ENTREPRENEURS' BEHAVIOURAL BIASES, RISK MISPERCEPTION AND COMPANY UNDERINSURANCE

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Abstract

We analyse the effect of behavioural biases on entrepreneurs' decisions to insure their firms against different kinds of corporate risks. We use a large sample of 2,295 Italian small and medium enterprises (SMEs), finding that they under-insure themselves. Since SMEs should insure more – in proportion – compared to bigger companies, analysing the reasons for this underinsurance is relevant to improve entrepreneurs' decisions and help their firms, but also from a policy-making point of view. We link corporate insurance choices with the entrepreneurs' personal characteristics and behavioral traits as well as with their households' financial choices. Our methodology uses stepwise regressions to discern which variables are statistically significant. In our results, we find that entrepreneurs not only underinsure their firms but also themselves, thus exposing themselves, their firms and their families to high idiosyncratic risk. We find that these suboptimal decisions are affected by behavioural biases such as overconfidence, over-optimism, risk misperceptions, and stubbornness, even though in a not straightforward manner. We measure both the overall effect on the number of insurances underwritten and on the specific type of insurance contract. In general, we find that relatively bigger firms do buy more insurance, and that trust in insurance companies is a key driver to insurance purchasing, as well as the estimated probability of suffering damages in the future. In contrast, entrepreneurs do underwrite fewer insurance contracts if their firms caused or suffered damages in the past, but also if they possess personal insurances, thus treating them as substitutes for firm insurance. Since SMEs represent a very important part not only of the Italian economy but also of the economy of many other countries, analyzing their insurance-related decisions is relevant because understanding the determinants that may lead entrepreneurs to mitigate the risks they face is beneficial not only for them and their firms but also for the economy as a whole.

Keywords: Behavioural Biases, Entrepreneurs, Risk Misperceptions, Small and Medium Enterprises (SMEs), Underinsurance

1. INTRODUCTION

We analyse the effect of entrepreneurs' personal characteristics and behavioral biases on the choice of underinsuring their companies against different kinds of risks. Following the traditional financial theory, bigger firms should purchase less insurance compared to smaller ones, because they may

self-insure themselves diversifying their businesses. In addition, shareholders of big companies should be less willing to pay for insurance because they can typically hedge risk by investing in a diversified portfolio. Instead, empirical evidence shows exactly the opposite: while big companies do buy insurance – sometimes even resulting over-insured, thus imposing an undesired cost to their shareholders – small ones tend to be underinsured (Chodokufa, 2016).

For SMEs, firm value typically constitutes a large portion of the owner's wealth, thereby exposing SMEs entrepreneurs to a large idiosyncratic and often uninsured risk. Both theoretical and empirical studies show that underinsurance leads entrepreneurs to invest less than optimally, thereby foregoing profit opportunities and ending up with a lower return on equity. Also, underinsurance reduces their chances to get credit from banks (Guiso & Schivardi, 2010; Santoboni, Vento, & Porretta, 2012), with a negative impact on their growth opportunities. This behaviour appears to be suboptimal because smaller firms typically get credit at worst conditions compared to bigger ones (Hubbard, 1998). Therefore, they should consider insurance as a way of obtaining better conditions from banks, as an alternative, for example, to collaterals. We claim that the suboptimal choice of underinsuring their companies is due, at least in part, to entrepreneurs' behavioural biases. In particular, we find a significant relationship with risk misperceptions due to over-optimism, and overconfidence, even if in a not straightforward manner, as we detail in our discussion of the results we find in the econometric analysis.

We analyse data coming from a survey conducted in 2008-2009 on a sample of 2,295 Italian SMEs. The survey is composed of two parts: a questionnaire addressed to the firm owner (or the person in charge of making decisions about insurance), and a face-to-face interview. Data include detailed information about the types of insurance contracts related to different kinds of corporate risks, information on damages suffered in the past, but also on the entrepreneurs' personal and household characteristics and on the firm in general, not only related to insurance decisions.

The database thus combines both entrepreneurs' personal information as well as data on their companies. This unique feature is important to link insurance-related decisions both at a personal and firm level, but also to discern the entrepreneurs' choices on how much to invest in their company with respect to their total wealth, and the degree to which they underestimate the riskiness associated with their business.

Since, on average, Italian SMEs entrepreneurs invest about 40% (Guiso & Schivardi, 2017) of their wealth int their firm, underinsurance leads to bear too much idiosyncratic risk. Eventually, this may be transferred to their household, and affect their wealth.

As a matter of fact, SMEs are exposed to several types of risk (Jadi, Abdul Manab, & Ahmad, 2014), but the companies in our sample on average insure only three out of eleven types of distinct risks. The choice of how much insurance to buy depends on the entrepreneurs' risk aversion, but also on their perception of the risk of suffering a loss, and the probability of provoking it to others. The capacity for bearing the regret associated with a loss also seems to play an important role in these kinds of decisions. Among other issues, trust in insurance companies plays a major role in the entrepreneurs' decision to get insurance.

Since part of the survey has been conducted through face-to-face interviews, we are able to use detailed information in our database to account for both entrepreneurs' risk attitude and trust (in insurance companies, banks and, in general, in other institutions or people). In addition, we have information on entrepreneurs' behavioural biases (such as ambiguity aversion, degree of overconfidence and over-optimism, regret aversion, etcetera), but also on entrepreneurs' families, such as overall household wealth and its composition, degree of diversification, personal insurance contracts, etcetera. These unique features of the dataset allow us to link information on entrepreneurs and their families with the ones on their firms, analyzing the relationships between risks born by these three distinct entities, but also of potential spillover effects between them.

2. LITERATURE REVIEW

Most of the theoretical literature has focused on the role of insurance in mitigating the principal-agent issues arising when managers do not fully own the company. Thus, these studies are not completely relevant for our analysis of SMEs where the owner has a large or full control of her firm. Yet, some insights, especially those related to the relationship between insurance cover and leverage, are pertinent.

Turning to the empirical studies, the breadth of the analysis is somehow limited by the availability of data on firm insurance purchases. Still, they can shed some light on the empirical evidence related to the theoretical results.

In what follows, we review the key theoretical insights and discuss their relevance for our analysis. Then, we turn to the empirical literature, summarizing the main results.[1]

2.1. Theoretical studies

Mayers and Smith (1982) claimed that "the corporate form provides an effective hedge since stockholders can eliminate insurable risk through diversification" (p. 282). Most of the theoretical literature studying the incentives corporations has for buying insurance aims at analyzing in which cases the above claim is true. This amounts to say that, from the point of view of an investor holding a diversified portfolio, the value of an insured corporation is the same as of an uninsured one, and therefore purchasing insurance is not necessary as a risk management tool. Such a result is established also by Mayers and Smith (1982) and MacMinn (1987) and holds in a model with stocks, insurance and risky debt, where default costs are nil. However, the introduction of conflicts of interest between managers – acting in the interest of stockholders – and bondholders dramatically alters the results. Two main agency problems arise, which require the purchase of insurance: underinvestment and asset substitution (or risk shifting). Underinvestment originates when the manager of a firm has no interest in undertaking investments above a certain threshold, as mostly

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[1] MacMinn and Garven (2013) provide a detailed survey of recent studies.

bondholders will enjoy the additional returns. As a consequence, the firm may forego positive net present value projects if their profits accrue just to bondholders (Jensen & Smith, 1985). Purchasing insurance can alleviate this problem (Mayers & Smith, 1987; Garven & MacMinn, 1993). In a nutshell, given a positive probability of insolvency, the optimal investments schedule for a leveraged firm is non-decreasing with respect to insurance coverage. Insurance reduces the probability of insolvency due to non-market risks. Thus, it protects (at least partially) stockholders from the extra risk involved in additional investment problems and bondholders.

The conflict between bondholders and managers also emerges when the firm has to choose mutually exclusive projects, and between sources of financing. If a firm substitutes high-risk projects with low-risk ones, the value of equity increases at the expense of that one of loans (Garven & MacMinn, 1993; Jensen & Smith, 1985), and thereby value shifts from bondholders to shareholders. Among mutually exclusive projects, purchasing insurance increases the value of the safest one, and therefore managers acting on behalf of shareholders will prefer it (MacMinn & Garven, 2013). Moreover, if the purchase of insurance in the financing decision is made before deciding on the scale of productions and the investment choices, even an insurance purchase with zero risk-adjusted net present value would increase current shareholders value (MacMinn & Garven, 2013).

The purchase of insurance is also related to the firms' preference to use internal funds to finance. An uninsured adverse shock cuts into liquidity buffers, reducing the number of projects that can be financed and therefore the overall value of the firm (Froot, Scharfstein, & Stein, 1993). Thus, insurance helps preserve internal funding.

The compensation scheme adopted for managers also influences insurance choices. Han and MacMinn (2006) show that a manager paid in stock options and using low-risk debt to finance investments has an incentive to buy coverage. They show that insurance increases the value of stock options by transferring money between states of nature.

Taxation offers another incentive to buy insurance: normally earnings up to a certain amount are not taxed and some expenses are deductible from taxable income. This implies that, with a proportional tax rate, after-tax earnings are a concave function of gross earnings, making firms averse to shock to total earnings, even though they could be diversified by portfolio choices (Eeckhoudt, Gollier, & Schlesinger, 1996). If the insurance premium is fully tax deductible, while accident-related losses are not, buying a fairly priced insurance reduces the expected tax payment.

Finally, industrial firms are better equipped at managing risks coming from their core business (e.g., related to the launch of a product, or the control of costs, etc.) and prefer to delegate to insurers or financial intermediaries the other risks for which they do not have a comparative advantage. Thus, insurance can be considered as a tool for externalizing some functions, especially in smaller companies.

2.2. Empirical studies

The above-mentioned theoretical studies underline the importance of the financing structure of the firm and the tension between managers and shareholders as key drivers of the decision of purchasing insurance. This tension is at the heart of the empirical studies of the corporate demand for insurance, whose number is however severely limited by the lack of data. Firms are not legally required to declare their expenditures on insurance and, moreover, information on the premium paid is a rather crude proxy for coverage and ideally should be complemented by further information on the contracts, i.e., deductibles and limits to coverage, which are difficult to obtain.

The seminal paper by Hoyt and Khang (1999) – that inspired most of the recent contributions – uses a large sample of Chinese firms, assessing what drives the decision of how much coverage to purchase against risks to property, proxied by the ratio between premiums paid and the value of firm's insured assets. Their findings corroborate many conclusions of the theoretical literature. First of all, firms with higher debt-to-equity ratios and higher growth opportunities tend, other things being equal, to purchase more property coverage, consistent with the underinvestment hypothesis. Moreover, the share of the company owned by managers has a negative correlation with insurance, reflecting the role of insurance in aligning incentives, although the effect is higher for larger firms. Larger firms tend to buy less insurance, in line with the real services, comparative advantage hypothesis, as well as those with higher tax shield (share of tax credits and carry forward losses to assets), consistent with the tax incentive for insurance purchase.

Aunon-Nerin and Ehling (2008) use detailed data on over 10,000 insurance contracts written by US corporations and analyse, using a simultaneous equation model, the choice of deductible and limit coverage (i.e., the ceiling for compensation). Accounting for the possible endogeneity of the financing structure, they find that the deductibles and limits have different drivers and size has a negative impact on the limit, but no impact on the deductible. The results on leverage are in line with the under-investment hypothesis: the share of long-term debt is positively related with limits and negatively with deductibles, and its interaction with the size is positive and statistically significant, indicating that the bankruptcy costs that insurance helps mitigate are proportionally higher for smaller firms. Moreover, insurance cover is negatively related to the pay-out ratio, as cash in excess of investment needs helps self-insurance.

A simultaneous equation model is also employed by Zou and Adams (2008) to model insurance purchases, debt capacity and the cost of debt, under the implicit assumption that the amount of insurance coverage and the financing structure are determined simultaneously. This is true if the banks providing credit and bondholders are informed of the insurance purchase. The authors analyze a sample of Chinese listed companies, from 1997 to 2003, finding a negative relationship between insurance purchase and debt, which they rationalize with the implicit bailout distressed firms obtain by the state. However, a higher cost of debt

leads to more insurance coverage. The usual negative relationship with the size is found as well.

Turning to the effect of insurance, they show that higher cover helps to expand leverage and reducing debt costs. All the studies surveyed below, instead, focus on the amount of insurance purchased, implicitly ruling out uninsured firms. Zou and Adams (2006) consider both the choice of whether to buy insurance and the degree of cover and in this sense is more akin to our paper. They use data on Chinese corporation spanning the period 1997-1999, and their results are mostly in line with those of the theoretical literature. The decision to purchase insurance is positively related to the incidence of physical assets on total assets and leverage. Also, for a given level of managerial ownership (which in itself is not statistically significant), the propensity to buy insurance increases with leverage. This result runs against the management alignment hypothesis, but it is consistent with managers of leveraged firms being concerned with the security of their job and the value of their stock options.

The probability of being insured is negatively correlated to the tax rate and the extent of tax-loss carryforwards. Additionally, the amount of purchase cover (defined as the ratio between premiums and insurable assets) is, conditional to the decision to get covered, positively related to growth opportunities, corroborating the underinvestment hypothesis, but negatively, and somehow counter-intuitively, to the intensity of physical assets. The extent of management shareholding is again positively correlated with the size of insurance cover, while the expected negative relationship with the size is statistically significant.

More recently, Chodokufa (2016) finds that purchasing insurance they do not mitigate risk. The author also finds that business size, educational

level, having a recovery plan and knowledge of insurance products influence insurance purchasing.

3. DATASET DESCRIPTION

We use a dataset obtained through the survey run in 2008-2009 by the Italian National Association of Insurance Firms (aka, ANIA, "Associazione Nazionale fra le Imprese Assicuratrici"). The database is composed of face-to-face interviews and a questionnaire covering 2,295 Italian SMEs. The answers are matched with individual balance sheet data (they are supplied by CERVED, the largest Italian information and rating provider).

The survey was addressed to the person in charge of taking insurance-related decisions, often the entrepreneur, i.e., the owner of the surveyed firm (other times the person in charge of taking insurance related decisions was the CEO or a director of the firm. However, for the sake of simplicity, and since many times the founder is also the CEO or has a managerial position, from now on we will refer to this person as the "entrepreneur"). First, it was asked to fill in a questionnaire containing data on the insurance coverage and other firm-related information. Then, entrepreneurs' personal information has been collected through face-to-face interviews.

3.1. Companies characteristics

The figures that follow refer to 2007, the last year before the survey for which we have balance sheet data.

In Figure 1, we show data on the firms' age. The left-skewed distribution clearly indicates that few very old companies took part to the survey (71-99 years old, 3.1%; 100-199 years old, 1.8%; > 200 years old, 0.1%), while the average age of the companies is around 34 years (median 29 years).

**Figure 1.** Number of firms, per year of incorporation
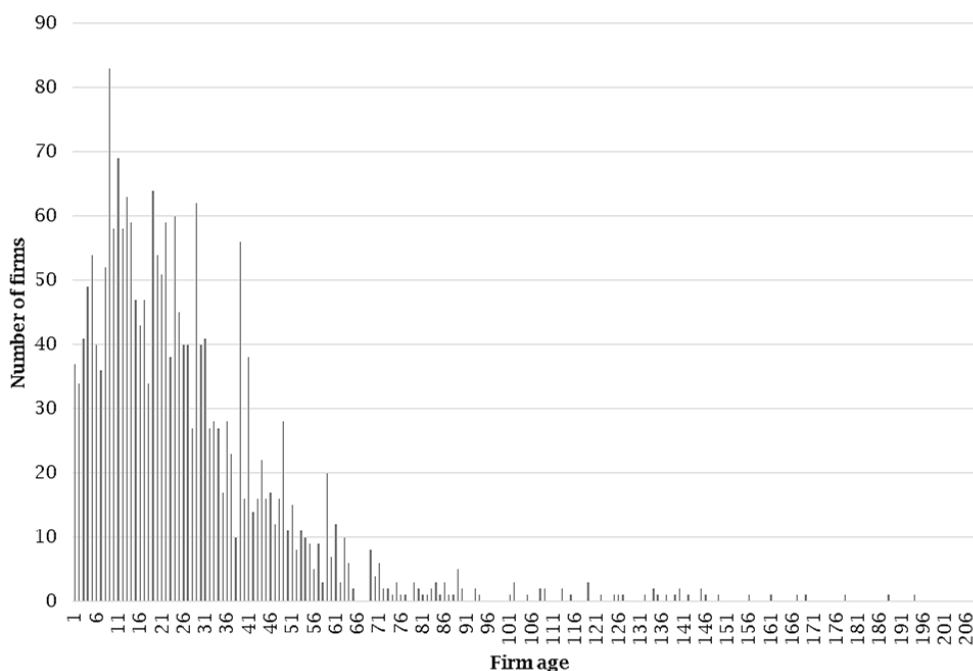
In Figure 2, we display the distribution of firms in terms of revenues, underlining the small dimension of analyzed firms, i.e., between 1 and 10 million euros.

Figure 2. Number of firms per revenues level
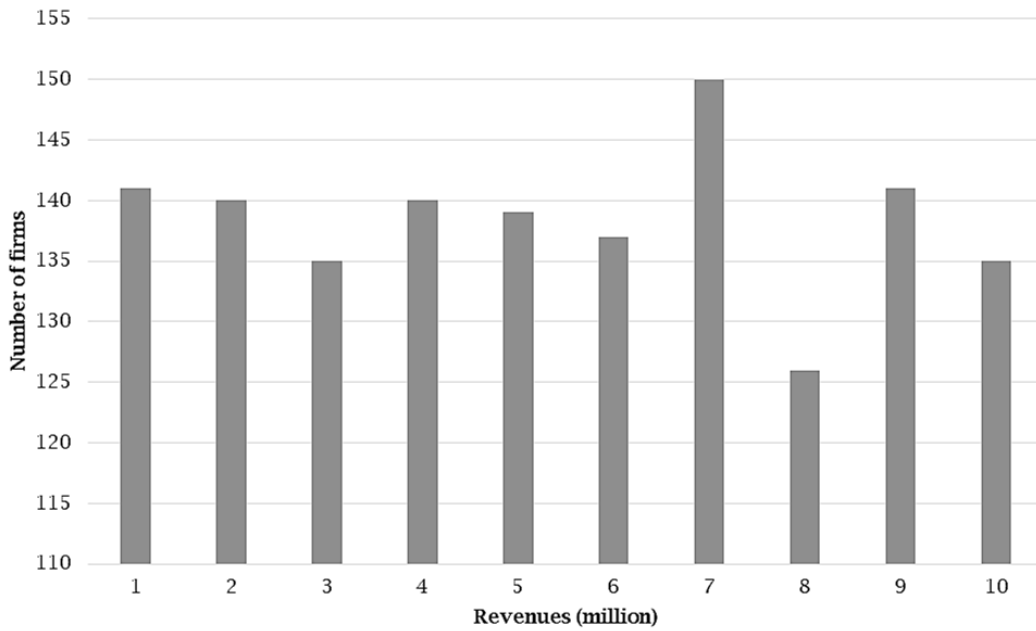
In Figure 3, we show the distribution with respect to the number of employees, which conveys another dimensional measure of the population considered for the study.
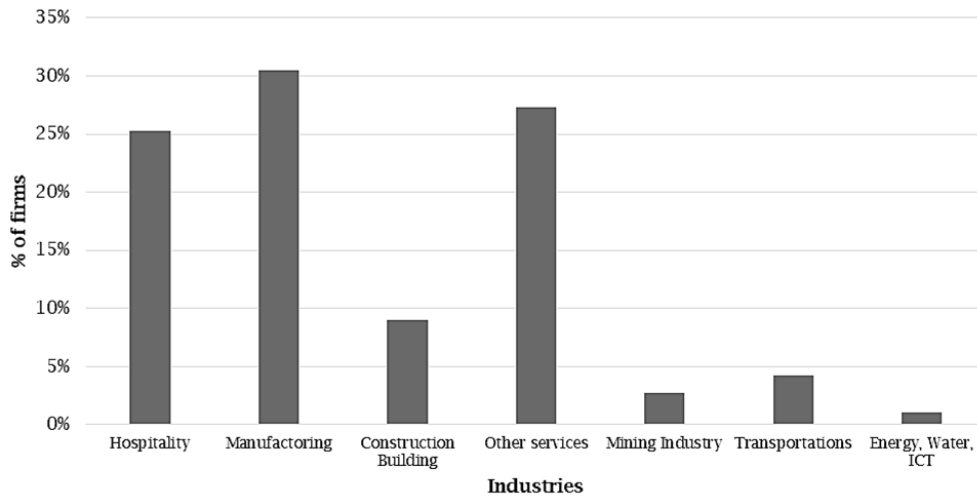
Figure 3. Number of firms, per number of employees
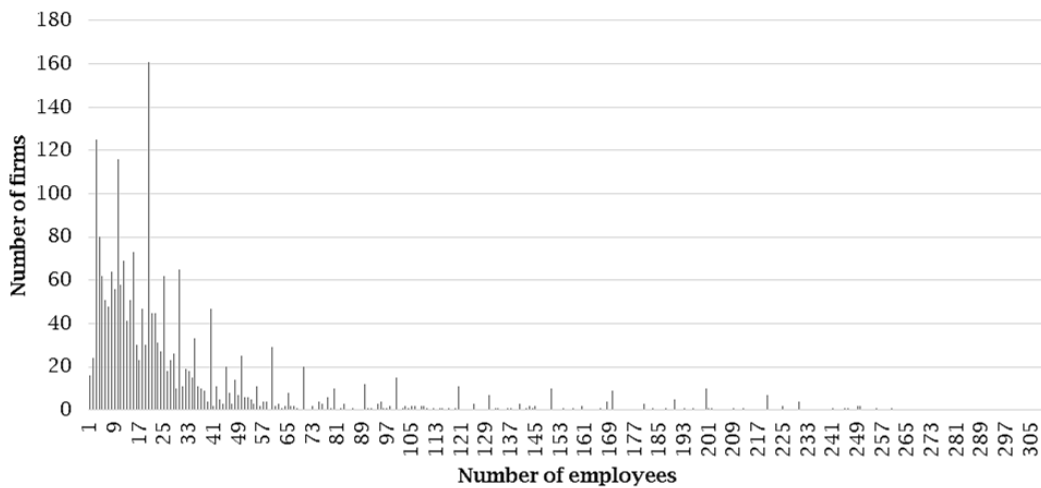
Even though on average those companies can count on 31 employees, most of them have no more than 20 employees (both mode and median are equal to 20).

In Figure 4, we categorize the companies with respect to the industry they belong to.

Figure 4. Industry breakdown

As Figure 4 shows, the vast majority of firms belong either to the manufacturing industry, hospitality, or "other services". We notice that sectors that are usually more prone to buy insurance because of intrinsic rationales (e.g., manufacturing or mining) are the smallest part of our sample. While this evidence may be due, at least in part, to the small dimension characterizing the analyzed firms, we claim that entrepreneurs in our sample may have a major role in deciding either to insure their firms or not and what kind of risks to cover, not being forced by the peculiarities of their sector. We will consider industry effects in our empirical analysis that we present in Section 5.

In Figure 5, we classify firms by their business name.

Figure 5. Companies classified by business name
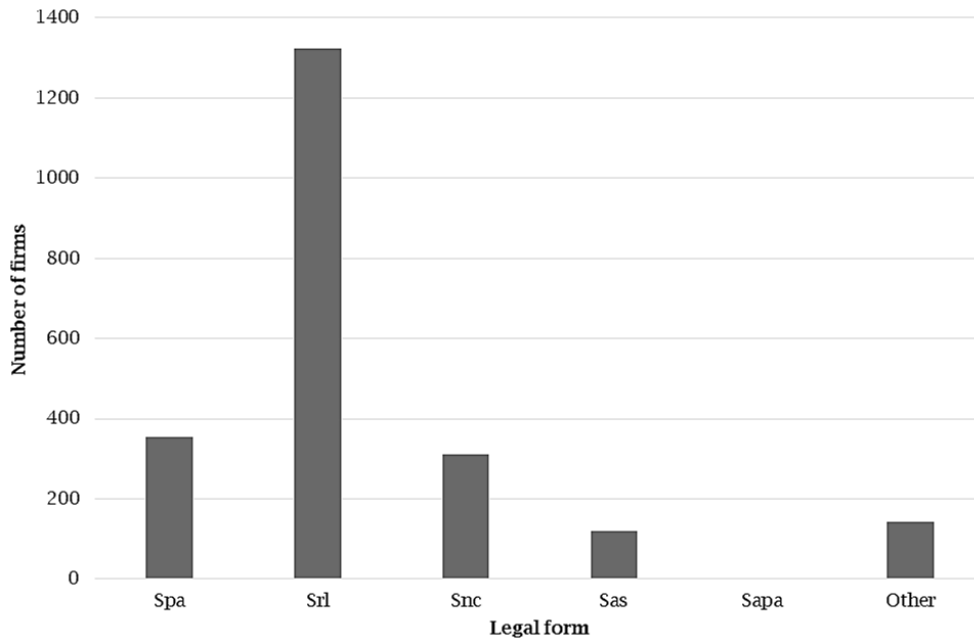
Without digging in legal details, we notice that the majority of the companies in our sample have limited liability structures (i.e., Spa and Srl). However, about 14% of the firms have unlimited liability in full (i.e., Snc). Thus, while in general SMEs should insure themselves more than bigger companies, we expect entrepreneurs in the subsample of firms with unlimited liability to properly insure their companies to avoid that a loss at firm level may impair their private or household wealth.

In Figure 6, instead, we classify the respondents to the survey, the useful information to understand how personal characteristics may affect insurance-related decisions.

Figure 6. Executive who answered the questionnaire
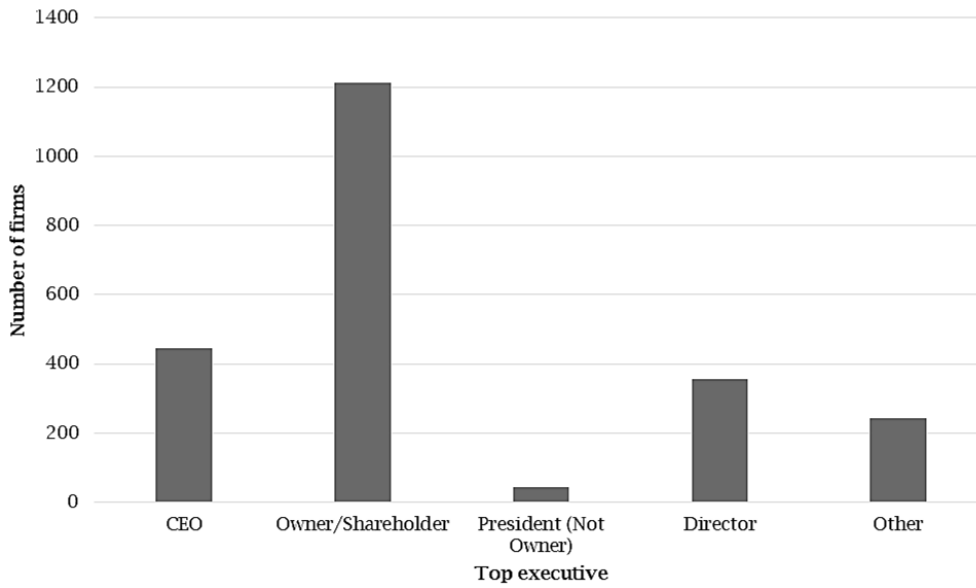
Entrepreneurs (owners or major shareholders of the firm) represent more than 50% of the respondents (i.e., the person in charge of insurance-related decisions), followed by CEOs (almost 20%), and directors (around 15%). Since the entrepreneur, i.e., the owner, in SMEs often is in charge of managing the firm, it is usually harder to manage risks (Longenecker, Petty, Moore, & Palich, 2014).
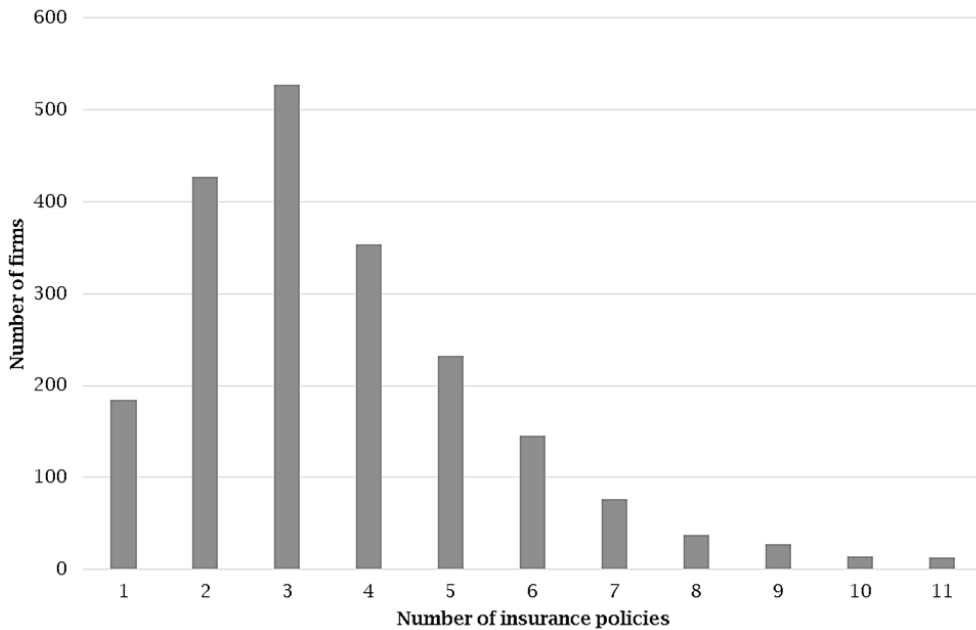
3.2. Data on insurance policies underwritten

The survey considers eleven different types of corporate risk against which the firm can buy insurance: business interruption; credit risk; goods transported; employees' insurance; environmental risk; fire; foreign investments and exports; product liabilities; technological risk; theft; and third parties' damages.

In Figure 7, we show the distribution of firms with respect to the number of insurance policies underwritten.

Figure 7. Breakdown of companies, by number of insurance policies underwritten

The average number of insurance policies underwritten is three. Out of eleven possible risks to cover, this suggests that companies are underinsured. Figure 8, instead, shows the number of insurance companies that firms use to cover the above-mentioned risks.

Figure 8. Number of insurance providers per company
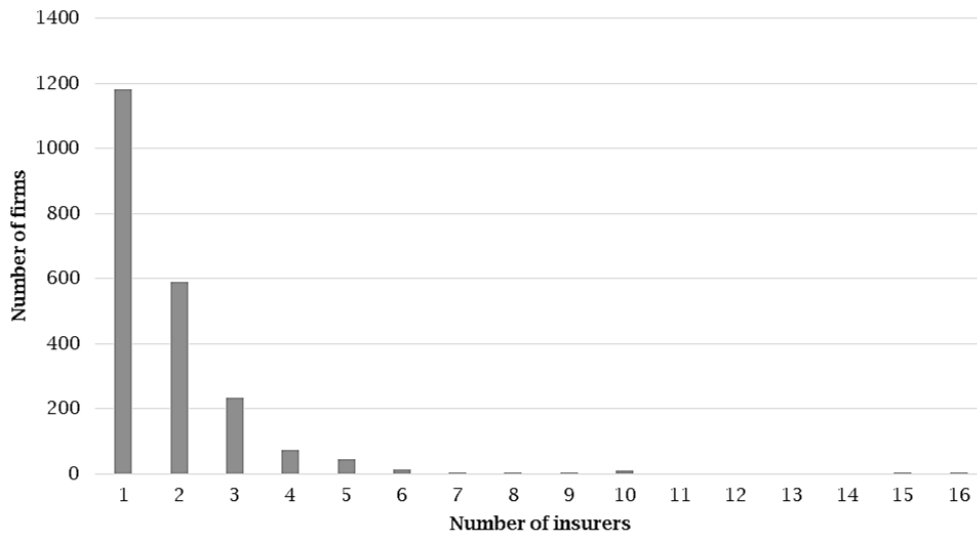
The majority of the companies have a single insurance coverage provider. Almost all the companies signed insurance policies with up to two or at most three different insurance companies, while really few have more than three. Given then the low number of insurance policies and insurance providers for every company, it is natural to check for the degree of satisfaction of the service offered. One of the questions in the survey captured exactly this variable, asking to rate from 1 (very bad) to 10 (excellent) the degree of satisfaction with respect to every single policy, as shown in Figure 9.

Figure 9. Degree of insurance policies satisfaction, per company
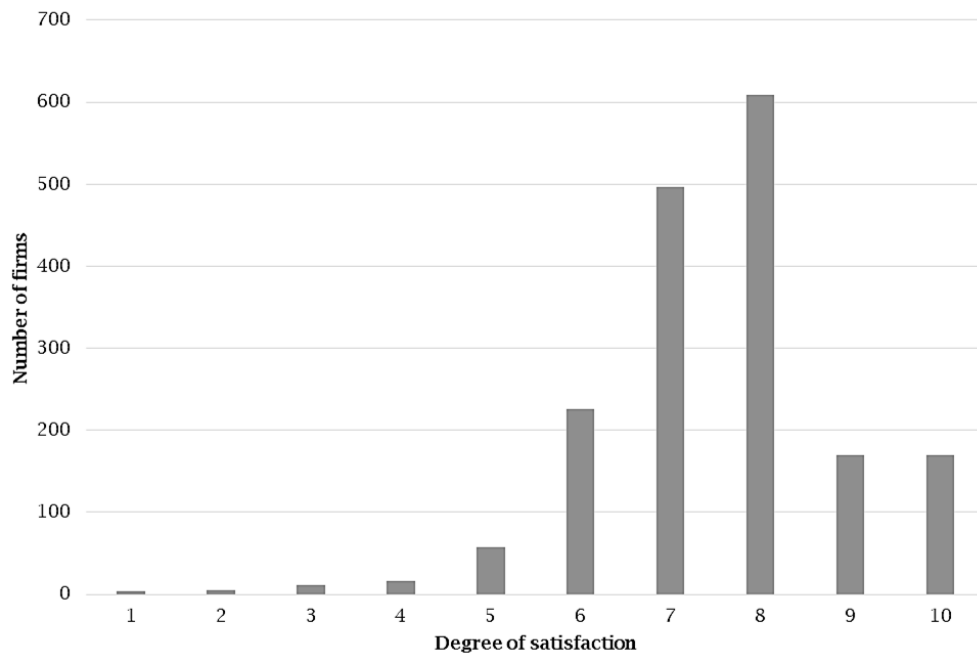
As Figure 9 suggests, on average, the majority of the interviewed are highly satisfied with the service received (more than 62% assigned a score of 7 or more), while very few did not like at all their current state of service. This might be an indication of the competition intensity in the Italian market that pushes insurance companies to provide high-quality services in order to retain their clients. Since the price does not represent a barrier for customers to change insurance providers, the service quality represents an important factor to be accounted for.

We also check if companies had installed (not compulsory) risk prevention devices (Figure 10, Panel A) or if they set aside "emergency funds" to use in case of accidents (Figure 10, Panel B).

Figure 10. Risk prevention devices and emergency funds

Panel A. Companies that have installed a risk prevention device
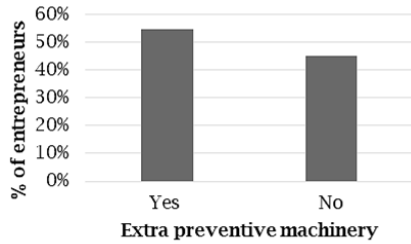
Panel B. Companies who put aside some emergency funds
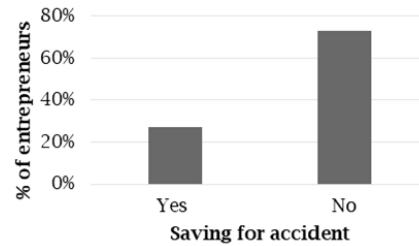
About 55% of the firms in our sample had installed risk prevention devices that were not compulsorily required by law. While this may suggest that entrepreneurs correctly estimate risk and try to prevent it, we should underline that some of these devices, even if not legally required, may have to be installed in order for the insurance to underwrite a particular contract, or to lower the premium paid. For example, insurance companies may ask the firm to install an alarm to prevent thefts or proposing to lower the insurance premium in case of installation. On the other side, we also point out that 45% of the firms did not install risk prevention devices. In addition, more than 70% of the respondents did not set aside emergency funds

to use in case of accidents. For firms with unlimited liability (14% of our sample, i.e., the ones with the business name "Snc") this situation is particularly risky.

Since in small companies the decision on buying insurance often depends on the person (or office) in charge of that decision, it is important to distinguish who take insurance-related decisions (the reality of SMEs and of family-controlled firms are quite different from the one of other companies; for example, Bozzi, Barontini, & Miroshnychenko (2017) show the differences in CEO compensation for a family CEO, compared to a professional CEO). In Figure 11, we summarize the results.

Figure 11. Person in charge of insurance decisions
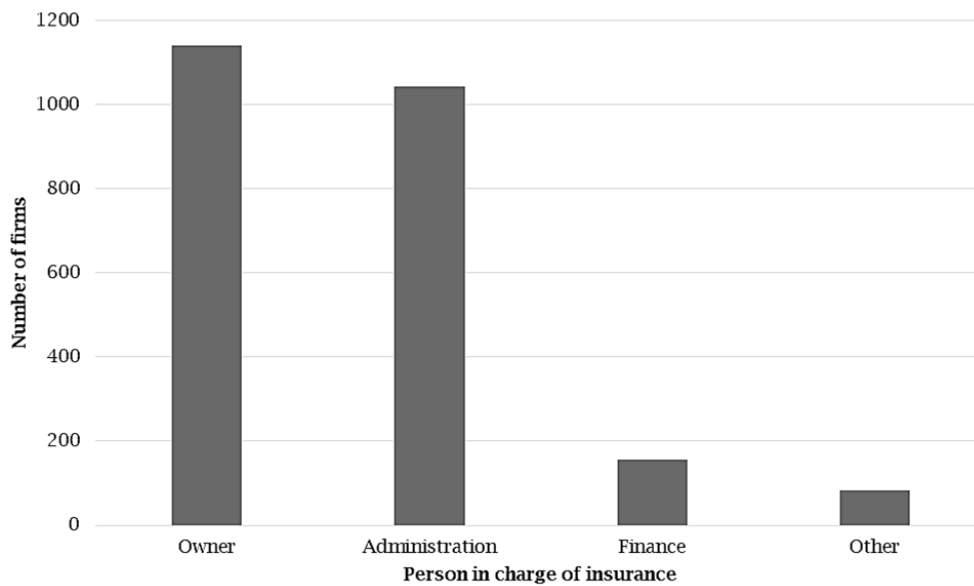
The finance/credit office does not take the majority of insurance-related decisions, that instead are taken by the administrative office or by the entrepreneur who decides how much investing and what risks should be covered by the insurance policies. Typically, then, the person (or office) deciding on insurance is also the one dealing with banks.

3.3. Entrepreneurs' personal characteristics and behaviours

Since the entrepreneur is often the person in charge of insurance-related decisions, it is important to analyse his/her personal characteristics and behaviors. To measure entrepreneurs' risk aversion, the survey asked two questions. The first one prompted to choose between two projects with the same cost, where the first returned a 1 million euros (a certain amount), while the second either a 10 million euros with a given probability or 0 otherwise (the gamble). The same question has been asked changing the probabilities assigned to the risky project, as we show in Figure 12.

Figure 12. Choice trade-off between a risk- free and a risky alternative project
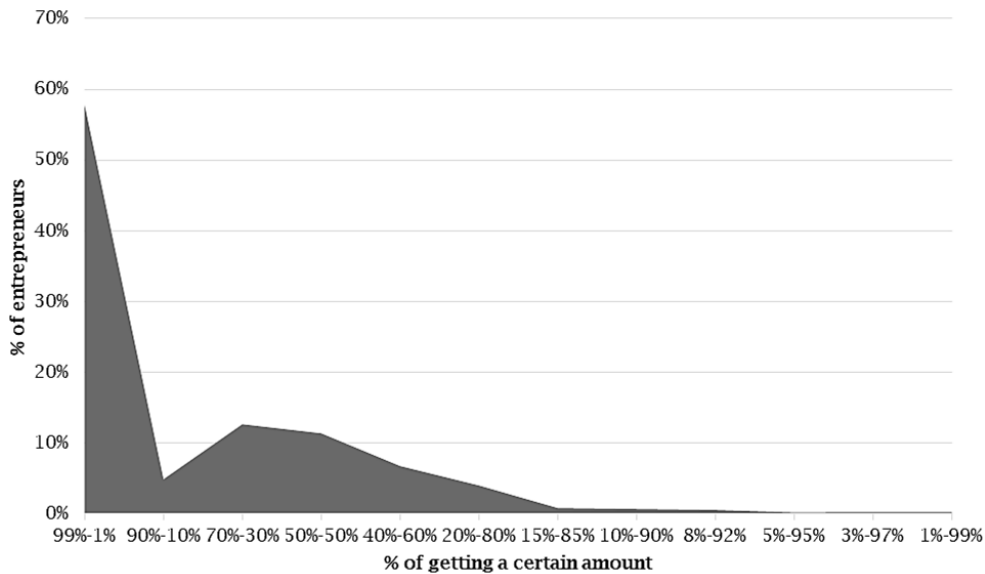
In Figure 12, we highlight a high intrinsic degree of risk-aversion: almost 60% of the individuals prefer a certain amount of 1M over a risky bet of 10M or 0, even in the case of a likely positive scenario such as 99% of getting 10M and 0 otherwise.

We also know that the switching regime point (i.e., the ratio between people who prefer the uncertain amount over the ones who prefer the certain sum) for the majority of the people to choose the bet over a certain amount is 20%-80%. This is the threshold value that, according to the traditional psychology of risk, it is perceived as high to determine the strict dominance of the risky option.

What instead does not sound to be framed in the right way is that, even if they prefer a certain amount over the uncertain for the level 99%-1%, they choose the bet if the probability trade-off is 90%-10%, but not anymore if it is 70%-30%. This evidence is counterintuitive, and it might mean that entrepreneurial brain works and perceive risk in a different (and maybe irrational) way.

In order to cross-check, in Figure 13 we consider the answers to the question about the investment strategy and its goal, used to assess the degree of risk aversion. The results seem to confirm the high entrepreneurs' risk-aversion attitude in our sample.

Figure 13. Degree of entrepreneurs' risk-aversion
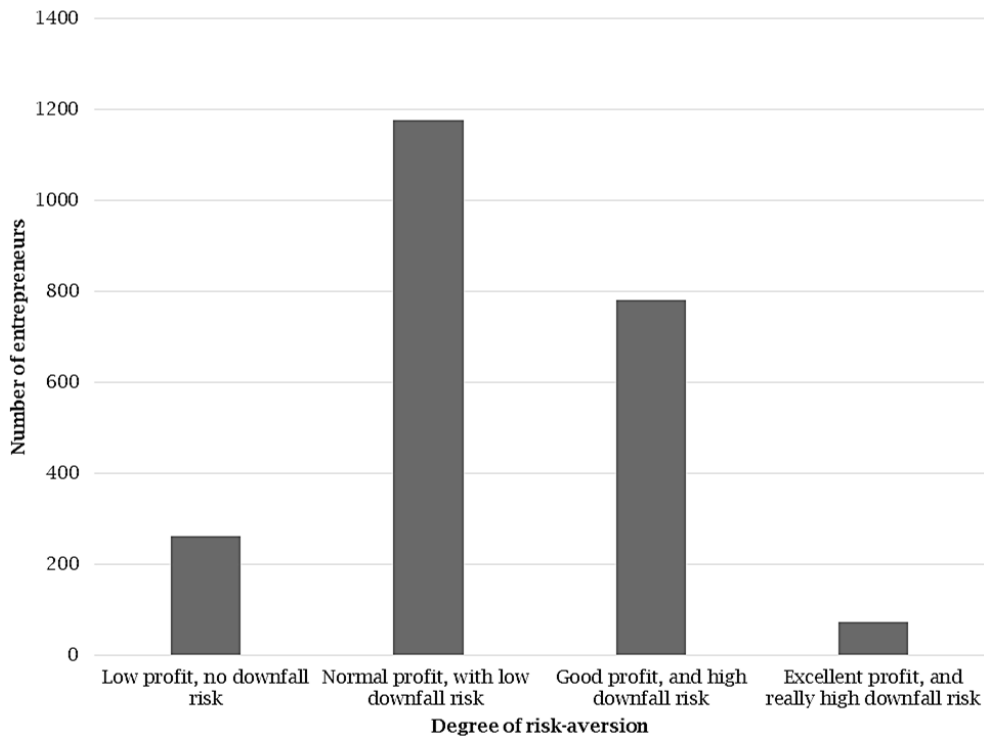
One may expect entrepreneurs to be less risk-averse than the general population. However, we point out that the survey was given in the middle of the 2008 financial crisis. Thus, risk-seeking entrepreneurs' attitude may have been replaced by a higher degree of risk aversion. Nonetheless, we would like to underline that more than 50% of respondents (almost 1,200 out of 2,295) preferred "Normal profit, with low risk of loss", and more than a third (about 800 respondents) went for "Good

profit, and high risk of loss", while only about 10% of them admitted preferring "Low profit, no risk of loss".

A question of the survey asks what the entrepreneurs think it might be the (subjective) probability of their firm to be damaged by others or to damage third parties. In Figure 14, we show those subjective probabilities, divided into seven different intervals.

Figure 14. Subjective probabilities of suffering/causing damage in the following year
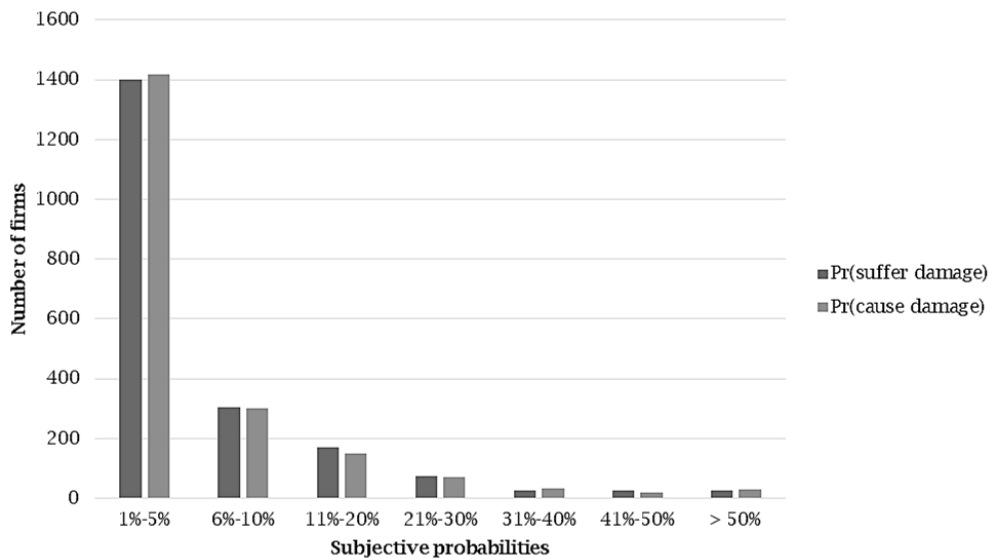
On average, many respondents estimate the likelihood of both suffering and causing damage as no higher than 5%, while a smaller part has a less optimistic point of view. The low perception of the probability of causing or suffering damages is in line with previous ones showing that often risk management in SMEs does not get attention until something actually happens, i.e., entrepreneurs often realize that they had insufficient insurance protection only after a major loss (Longenecker et al., 2014).

The questionnaire also provides some information on the behavioural aptitudes of the person in charge of insurance decisions. In particular, with regard to entrepreneur's over-optimism, overconfidence, and attitude toward ambiguity.

With respect to over-optimism, the survey asked whether the entrepreneurs expected more good things than bad things to occur in their business. In Figure 15, we show that the majority of entrepreneurs seem to be overly optimist with respect to their future.

Figure 15. Degree of optimism of the respondents
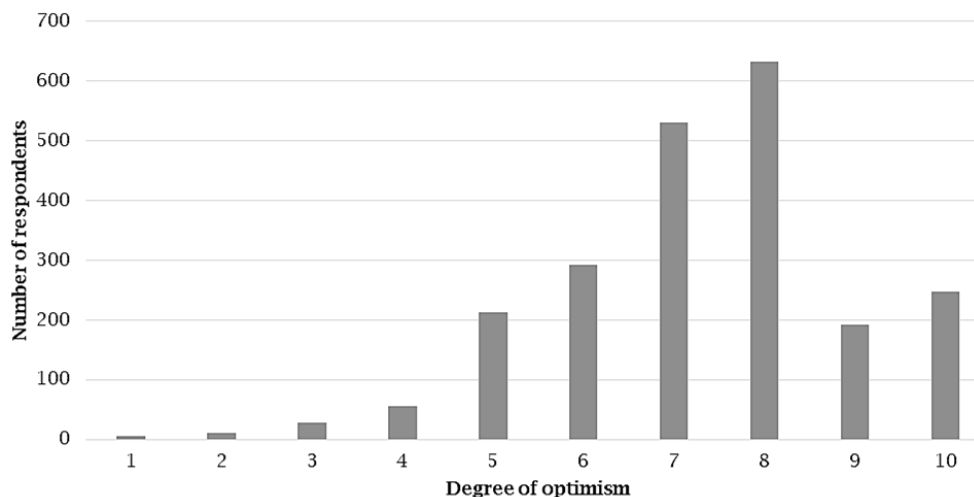
Another question asked entrepreneurs, if they thought to be worse/better than their peers, asking to grade themselves as on, above or below average. This question was aimed to measure the "better-than-Average" (BTA) effect (Hoelzl & Rustichini, 2005), a type of overconfidence. In Figure 16, we show the results. Almost 80% of respondents rated themselves as "on average", while only a small portion (1%) believes to be below average, and the remaining 18% as above average.

While this evidence may initially lead to think that entrepreneurs in our sample are not overconfident, we underline that this question was asked in the face-to-face interview. Thus, we claim that the results are probably biased. Even an overconfident person, if asked directly, may rate herself as "on average", to avoid to "show off". It thus might be the case that at least some of the respondents that claimed to be "on average" actually perceived themselves as "above average".

In the empirical analysis, we will combine the results of this answer with other proxies of overconfidence.

Figure 16. Degree of overconfidence of the respondents
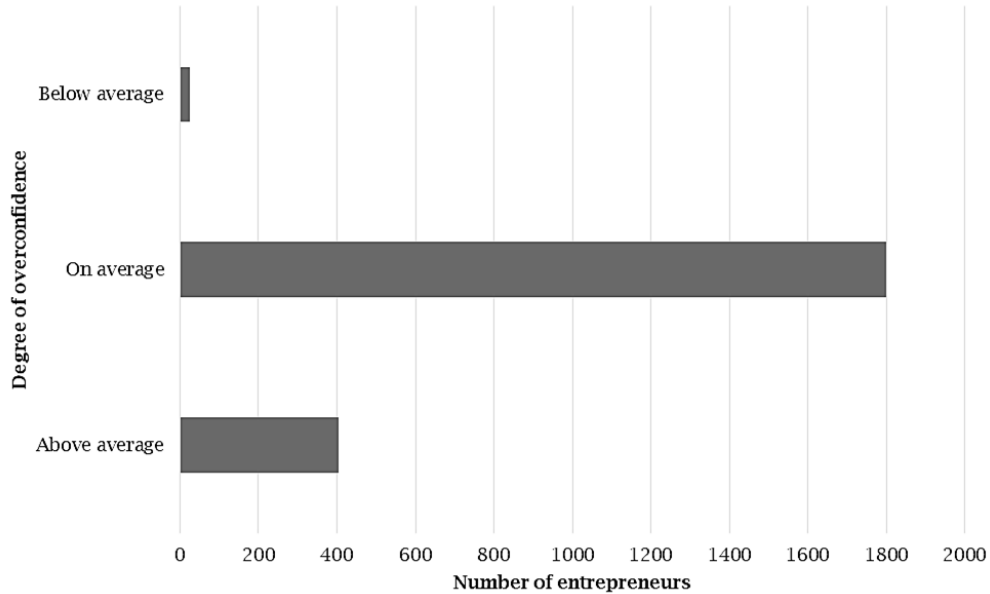
Another question asked entrepreneurs about their attitude when things get harder to manage, if they prefer to quit or if they keep working, no matter what. The idea was to try to detect "stubbornness" or "not-giving-up" attitude. The answers ranged from 1 "I immediately give up" to 10 "I never give up". In Figure 17, we show the results.

Figure 17. Degree of stubbornness of the entrepreneurs
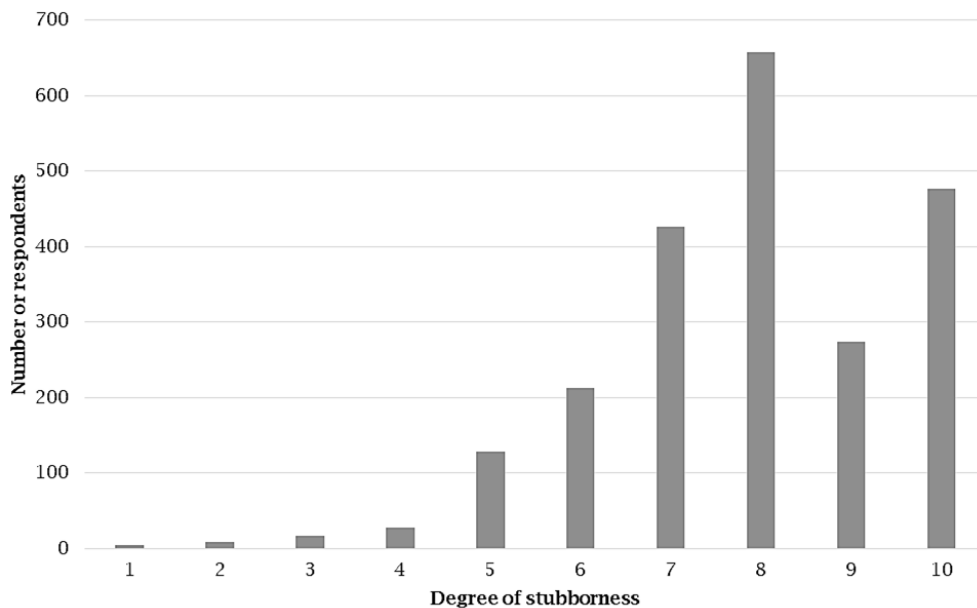
A standard set of questions was then used to elicit ambiguity aversion through choice preferences have been used, and the results are shown in Figure 18.

Figure 18. Ambiguity aversion
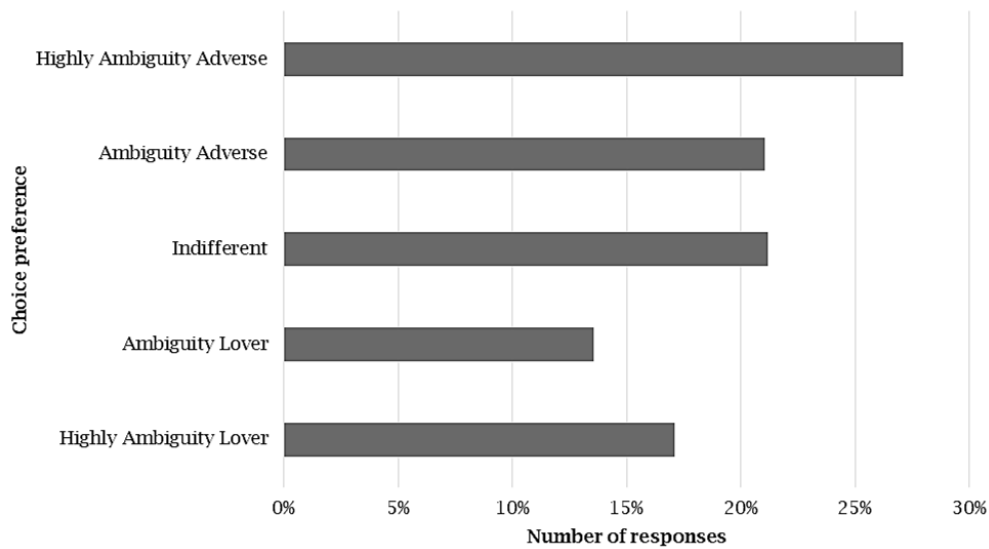
Hence, respondents are risk-averse, but also averse to ambiguity. In Figure 19, instead, we show how entrepreneurs reacted to questions on missed gains or unexpected losses.

Figure 19. Regret aversion to missed gains or unexpected losses
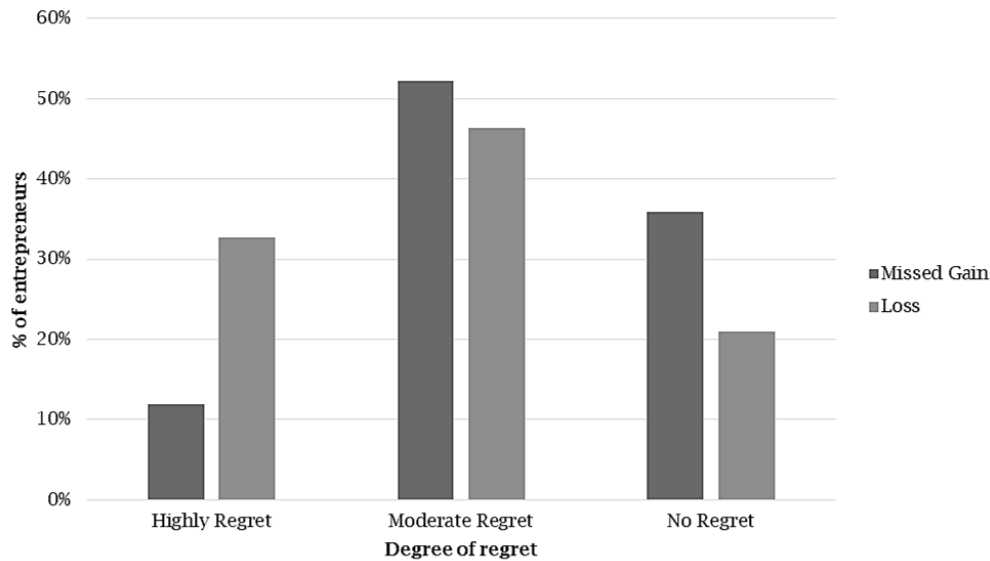
The majority of respondents showed greater regret in case of loss rather than a missed gain. However, the overall degree of regret is quite moderate.

4. REGRESSION ANALYSIS

As a first step, we consider the relationship between the number of insurance policies. In Table 1, we summarize the results of our first regression model in which we consider the potential determinants of the choice of how many insurance policies to underwrite. We performed a stepwise regression to propose the model that best fits our data. We consider the first two variables, *Employees* and *Age*, as proxies of the firm size, based on the idea that the higher the number of employees, the bigger the firm size, and that the older the firm, the greater – again, on average – the size. Both variables present a positive coefficient, suggesting that the bigger the firm, the higher the number of signed insurance contracts. This result is in line with our intuition as the complexity of a firm may increase by its size, as well as the number of risks to cover. This is in contrast with traditional finance theories affirming that bigger firms should insure themselves less, given the alternative ways of neutralizing risks. The number of insurance policies underwritten also increases when the perceived probability of being damaged rises – as it was reasonable to expect – and

decreases when the likelihood of going bankrupt is high. Furthermore, if the entrepreneur asks for a piece of advice on the insurance budgeting to a professional consultant, this leads to an optimization in the level of the protection, involving a lower insurance coverage being purchased. *Business name* is a variable that takes the following values: 1 = Snc; 2 = Srl; 3 = SpA; 4 = Sapa. "Snc" are firms with unlimited liability of its shareholders, while all the other firms have a limited liability provision. However, passing from Srl to Spa and Sapa the firm size and the complexity of the firm increase. The negative coefficient associated with this variable seems to suggest that passing from a legal form with unlimited liability (Snc) to the limited liability legal forms (Srl, Spa and Sapa), the number of insurance contracts underwritten by the company tends to decrease. A potential explanation for this result is that, given that shareholders of a firm with limited liability do risk only the money invested in the firm (and not also their own), they may afford to insure their companies less compared to shareholders of firms with unlimited liability that, instead, are also risk their personal wealth.

Table 1. Number of insurance policies underwritten by firms

	Number of policies underwritten
Number of employees	0.382***
	(7.06)
Firm age	0.008***
	(3.52)
Probability being damaged	0.122***
	(2.72)
Consultant	-0.086*
	(-1.65)
Damaged (last 5 years)	-0.466***
	(-3.15)
Having damaged (last 5 years)	-0.458**
	(-2.47)
Building	-0.429**
	(-2.24)
Savings	-0.514***
	(-4.15)
PersonalDamage	-0.390***
	(-3.39)
Bankruptcy	-0.005*
	(-1.71)
Export	0.013***
	(5.24)
Factories	0.018***
	(5.07)
AdmOffice	0.312**
	(2.17)
Overconfidence	0.248**
	(2.00)
Optimism	0.053*
	(1.77)
Stubbornness	0.069**
	(2.16)
Business name	-0.005**
	(-2.54)
Trust on insurance	0.078***
	(3.02)
Loan	0.268**
	(2.42)
PersonalLD	-0.225*
	(-1.95)
Owner office	0.268*
	(1.83)
Foreign management	1.152***
	(3.98)

Note: t-stats in parentheses. $* p < 0.1$, $** p < 0.05$, $*** p < 0.01$.

Having suffered damages in the previous five years leads to underwriting a lower number of insurance policies. In the same vein, having caused damages in the past is associated with a lower number of insurance contracts. The last two results are counter-intuitive, but they could be justified with a *snake-effect bias* – i.e., "it already happened, and it cannot happen again to me". An alternative explanation is that entrepreneurs must seek a balance among insurance coverage and premiums to pay (Longenecker et al., 2014). If they caused or suffered damages in the past, the insurance premiums went up, and if they set a budget to buy insurance this may lead them to lower the number and types of insurance contracts they can buy.

As expected, instead, as the level of trust in the insurance company increases so does the average number of insurance contracts. *Owner office* is a dummy variable indicating if insurance-related decisions are taken by the firm owner. The positive coefficient suggests that when the owner is in charge of insurance decisions, then he underwrite a higher number of insurance contracts. *Personal life insurance* is a dummy variable equal to one in case the respondent has a life insurance (against the case of death). The negative coefficient may suggest that the respondents consider their personal life insurance as a buffer in case of unfavorable events happen to the firm. *Export* is a dummy that takes value one in case the company exports abroad. The associated positive coefficient may suggest that also this variable may be considered as a proxy for firm size. Typically, bigger companies do exports. We offer the same intuition for the variable *Factories*, capturing the number of branches of the firm in Italy, which it works the other way around in the specific case of the construction industry (*Building*). If the company has a foreign manager, the number of insurance contracts increases. This may suggest that foreign managers have a higher sensitivity to risk management, or, in alternative, the presence of foreign management may proxy for firm size. *Overconfidence* measure the BTA effect. In contrast with our intuition and with former results in the literature, overconfident respondents tend to buy more insurance. There might be anyway an intrinsic bias in how the question has been asked in the first place, so we do not believe this conclusion around overconfidence to be universally valid. As *Optimism* increases, also the number of insurance policies increases, again in contrast with our intuition and former results in the literature. As *Stubbornness* increases, the number of insurance policies underwritten increases.

A behavioural explanation for this evidence could be that entrepreneurs are aware that their perseverance might entail extra risks, and for this reason, they would need more insurance policies to be in place. *Loan* is a dummy variable that equals one when the firm has obtained at least a loan from a bank. The positive coefficient is in line with our intuition that banks tend to require companies to which they lend money to be insured, even if this is not compulsory by law. For example, it is typical to require *Fire* insurance. *PersonalDamage* is a dummy variable that equals one when the respondent has personal insurance against personal damages. In this case, the negative coefficient suggests that when the respondent is personally insured, her firm has a lower number of insurance contracts. This might mean that the mental accounts of business risks

(and insurance) and personal risks are highly correlated, if not completely overlapped. *Savings* is a dummy variable that equals one when the firm set aside some funds to cover damages that it can suffer in case of accidents. The negative coefficient suggests that firms treat emergency funds as a substitute for insurance. Unfortunately, the survey did not contain information on the number of funds set aside by firms. It would be useful to know this information, because entrepreneurs may underestimate the amount of money needed to cover potential damages from accidents and incorrectly treating emergency funds as an alternative to insurance. *AdmOffice* is a dummy variable that equals one when it is the administrative office that takes insurance-related decisions. The positive coefficient suggests that in these cases the firm tends to underwrite more insurance contracts.

As a second test, in Table 2 we analyse the determinants of the choice to purchase specific cover. In addition to the variable previously found to significative, we observe other significant aspects affecting the choice of whether purchasing or not an insurance policy against a specific event. From a behavioural perspective, *Dedication* (proxied by the number of hours worked per day) and *Ambiguity aversion* have an impact on a few policies, while trust (in other entrepreneurs, in the market, and more in general in other people) plays a crucial role. Demographic characteristics (gender, marital status, height, age, education) and the ownership of personal policies – death (P*ersonalLD*), health (*PersonalHealth*), damages (*PersonalDamage*), life (*PersonalLI*), and insurance for social security (*PersonalLP*) – have controversial and different impacts on the different types of risk insured.

Table 2. Logistic regression for different risks to be insured (Part 1)

	Fire	Theft	Goods	Credit	Expo	Bus. inter.	Third liab.	Product liab.	Envir. liab.	Employee liab.	Tech. liab
Employee	0.167***		0.259***	0.101*	0.172**	0.247**	0.264***	0.223***	0.202***	0.170***	0.149***
	(2.65)		(5.37)	(1.81)	(2.43)	(2.44)	(5.44)	(4.47)	(3.37)	(3.14)	(3.23)
Age	0.00783**					0.00767**			0.00836***		
	(2.06)					(2.49)			(3.75)		
Loan	0.449***	0.150*				0.643***	0.223**	0.285***	-0.349***		0.173*
	(3.29)	(1.65)				(3.12)	(2.31)	(2.78)	(-2.69)		(1.77)
Savings	-0.527***	-0.225**	-0.336***	-0.293**	-0.576***	-0.519**		-0.307***			-0.260**
	(-3.19)	(-2.09)	(-3.28)	(-2.45)	(-3.89)	(-2.48)		(-2.79)			(-2.42)
Damaged (last 5y)	-0.728***	-0.268**							-0.340**		-0.294**
	(-2.77)	(-2.02)							(-2.24)		(-2.29)
AdmOffice	0.415**			0.257**			-0.244*				
	(2.39)			(2.32)			(-1.86)				
Dedication	0.0468*			0.0409**	0.0745***						
	(1.94)			(2.08)	(2.72)						
Production	0.536***		0.392***				-0.189*	0.552***			
	(3.61)		(3.39)				(-1.92)	(5.15)			
Trade	0.790***	0.466***	0.352***		-0.347*	-0.478*			-0.436***		-0.207*
	(4.70)	(4.30)	(2.84)		(-1.65)	(-1.71)			(-2.70)		(-1.79)
Owner office	0.298*						-0.241*				
	(1.73)						(-1.82)				
Business name	-0.00594***	-0.00509***		-0.00818**							
	(-3.10)	(-3.09)		(-2.32)							
Entrepreneur's age	0.0141**										
	(2.23)										
Trusting insurance		0.0486**	0.0507**			0.103*			0.0729**		
		(2.01)	(2.16)			(1.83)			(2.37)		
Probability being damaged		0.0904**		0.214***		0.157**			0.166***		
		(2.22)		(4.34)		(2.24)			(3.60)		
Personal health insurance		-0.184*		-0.248**							
		(-1.78)		(-2.05)							
Trusting other entrepreneurs		0.0481*				-0.114*					0.0588**
		(1.78)				(-1.89)					(2.30)
Personal life insurance		-0.218**					-0.195*				-0.319***
		(-2.34)					(-1.92)				(-3.43)
Factories		0.0585**		0.0240*		0.0113***		0.00997**		0.0109*	0.0124**
		(2.47)		(1.86)		(2.99)		(2.50)		(1.95)	(2.21)
Education			-0.105***							0.114**	
			(-2.67)							(2.36)	
Probability damaging others			0.0790**	-0.135**			0.116***				
			(2.04)	(-2.37)			(2.63)				
Personal damage insurance			-0.205**				-0.396***	-0.296***	-0.352***		
			(-2.26)				(-3.85)	(-3.04)	(-2.88)		
Transportation			1.073***								-0.579**
			(4.97)								(-2.24)
Foreign management			0.565**			0.970***				1.076***	
			(2.42)			(2.97)				(4.66)	
Export			0.0101***		0.0192***	0.00667*		0.00531**			
			(4.73)		(7.70)	(1.90)		(2.42)			
Married			-0.183*								
			(-1.72)								

Table 2. Logistic regression for different risks to be insured (Part 2)

|	*Fire*	*Theft*	*Goods*	*Credit*	*Expo*	*Bus. inter.*	*Third liab.*	*Product liab.*	*Envir. liab.*	*Employee liab.*	*Tech. liab*
Having damaged (last 5y)				-0.833***					-0.391**		
				(-5.15)					(-2.12)		
Majority share				0.00236**		-0.00557**					
				(1.98)		(-2.38)					
Consultant				-0.113**					-0.126**		-0.0831*
				(-2.07)					(-2.07)		(-1.77)
Personal retirement insurance				0.228*							
				(1.91)							
Overconfidence				0.271**		0.851***					
				(2.00)		(2.99)					
Height				0.0168**					0.0143*		
				(2.43)					(1.87)		
Trusting stock market				0.0436*	0.0731**						
				(1.66)	(2.10)						
Listed						-1.339**					
						(-2.43)					
Optimism						0.222***				0.120***	
						(3.43)				(3.44)	
Personal liability						0.615**					
						(2.35)					
EV/Family assets							-0.00430**				
							(-2.51)				
Stubbornness							0.0679**	0.0788***	0.0915**		
							(2.53)	(2.65)	(2.32)		
Bankruptcy							-0.00512*	-0.00767**			
							(-1.95)	(-2.49)			
Gender							0.211**				
							(2.15)				
Energy/Water/Telco								1.040**			
								(2.46)			
Trusting others								0.0386*			
								(1.73)			
Mining								0.595**			0.582**
								(1.96)			(2.01)
Ambiguity aversion								-0.0829**			
								(-2.52)			
Building											-0.568***
											(-2.98)

*Note: t-stats in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01.*

The effect is also different depending on sectoral dummies (*Transportation, Mining, Energy/Water/Telco,* mass *Production, Building, Trade*), whether the company is listed or not, and if the entrepreneur still owns the majority of the shares in the company. Finally, it is also really relevant to the percentage of the company value on the total personal wealth of the entrepreneur (*EV/assets*). The positive coefficient suggests that the higher the weight of the firm on entrepreneurs' total assets, the higher the propensity to buy insurance.

In other words, when the firm is a great part of their total wealth, entrepreneurs tend to get more insurance to protect it.

As it emerges from the analysis, there is not a unique formula to be applied to every insurance policy, and every determinant is different and has a different impact on the likelihood of buying a certain type of insurance. In this respect, the survey explicitly asked entrepreneurs why certain types of insurance were not underwritten and we present the data in Figure 20.

Figure 20. Reasons for not buying insurance
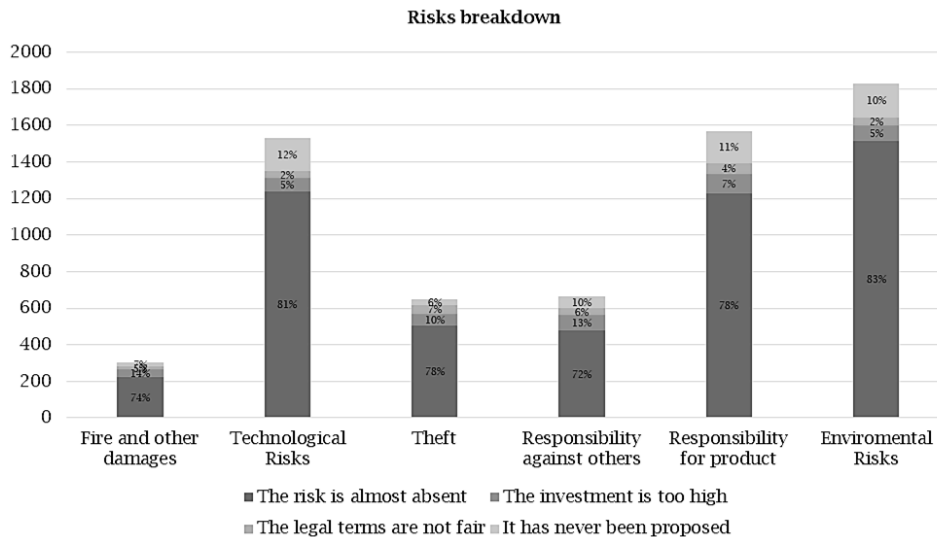
There are cases in which the high cost or the fact that the insurance policy was never proposed to the entrepreneur that are further reasons to not buy insurances, however, the data show that it seems that entrepreneurs overall think the risk is almost absent. Since risk perception is the first rationale for not purchasing the insurance policies, we might wonder whether this is a direct consequence of overconfidence bias.

Before presenting our concluding remarks, it is worth stressing how our results differ from the ones found in previous studies. Similar to previous studies (e.g., Jadi et al., 2014), we find that SMEs are exposed to several types of risk, but that they tend to be underinsured. As a matter of fact, as shown, firms in our sample do insure on average only three out of eleven types of distinct risks. In addition, in line with former papers (e.g., Chodokufa, 2016), we find that firm size – measured by age, the number of employees and domestic branches, exporting, having branches abroad or a foreign management) leads to buy more insurance. Again, in line with previous studies, we find that trust in insurance companies, but also generalized trust, lead to more insurance purchasing. However, our study is based on a much greater number of variables compared to the majority of previous studies, so it is not directly comparable. One exception is Guiso and Schivardi (2017) paper that is directly comparable with ours. Most of our results are in line with theirs, however, we do not fully agree with some of their conclusions. For example, they claim that overconfidence is not important in explaining entrepreneurs' insurance-related decisions, however, they only use the "better-than-average effect" effect to measure overconfidence, while we also use the "stubbornness" variable as well as the different entrepreneurs' perception of causing or suffering damages compared to other entrepreneurs as proxies for overconfidence.

5. CONCLUSION

Entrepreneurs should be rational decision-makers when it comes to their businesses, and they should always act in the best interest of their companies. Unfortunately, this seems to be disproved by empirical analysis on SMEs. We analyzed 2,295 Italian SMEs, and we studied the effect of behavioural biases on entrepreneurial choices related to different kinds of corporate risks. We conclude that Italian entrepreneurs underinsure their firms – and themselves – and that this decision is also conditioned by behavioral aspects such as the illusion of control, over-optimism, overconfidence and stubbornness. On the other side, trust leads to buying more insurance.

A possible limitation of our study is that the data refers to 2008 and 2009, right at the peak of the recent economic crisis, thus results may be biased, and we should be careful in drawing insights from such a peculiar period. We stress, for example, that the lower entrepreneurs' risk propensity that we found in our sample may be exactly explained by the specific period analyzed. Thus, it may be the case that in normal times entrepreneurs tend to insure more. Nevertheless, the evidence on the influence of behavioral issues on insurance-related decisions is quite evident. Another possible limitation is that the study only considers Italian SMEs and also that, even though the number of firms analyzed is quite high, it is smaller than the total number of Italian SMEs.

Future research should try to be based on an international comparison of insurance-related decisions by SMEs and to get a higher number of firms to analyze. Another possible extension of the present study would be to investigate the effect of the same behavioral aspects, and of the other variables considered, on entrepreneurs' insurance-related decisions, but referring to a different time period. In case ANIA would decide to run a second survey with the same SMEs included in the first sample, and hopefully, with other ones, it would be interesting to analyze the differences ten years after the first survey. Analyzing a higher number of SMEs would also allow addressing one of the limitations of the present study.

Another perspective for future research is somehow to adjust the questions asked to entrepreneurs to try to spot behavioral issues. As an example, the question used to measure overconfidence, as mentioned above, should be changed, since the current one, based on the "better than average effect", may bias the answers obtained by respondents in a direct interview.

Given the importance of SMEs in the Italian economy, as well as in other countries all over the world, it seems definitely relevant to continue analyzing their choices, also with regard to insurance-related decisions. Mitigating the risks that SMEs face can not only protect them but the economy of the country to which they belong.
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REFERENCES

1. Aunon-Nerin, D., & Ehling, P. (2008). Why firms purchase property insurance. *Journal of Financial Economics, 90*(3), 298-312. https://doi.org/10.1016/j.jfineco.2008.01.003
2. Bozzi, S., Barontini, R., & Miroshnychenko, I. (2017). Investor protection and CEO compensation in family firms. *Corporate Ownership & Control, 14*(2), 17-29. http://doi.org/10.22495/cocv14i2art2.
3. Chodokufa, K. (2016). Risk management practices and the purchase of insurance by SMES [Special issue]. *Risk Governance & Control: Financial Markets & Institutions, 6*(3-2), 100-104. http://dx.doi.org/10.22495/rcgv6i3c2art13.
4. Eeckhoudt, L., Gollier, C., & Schlesinger, H. (1996). Changes in background risk and risk taking behavior. *Econometrica, 64*(3), 683-689. https://doi.org/10.2307/2171866
5. Froot, K. A., Scharfstein, D. S., & Stein, J. C. (1993). Risk management: Coordinating corporate investment and financing policies. *The Journal of Finance, 48*(5), 1629-1658. https://doi.org/10.2307/2329062
6. Garven, J. R., & MacMinn, R. D. (1993). The underinvestment problem, bond covenants, and insurance. *The Journal of Risk and Insurance, 60*(4), 635-646. https://doi.org/10.2307/253383

7. Guiso, L., & Schivardi, F. (2010). *Copertura assicurativa e accesso al credito bancario: Evidenza da un campione di piccole e medie imprese italiane.* Retrieved from http://docenti.luiss.it/schivardi/files/2012/11/paper-ANIA-credito-e-assicurazione.pdf
8. Guiso, L., & Schivardi, F. (2017). La domanda di assicurazione delle imprese. Risultati dall'Indagine Ania sull'Assicurazione nelle Piccole Imprese Italiane. *Economia Italiana: Nuove e vecchie sfide per l'Italia che riparte, 1-2-3,* 45-102. Retrieved from https://economiaitaliana.org/wp-content/uploads/2018/11/EI_2017_123_022_S_Guiso_Schivardi.pdf
9. Han, L. M., & MacMinn, R. D. (2006). Stock options and the corporate demand for insurance. *The Journal of Risk and Insurance, 73*(2), 231-260. https://doi.org/10.1111/j.1539-6975.2006.00172.x
10. Hoelzl, E., & Rustichini, A. (2005). Overconfident: Do you put your money on it? *The Economic Journal, 115*(503), 305–318. https://doi.org/10.1111/j.1468-0297.2005.00990.x
11. Hoyt, R. E., & Khang, H. (2000). On the demand for corporate property insurance. *The Journal of Risk and Insurance, 67*(1), 91-107. https://doi.org/10.2307/253678
12. Hubbard, R. G. (1998). Capital-market imperfections and investment. *Journal of Economic Literature, 36*(1), 193-225. Retrieved from https://www0.gsb.columbia.edu/mygsb/faculty/research/pubfiles/581/581.pdf
13. Jadi, D. M., & Abdul Manab, N., & Ahmad, S. N. (2014). *Insurance as a risk transfer mechanism in small and medium enterprises (SMEs).* Retrieved from http://repo.uum.edu.my/15712/1/Jadi.pdf
14. Jensen, M. C., & Smith, C. W. (1985). Stockholder, manager, and creditor interests: Applications of agency theory. In *Theory of the Firm, 1*(1). https://doi.org/10.2139/ssrn.173461
15. Longenecker, J. G., Petty, J. W., Moore, C. W., & Palich, L. E. (2014). *Small business management: Launching and growing entrepreneurial ventures* (17th ed.). Stamford, CT, the USA: Cengage.
16. MacMinn, R. D. (1987). Insurance and corporate risk management. *The Journal of Risk and Insurance, 54*(4), 658-677. https://doi.org/10.2307/253115
17. MacMinn, R. D., & Garven, J. R. (2013). On the demand for corporate insurance: Creating value. In G. Dionne (Ed.), *Handbook of Insurance* (pp. 487-516). https://doi.org/10.1007/978-1-4614-0155-1_18
18. Mayers, D., & Smith, C. W. (1982). On the corporate demand for insurance. *The Journal of Business, 55*(2), 281-296. https://doi.org/10.1086/296165
19. Mayers, D., & Smith, C. W. (1987). Corporate insurance and the underinvestment problem. *The Journal of Risk and Insurance, 54*(1), 45-54. https://doi.org/10.2307/252881
20. Santoboni, F., Vento, G. A., & Porretta, P. (2012). Corporate insurance and debt capacity: Empirical evidence from Italy. *Journal of Governance and Regulation, 1*(4), 54-75. http://doi.org/10.22495/jgr_v1_i4_p5
21. Zou, H., & Adams, M. B. (2006). The corporate purchase of property insurance: Chinese evidence. *Journal of Financial Intermediation, 15*(2), 165-196. https://doi.org/10.1016/j.jfi.2004.06.007
22. Zou, H., & Adams, M. B. (2008). Debt capacity, cost of debt, and corporate insurance. *Journal of Financial and Quantitative Analysis, 43*(2), 433-466. https://doi.org/10.1017/S0022109000003586