1,223	n.s.	
VARIABLES ANALYSES	Coeff.	P-values	Std. Er.	Coeff.	P-values	Std. Er.	Coeff.	P-values	Std. Er.
Intercept	0,816	***	0,030	12,243	***	3,233	0,214	***	0,066
AGE	- 0,000	n.s.	0,001	0,117	n.s.	0,073	- 0,002	n.s.	0,001
INNOVATION REQUIREMENTS	- 0,056	***	0,012	4,254	***	1,249	- 0,012	n.s.	0,026
COMMERCE	-	n.a.	-	-	n.a.	-	-	n.a.	-
SERVICES	0,039	n.a.	0,024	- 0,892	n.a.	2,551	0,041	n.a.	0,052
INDUSTRY	- 0,028	n.s.	0,026	10,532	***	2,738	0,088	n.s.	0,056
TOURISM	- 0,130	*	0,070	20,695	***	7,477	- 0,082	n.s.	0,154

*Significance level: * p < 0,1; ** p < 0,5; *** p < 0,01*
Source: Authors' elaboration.

The model we used has a low explanatory capacity even though it is statistically significant for all the capital structure ratios. The reported R2s are very low (always below 4%, except for bank loans on revenues ratio), which indicates poor specification of the model applied in the first step of regression analysis. To overcome this problem, we improved the model 3.1 by including selected financial variables to control for solvency, intangibility, profitability, size, and ownership characteristics of the sampled firms. Then, we applied the regression model 3.2 to control for firm-specific variables other than life cycle and innovativeness and to verify whether they might significantly influence financial structure choices. We didn't use dummy variables to control for sectors because we applied the regression model 3.2 to sub-samples representing the sectors in which observed firms operate.

Considering the financial leverage [Table 18] or the net financial leverage [Table 19] as independent variables, regression analysis indicates that theoretical models are poorly

explanatory of financial structure choices. Only for the "Commerce" sub-sample, the model shows a satisfying explanatory capacity. The life cycle is never a significant variable in the regression model; the innovativeness degree negatively affects the financial exposure having a negative coefficient for all samples, statistically significant for almost all sub-samples. Among the control variables, the current ratio always presents a negative and statistically significant coefficient, while the relevance and influences of intangibility and size are uncertain.

Table 18: Regression statistics for financial leverage

INDEPENDENT VARIABLE	FINANCIAL DEBT on NET WORTH											
REGRESSION STATISTICS	SAMPLE INNOVATIVE FIRMS			SUB-SAMPLE "SERVICES"			SUB-SAMPLE "INDUSTRY"			SUB-SAMPLE "COMMERCE"		
R multiple	20,45%			17,78%			25,70%			52,26%		
R2	4,18%			3,16%			6,60%			27,31%		
R2 adjusted	3,28%			1,75%			3,24%			16,54%		
Standard Error	520,02%			506,06%			602,13%			300,37%		
Observations	1.289			838			346			94		
VARIANCE ANALYSES	df	SS	MS	df	SS	MS	df	SS	MS	df	SS	MS
Regression	12,0	1.506,2	125,5	12,0	690,1	57,5	12,0	853,8	71,2	12,0	274,6	22,9
Residual	1.276,0	34.505,2	27,0	825,0	21.128,2	25,6	333,0	12.073,4	36,3	81,0	730,8	9,0
Total	1.288,0	36.011,4		837,0	21.818,2		345,0	12.927,2		93,0	1.005,4	
F - Test	4,642	***		2,245	**		1,963	*		2,536	**	
VARIABLES ANALYSES	Coeff.	P-values	Std. Er.	Coeff.	P-values	Std. Er.	Coeff.	P-values	Std. Er.	Coeff.	P-values	Std. Er.
Intercept	0,622	n.s.	2,341	0,853	n.s.	2,880	5,063	n.s.	5,543	5,186	n.s.	4,597
AGE	- 0,034	*	0,017	- 0,026	n.s.	0,025	- 0,039	n.s.	0,030	- 0,029	n.s.	0,041
INNOVATION REQUIREMENTS	- 0,759	**	0,287	- 0,428	n.s.	0,356	- 1,467	*	0,614	- 1,231	n.s.	0,796
CURRENT ratio	- 0,446	***	0,098	- 0,362	***	0,112	- 0,593	*	0,266	- 0,482	n.s.	0,342
FIN.DEBT/EBITDA ratio	0,005	n.s.	0,004	0,005	n.s.	0,004	0,008	n.s.	0,016	0,240	***	0,063
EBITDA on REVENUES (%)	0,003	n.s.	0,003	0,003	n.s.	0,004	0,003	n.s.	0,009	0,057	n.s.	0,037
RETURN ON ASSET (%)	- 0,006	n.s.	0,010	- 0,007	n.s.	0,011	- 0,021	n.s.	0,032	- 0,025	n.s.	0,030
INT.ASSET on TOT.ASSET	2,797	***	0,918	2,682	*	1,086	- 3,127	n.s.	2,367	- 1,204	n.s.	2,186
LN(Tot.Asset)	0,585	*	0,235	0,680	*	0,278	0,298	n.s.	0,653	- 0,528	n.s.	0,512
LN(Revenues)	- 0,329	n.s.	0,234	- 0,390	n.s.	0,278	- 0,202	n.s.	0,664	0,538	n.s.	0,491
N° of SH	- 0,003	n.s.	0,004	0,005	n.s.	0,007	0,002	n.s.	0,011	- 0,002	n.s.	0,003
TYPE of FSH (dummy)	0,579	n.s.	0,311	0,541	n.s.	0,377	0,540	n.s.	0,726	0,822	n.s.	0,684
Control of FSH (dummy)	0,397	n.s.	0,307	0,505	n.s.	0,375	- 0,191	n.s.	0,680	1,533	*	0,730

P-Value: n.s. >5%; * <5%; **<1%; ***<0,5%

Source: Authors' elaboration.

Table 19: Regression statistics for net financial leverage

INDEPENDENT VARIABLE	NET FINANCIAL POSITION on NET WORTH											
REGRESSION STATISTICS	SAMPLE INNOVATIVE FIRMS			SUB-SAMPLE "SERVICES"			SUB-SAMPLE "INDUSTRY"			SUB-SAMPLE "COMMERCE"		
R multiple	19,90%			17,97%			24,46%			56,92%		
R2	3,96%			3,23%			5,98%			32,40%		
R2 adjusted	3,06%			1,82%			2,59%			22,38%		
Standard Error	397,22%			318,80%			555,54%			280,58%		
Observations	1.289			838			346			94		
VARIANCE ANALYSES	df	SS	MS	df	SS	MS	df	SS	MS	df	SS	MS
Regression	12,0	830,4	69,2	12,0	279,9	23,3	12,0	653,8	54,5	12,0	305,6	25,5
Residual	1.276,0	20.133,0	15,8	825,0	8.384,6	10,2	333,0	10.277,1	30,9	81,0	637,7	7,9
Total	1.288,0	20.963,4		837,0	8.664,6		345,0	10.931,0		93,0	943,2	
F - Test	4,386	***		2,295	**		1,765	n.s.		3,235	***	
VARIABLES ANALYSES	Coeff.	P-values	Std. Er.	Coeff.	P-values	Std. Er.	Coeff.	P-values	Std. Er.	Coeff.	P-values	Std. Er.
Intercept	- 1,146	n.s.	1,788	2,849	n.s.	1,814	4,486	n.s.	5,114	5,121	n.s.	4,294
AGE	- 0,019	n.s.	0,013	- 0,006	n.s.	0,016	0,031	n.s.	0,028	- 0,019	n.s.	0,038
INNOVATION REQUIREMENTS	- 0,465	*	0,219	0,044	n.s.	0,224	1,234	*	0,567	1,806	*	0,744
CURRENT ratio	- 0,387	***	0,075	0,244	***	0,071	0,605	*	0,246	- 0,411	n.s.	0,320
FIN.DEBT/EBITDA ratio	- 0,001	n.s.	0,003	- 0,001	n.s.	0,003	0,005	n.s.	0,015	0,265	***	0,059
EBITDA on REVENUES (%)	0,003	n.s.	0,003	0,002	n.s.	0,002	0,004	n.s.	0,009	0,056	n.s.	0,034
RETURN ON ASSET (%)	- 0,003	n.s.	0,008	- 0,002	n.s.	0,007	0,017	n.s.	0,029	- 0,025	n.s.	0,028
INT.ASSET on TOT.ASSET	- 0,810	n.s.	0,701	0,019	n.s.	0,684	1,930	n.s.	2,184	- 0,998	n.s.	2,042
LN(Tot.Asset)	0,532	***	0,180	0,491	**	0,175	0,417	n.s.	0,603	0,145	n.s.	0,478
LN(Revenues)	- 0,295	n.s.	0,179	- 0,244	n.s.	0,175	0,364	n.s.	0,612	0,172	n.s.	0,459
N° of SH	- 0,002	n.s.	0,003	- 0,004	n.s.	0,004	0,004	n.s.	0,010	- 0,001	n.s.	0,003
TYPE of FSH (dummy)	0,550	*	0,237	0,450	n.s.	0,238	0,441	n.s.	0,670	1,105	n.s.	0,639
Control of FSH (dummy)	- 0,214	n.s.	0,234	- 0,239	n.s.	0,236	0,270	n.s.	0,627	- 1,476	*	0,682

P-Value: n.s. >5%; * <5%; **<1%; ***<0,5%

Source: Authors' elaboration.

The financial independence (net worth on total assets) of the sampled firms is not influenced by age and innovativeness, while it is positively and significantly influenced by the current ratio, operating profitability, company size (when measured in terms of assets), and the number of shareholders [Table 20]. The regression analysis highlights that the growth in turnover as well as in operating margin has a reductive effect on the degree of financial independence.

Table 20: Regression statistics for financial independence

INDEPENDENT VARIABLE	NET WORTH on TOTAL ASSET											
REGRESSION STATISTICS	*SAMPLE INNOVATIVE FIRMS*			*SUB-SAMPLE "SERVICES"*			*SUB-SAMPLE "INDUSTRY"*			*SUB-SAMPLE "COMMERCE"*		
R multiple	66,70%			66,41%			73,30%			68,18%		
R2	44,48%			44,11%			53,73%			46,49%		
R2 adjusted	43,96%			43,29%			52,07%			38,56%		
Standard Error	1668,39%			1681,90%			1484,32%			1717,66%		
Observations	1.289			838			346			94		
VARIANCE ANALYSES	df	SS	MS	df	SS	MS	df	SS	MS	df	SS	MS
Regression	12,0	284.606	23.717,2	12,0	184.153	15.346,1	12,0	85.211	7.100,9	12,0	20.764	1.730,3
Residual	1.276,0	355.178	278,4	825,0	233.375	282,9	333,0	73.367	220,3	81,0	23.898	295,0
Total	1.288,0	639.784		837,0	417.528		345,0	158.577		93,0	44.662	
F - Test	85,206	***		54,250	***		32,230	***		5,865	***	
VARIABLES ANALYSES	Coeff.	P-values	Std. Er.	Coeff.	P-values	Std. Er.	Coeff.	P-values	Std. Er.	Coeff.	P-values	Std. Er.
Intercept	- 7,586	n.s.	7,509	7,023	n.s.	9,570	43,674	***	13,663	- 0,067	n.s.	26,289
AGE	0,027	n.s.	0,056	- 0,133	n.s.	0,085	0,109	n.s.	0,075	0,130	n.s.	0,232
INNOVATION REQUIREMENTS	0,416	n.s.	0,919	- 0,444	n.s.	1,183	3,448	*	1,515	1,293	n.s.	4,553
CURRENT ratio	7,864	***	0,315	7,606	***	0,373	9,059	***	0,656	3,682	n.s.	1,958
FIN.DEBT/EBITDA ratio	- 0,005	n.s.	0,013	- 0,004	n.s.	0,014	- 0,021	n.s.	0,040	- 0,505	n.s.	0,362
EBITDA on REVENUES (%)	- 0,030	**	0,011	- 0,035	**	0,012	- 0,010	n.s.	0,023	0,257	n.s.	0,209
RETURN ON ASSET (%)	0,322	***	0,032	0,311	***	0,038	0,435	***	0,078	0,132	n.s.	0,170
INT.ASSET on TOT.ASSET	21,811	***	2,945	20,529	***	3,608	29,401	***	5,835	7,712	n.s.	12,499
LN(Tot.Asset)	5,079	***	0,755	4,902	***	0,924	5,375	***	1,610	10,654	***	2,926
LN(Revenues)	- 3,668	***	0,751	- 4,254	***	0,923	2,312	n.s.	1,636	8,854	***	2,809
N° of SH	0,066	***	0,012	0,067	***	0,022	0,051	n.s.	0,026	0,077	***	0,020
TYPE of FSH (dummy)	- 1,516	n.s.	0,997	- 0,801	n.s.	1,254	- 1,037	n.s.	1,791	4,145	n.s.	3,910
Control of FSH (dummy)	- 2,738	**	0,985	- 2,396	n.s.	1,247	- 2,004	n.s.	1,676	- 4,745	n.s.	4,174

P-Value: n.s. >5%; * <5%; **<1%; ***<0,5%

Source: Authors' elaboration.

The financial strength (net worth on total debt) of the sampled firms is sensitive to the same firm-specific variables that influence corporate financial independence already considered and discussed above [Table 21].

Table 21: Regression statistics for financial independence

INDEPENDENT VARIABLE	NET WORTH on TOTAL DEBT										
REGRESSION STATISTICS	*SAMPLE INNOVATIVE FIRMS*			*SUB-SAMPLE "SERVICES"*			*SUB-SAMPLE "INDUSTRY"*			*SUB-SAMPLE "COMMERCE"*	
R multiple	66,70%			70,55%			75,26%			79,00%	
R2	44,48%			49,77%			56,64%			62,40%	
R2 adjusted	43,96%			49,04%			55,08%			56,83%	
Standard Error	1668,39%			144,26%			87,22%			101,87%	
Observations	1.289			838			346			94	
VARIANCE ANALYSES	*df*	*SS*	*MS*	*df*	*SS*	*MS*	*df*	*SS*	*MS*	*df*	*SS*	*MS*
Regression	12,0	2.082	173,5	12,0	1.701	141,8	12,0	331	27,6	12,0	140	11,6
Residual	1.276,0	2.200	1,7	825,0	1.717	2,1	333,0	253	0,8	81,0	84	1,0
Total	1.288,0	4.282		837,0	3.418		345,0	584		93,0	224	
F - Test	100,663	***		68,125	***		36,247	***		11,204	***	
VARIABLES ANALYSES	*Coeff.*	*P-values*	*Std. Er.*	*Coeff.*	*P-values*	*Std. Er.*	*Coeff.*	*P-values*	*Std. Er.*	*Coeff.*	*P-values*	*Std. Er.*
Intercept	- 2,294	***	0,591	- 2,278	**	0,821	2,288	***	0,803	- 0,568	n.s.	1,559
AGE	0,001	n.s.	0,004	- 0,011	n.s.	0,007	0,002	n.s.	0,004	0,040	***	0,014
INNOVATION REQUIREMENTS	- 0,290	***	0,072	- 0,376	***	0,101	0,010	n.s.	0,089	- 0,129	n.s.	0,270
CURRENT ratio	0,761	***	0,025	0,809	***	0,032	0,700	***	0,039	0,272	*	0,116
FIN.DEBT/EBITDA ratio	- 0,000	n.s.	0,001	- 0,001	n.s.	0,001	0,000	n.s.	0,002	- 0,037	n.s.	0,021
EBITDA on REVENUES (%)	- 0,003	***	0,001	- 0,004	***	0,001	0,001	n.s.	0,001	0,012	n.s.	0,012
RETURN ON ASSET (%)	0,010	***	0,003	0,010	***	0,003	0,005	n.s.	0,005	0,014	n.s.	0,010
INT.ASSET on TOT.ASSET	2,081	***	0,232	2,654	***	0,309	0,982	***	0,343	0,959	n.s.	0,741
LN(Tot.Asset)	0,308	***	0,059	0,342	***	0,079	0,246	**	0,095	0,209	n.s.	0,174
LN(Revenues)	- 0,185	***	0,059	- 0,220	**	0,079	- 0,124	n.s.	0,096	- 0,155	n.s.	0,167
N° of SH	0,004	***	0,001	0,001	n.s.	0,002	0,000	n.s.	0,002	0,008	***	0,001
TYPE of FSH (dummy)	0,033	n.s.	0,078	0,008	n.s.	0,108	0,037	n.s.	0,105	- 0,358	n.s.	0,232
Control of FSH (dummy)	0,101	n.s.	0,077	0,183	n.s.	0,107	0,067	n.s.	0,098	- 0,255	n.s.	0,248

*P-Value: n.s. >5%; * <5%; **<1%; ***<0,5%*

Source: Authors' elaboration.

The adjusted R2 for the regression model 3.2 is about 44% for the accounting ratios representing the sampled firms' financial strength and financial independence, which indicates a good specification of the model.

5 Conclusions

The paper shows the first results of a research project that focuses on the capital structure of young innovative companies in order to identify and study issues and constraints that affect the financing policies of these companies. This paper focuses on the financial behaviour of Italian innovative startups and SMEs, defined as companies with high technological content and strong growth potential. The research design and methodological approach of this paper reflect the Italian regulatory framework, which provides specific requirements for identifying innovative firms and defines fiscal and

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financial benefits they can access. A sample of 1289 Italian startups and SMEs has been analyzed, identified among those reported in the appropriate section of the Italian Business Register.

We observe that level and composition of debt vary with the age of the sampled firms and the innovation subjective requirement they have.

However, not all accounting ratios provide clear insights. Considering the financial independence of sampled firms, we observed that equity finances just under 30% of total assets up to the third year of life, around 35% in the following 5 years, and about 40% from the ninth year onwards. Similarly, considering the bank exposure, it can be seen that bank loans grow with the age of the companies sampled. They represent less than 20% of revenues up to the third year of life, range between 23% and 25% in the following 5 years, and stabilize at around 25% from the ninth year onwards. These dynamics are representative of the financial behavior of the entire reference population of young Italian innovative firms. Thus, the importance of shareholders and banks in supporting corporate growth and consolidation is clear.

However, the regression analysis demonstrates that the life cycle has a low explanatory power of the financing policies of the sampled firms. Only by adding variables related to firm-specific characteristics (solvency, profitability, intangibility, size, ownership structure) the regression model becomes statistically significant showing a good explanatory power. Again, the relevance of their outcomes depends on the financial ratio and, often, on the sector. Consistent with the financial literature, size, profitability, and solvency are relevant drivers for financial structure choices. Financial independence and strength increase with size, short-term financial equilibrium (current ratio), and operating profitability (ROA). Coherently, the operating margin (EBITDA margin) has a positive relationship with the indebtedness of innovative firms. As for the ownership structure, while the number of shareholders improves strength and financial independence, curiously the type of shareholder and the type of control are not relevant factors.

This results and here represent only the first step of a research path that still requires further analysis and in-depth analysis. The main limitation of this paper lies in the extent of the dataset. This study focuses on a sample that represents about 8% of the reference population, and accounting or ownership structure data are relative just to the last available fiscal years (2020 or 2021). The available dataset reflects the effects of the pandemic outbreak of Covid-19, and does not allow for time-series or panel analysis. The extension of the number of companies and the fiscal years under observation will allow to isolate the effects of exogenous systemic or sectoral shocks, and to validate the results here presented with broader and more in-depth analyzes. Furthermore, the robustness of our results will have to be verified using alternative definitions and criteria to identify young innovative companies.

Despite the limitations highlighted above, in our opinion, the research has different
aspects of originality and offers first significant insights. To our knowledge, despite the
number of previous studies on the relevance of capital structure, relatively few researchers
have analyzed the financial life-cycle of innovative startups and SMEs, using several
alternative accounting ratios to study its capital structure. This paper provides exploratory
but interesting evidence about the financial behavior of Italian innovative firms. Such
analysis allows for assessing the effectiveness of Italian public policies to incentivize and
support corporate innovation, which is a key factor of competitiveness in a "knowledge
open economy".

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Notes:

[1] The data base AIDA is part of the Bureau van Dijk (https://www.bvdinfo.com/) solutions thought
for several type of organizations (also Academic institutions) that need accounting, governance and
operating information about companies and financial institutions. Specifically, Aida contains
comprehensive information on Italian companies, with up to ten years of history, with reference to:
accounting data from financial statements, debt and credit detail, financial rations and operating
indicators, rating, activity codes and description (ATECO; SIC, NACE), employees, local units,
share values for listed companies, shareholders and equity investments, etc.

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