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Managerial Overconfidence of Entrepreneurs: Contextual Explanations and the Aid of Technological Developments

Abstract This chapter uses budget forecasting to highlight (i) if entrepreneurs make on average inaccurate predictions, (ii) the possible drivers of inaccuracy, (iii) the managerial implication of this biased attitude. The study empirically analyzes a sample ($N = 151$) of a peculiar context: small and medium non-financial Italian firms. We argue that what drives inaccuracy is an overconfidence attitude. Several independent variables are collected to capture and explain the potential underlying mechanisms: individual characteristics, such as entrepreneur's gender, age, and educational level and contextual characteristics, such as the firm's organizational structure and the processes of administration and control. The variation between budget and final balance sheet of EBITDA, equity, and borrowing costs are used as dependent variables. We find that when entrepreneurs decide without a joint committee, biases are more pronounced. Interestingly, we show how the proper implementation of an integrated software system increases substantially forecasting accuracy. Focusing on a peculiar geographical area affected by the recent crisis, this chapter elicits for the first time overconfidence in SMEs through forecast predictions in the annual budget.

Keywords Accuracy · Overconfidence · Entrepreneurs · SMEs
Budget · Forecasting · Contextual characteristics

2.1 Introduction

The global economic crisis of these recent years has highlighted the need to develop defensive techniques to face the market.

Small businesses are characterized by variable rates of growth and change, more intense than those of large enterprises, making unpredictability a constant in their business. Furthermore, internal efficiency, competitive position, and profitability have to be constantly defended (Arcari 2004). On the one hand, SMEs require control over cost components to prevent imbalances. On the other hand, changes in market conditions and the need to regain profitable production levels often dictate choices which necessarily involve investments with a corresponding increase in the degree of risk (Panizza 2011).

The study of forecasting within small firms is important because forecasts and expectations have a vital influence on many commercial decisions and the subsequent profitability and survival of the firm. For example, as highlighted by Diamantopoulos and Winklhofer (1999), the consequences of inaccurate predictions involve flows in capital investments and financing decisions while in Dechow and Dichev (2002), it is shown that forecasting quality is positively related to earnings persistence. An attempt here is made to explain the effect of some entrepreneurial cognitive processes in a specific context (Wright and Stigliani 2012).

The previous literature discusses the relationship among risk perception, overconfidence, the illusion of control, and the related planning fallacy (Barnes 1984; Simon et al. 2000; Keh et al. 2002).

Entrepreneurs often fail to recognize crises and have substantial difficulty in admitting decline, even when they are already involved, at least as long as it is not painfully obvious (Arcari 2004; Shepherd et al. 2009). In this context, evidence suggests that some owner-managers decide to persist in carrying on their business and delay business failure

despite poor performance, resulting in negatives outcomes (Karlsson et al. 2005; Garland et al. 1990; Ross and Staw 1986, 1993). As suggested by Shepherd et al. (2009), this behavior is generally explained also by the individual's need to justify previous decisions to self and others, because owner-managers are often confident that their businesses will be successful and this confidence likely influences their strategic decisions (Hayward et al. 2006).

Considerable literature exists on the potential for entrepreneurs to be overconfident in their expectations of firm performance but the majority of this evidence is derived from self-reported attitudinal surveys. In addition, this literature has offered no empirical evidence that identifies an association between overconfidence and firm performance and only limited information on the attributes of the entrepreneur, or firm, that may lead to such behaviour (Ucbasaran et al. 2010).

The following sections, focusing on SMEs, investigate the factors that could influence the accuracy in forecasting; as a result, the chapter analyzes some of the variables that can influence the attitude of the entrepreneur to make decisions leading to an overconfidence bias in the preparation of the annual budget. Eliciting systematic overconfidence through budget reports is, to the best of our knowledge, a new empirical approach. If entrepreneurs are overoptimistic in starting a business or unable to predict their own managerial and financial performance, resource allocation decisions may be wrong (Lowe and Shaw 1970), with a subsequent risk of accounting frauds (Hope 2003), lower rates of subsequent duration (Dawson and Henley 2012) and bankruptcy (Shumway 2001). We particularly investigate the turbulent context of Piedmont, an area of Italy recently characterized by a high rate of failures of small and medium firms (Cerved 2013).

The remainder of the chapter is as follows: Sect. 2 investigates the role of overconfidence on entrepreneurial decisions, clarifying the boundaries of defeat and business failure, and then identifying ways to recognize an entrepreneur's overconfident attitude. Sections 3 and 4 present the hypotheses and the methodology we used, while Sects. 5 and 6 present our results and leave open rooms for discussion, conclusion, and further research.

2.2 Literature Review

2.2.1 Overconfidence

Economists, psychologists, and other authors involved in management have tried to understand the advantages and the drawbacks of an overconfident attitude. As argued by Tipu and Arain (2011), entrepreneurs' judgment can be influenced by different cognitive biases and heuristics such as: overconfidence, i.e., the cognitive bias to overweigh the probability of a positive outcome of an event (Busenitz and Barney 1994) and counterfactual thinking, defined as imagining outcomes or events different from those that actually happened (Baron 2000).

In finance, almost all decisions require an estimate. It has been found that agents are hindsight-biased when they judge (Biais and Weber 2009). In accounting, more empirical support for theories is needed, in fact the subject of overconfidence is studied only theoretically because it concerns metaknowledge, an understanding of the limits of our knowledge. It remains a hidden flaw in managerial decision-making.

The moment in which one applies overconfidence is crucial. It is demonstrated that this positive bias could be effective in implementing the decision but it does not have to play a role in the decision itself (Russo and Schoemaker 1992).

For an individual who starts a new business, the sum of the perceived potential outcomes weighted by their respective probabilities has to be larger than the perceived outcome of a salary job, weighted by their respective probabilities. Therefore, the role of perception is crucial in the decision to start a business and may be systematically distorted by overconfidence (Moore and Kim 2003). In this context, Koellinger et al. (2007) found that there is a significant negative relationship between entrepreneurial confidence and survival rates of newly founded firms (Simon et al. 2000; Andersen 2010). Overall, growing literature questions the generality of the beneficial association between positive illusions and motivation (Paulhus 1998).

In this prolonged period of crisis, the effect of biased prevision can also lead the management to hide the truth once results differ from

the expected ones. In this context, various authors have defined different models to understand the quality of *financial statement disclosure* (Beattie et al. 2004). The amount of disclosure provided is also highly related to *management disclosure behavior*; in fact, a number of studies point to the severe communication challenges facing management in financial difficulties (Frost 1997; Mutchler et al. 1997; Uang et al. 2006). For example, various authors (Beretta and Bozzolan 2008; Campra et al. 2011) have focused their studies on the analysis of enterprises' concern, comparing companies' information provided within the financial statement with the economic and financial performance, often finding an attempt to "cover" the true state of health of the company.

Taking this into account, companies require an analysis to assess *management's conduct and objectivity* on the *development of the business prospects*, materialized in the *annual budget* prepared by individual companies. The aim is to verify whether the predictions—often successful—projected in the corporate budget were subsequently proved as accurate or were inflated by a good dose of overconfidence. In the latter case, we would assist at a costly overestimation, as inaccurate predictions lead to wrong investment allocations (Bennouna et al. 2010). We therefore operationalize overconfidence as a systematic inaccurate overestimation of performance.

2.2.2 What Factors Could Lead to a Situation of Business Failure in SMEs

As argued by Lussier and Pfeifer (2001), in free market economies, new and small businesses have long been recognized as a major source of jobs, technical innovation, economic flexibility, and growth. However, the survival rate of these firms is an important issue of concern and many survivors achieve only marginal performance (Cooper et al. 1991).

The ability to identify those factors associated with survival and non-survival outcomes of particular businesses is therefore of great interest to public policy makers who are concerned with economic development (Reynolds 1987). Politis and Gabrielson (2009) suggest that previous

start-up experience is strongly associated with a more positive attitude toward failure and a positive attitude toward failure might be a significant asset for entrepreneurs as it might help them to deal with and learn from their mistakes and to move forward.

There have been studies investigating the determinants of business failure of SMEs in Central and Eastern European countries (Hisrich and Szimal 1993; Lipton and Sachs 1990; Peng and Hearsh 1996), and these determinants can be found either in bad management, in strategic mistakes, in a scarce competence of the entrepreneur, or in contextual factors, such as the state of the industry, the high labor costs, and the tax system (Coda 1987). Neither management nor the environmental variables alone can give reasons for business failure. Yet, it can actually be argued that the degenerative process is related to the inadequacy of entrepreneurial and managerial resources to face the complexity of the problems (Arcari 2004; Shepherd et al. 2009).

Building on previous literature (Levesque and Minniti 2006; Lovallo and Kahneman 2003; Morrell and Ezingard 2002), we identified four determinants in SMEs that deserve further investigation: individual variables, such as entrepreneur's gender, age, and educational level and contextual variables, like the organizational structure which processes and makes business decisions and the processes of administration and control.

i. Individual differences

Demographic differences among entrepreneurs may account for differences in the degree to which they are overconfident. Gender and age have been shown to play some role in entrepreneurial decisions. For example, individuals' ages have been shown to affect their cognitive processes (Hagestad and Neugarten 1985) and as argued by Forbes (2005), younger entrepreneurs will be more overconfident than the older ones. Moreover, men have been shown to be more active than women in starting a business (Blanchflower 2004), while the relation with age is an inverted U shape, which peaks at middle age (Levesque and Minniti 2006). Yordanova and Boshnakova (2011) argued that although female and male entrepreneurs have similar risk perceptions,

female entrepreneurs are likely to have a lower risk propensity than that of male entrepreneurs. Risk propensity mediates the effect of gender on risk behavior. The effect is mediated partially by risk preference, outcome history, and age. Gender has an indirect effect on risk perception via overconfidence and risk propensity.

The role of education in becoming an entrepreneur is controversial. It is positive in rich countries where graduate business training has positive effects but it is negative in others, where being self-employed is related to low levels of education (Reynolds et al. 2003). In this context, Kropp et al. (2008) argued that, since older and less educated entrepreneurs have a greater likelihood of starting ventures, entrepreneurial training programs might provide greater returns by targeting this age and education group. An interesting issue under investigated is also the relation between education and managerial overconfidence, which was shown to be small and slightly negative (Koellinger et al. 2007), requiring further examination. In any case, the effort to provide entrepreneurship education seems to pay in terms of effectiveness (Heinonen and Poikkijoki 2006)

ii. *Contextual differences*

A major drawback of inexperience is that entrepreneurs tend to make their own decisions, overestimating the results of their businesses, attributing the chances of success to themselves and the chance of failure to others. A possible explanation of this consistent biased behavior is, the so-called selection bias, is offered by Einhorn and Hogarth (1978): It is because of overconfidence that prospect entrepreneurs are more likely to apply for these risky types of jobs. In other words, the sample of entrepreneurs is not a random sample of the whole population, because deciding to start an entrepreneurial carrier is related to the level of overconfidence.

Moreover, in small firms, fewer people are involved in the decision-making processes and biases may be more stagnant. Koellinger et al. (2007) showed that entrepreneurs of small firms who exhibit a high degree of overconfidence have more starting-up activity but also a higher failure rate. One explanation is the reference group neglect

(Camerer and Lovallo 1999), a behavior where agents fail to take competition into account. Among small entrepreneurs, there is also a general underestimation of the project costs, as well as the completion time (Lovallo and Kahneman 2003).

Biased calibration of probabilities in business decisions is more present among entrepreneurs than among managers (Alpert and Howard 1982; Cooper et al. 1988), due to a general entrepreneurial tendency of overestimating the degree of responsibility for success.

Strategy literature (Castaldi and Wortman 1984; Watkins and Shen 1997) indicates that boards and managerial teams may have a more important role in small businesses than in corporations. Nevertheless, introducing externally recruited members is perceived as a risk from family business companies (Johannisson and Huse 2000).

By focusing on the mechanisms and processes of administration and management control, besides making strategic decisions and implementing them, an organization must also set up appropriate administrative and operating mechanisms to control and evaluate its performance (Sharma et al. 1997). Often, entrepreneurs, having no useful information to support critical decision-making processes, lose control of the business and are not in a position to bring the situation back into balance. As argued by Morrell and Ezingear (2002), significant benefits are indeed attainable for the SME by adopting and developing information systems to increase their efficiency and effectiveness, helping in reducing the bias of human predictions.

In contrast to large organizations, Information Technology (IT) management in small organizations appears to be negligible (Fink 1998) and in some cases lacking (Ogbonna and Harris 2005). Smaller firms are reluctant to engage the services of in-house IT managers in the manner larger firms had done. Although lack of in-house IT expertise is not the only reason why “smaller organizations have been shown to have different technology adoption patterns than large ones” (Iacovou et al. 1995), there are ranges of factors that have influenced the IT adoption behavior of smaller firms. The unique characteristics of SMEs with respect to IT can be identified as environmental, organizational, decisional, and psycho-sociological (Blili and Raymond 1993). In fact, SMEs are usually characterized by high level of environmental uncertainty, and SMEs

are also regarded as poor in human, financial, and material resources. This has caused them to rely more extensively than larger organizations on outside help (Yap et al. 1992).

Essentially, there is a need to investigate how information flows are designed within organizations to meet their information needs (Gunasekaran et al. 2001).

2.2.3 Identify a Proxy to Recognize an Entrepreneur's Overconfident Attitude

Entrepreneurs might not know exactly how good they need to be in order to survive in the market. They should be able to identify a proxy to recognize the threat of a potential overconfident attitude. Gervais et al. (2011) provide a theoretical model, where capital budgeting can be used as a proxy for overconfidence for what concerns decision on managers' type and compensation. The "post" phase is much more developed. Empirically, as argued by Chiao et al. (2006), previous studies have adopted objective approaches to measure firms' performance, such as return on assets (ROA), return on sales (ROS), return on equity (ROE), or sales growth. Although some researchers (Aaker and Jacobson 1987) have criticized the accounting-based measures of performance, managers, and analysts often use ROA and ROS as measures of management efficiency and effectiveness (Grant et al. 1988; Robins and Wiersema 1995).

Ben-David et al. (2008) and Sautner and Weber (2009), in the attempt to uncover the relation between overconfidence and investment, identified that a tight prediction of the distribution of forecast returns is a signal of overconfidence; this measure is also related to the tendency to predict higher cash flows, even controlling the CEO's incentives. The invested cash flows were also shown to be an explanatory variable of overconfidence (Malmendier and Tate 2008).

Here, we investigate the differences between budget prediction and the final balance sheet. Through simple and row variables to control for some minimum requirements in the preparation of a budget: (i) the accuracy in predicting the operating results of the core business,

(ii) the impact that these results will have on the company's equity, (iii) the financial charges arising from borrowing.

That said, we offer a within-firm measure of overconfidence. Also, by using an aggregated index, it would not be possible to advise a company whether or not entrepreneurial overconfidence can damage a specific growth goal (Andersen 2010). Therefore, we analyze three main different indicators of the well-being of small firms:

- i. EBITDA,
- ii. Equity,
- iii. Borrowing costs.

The difference in these three measures between budget and balance sheet are signals of the entrepreneur's ability to predict respectively: (i) the performance of the core business of the firm, (ii) the firm's self-financing capability, and (iii) the level and the costs of debt.

In this regard, EBITDA is an earnings performance measure, in addition to those defined by general accepted accounting principles (Moehrle et al. 2003), which shows the income of a company based only on its core business: Earnings before Interest, Taxes, Depreciation, and Amortization. Koller et al. (2005) refer to EBITDA also as a good measure of extremely low short-term ability to meet interest payments. We consider the level of equity as an indicator of an increase or decrease in the company's wealth, influenced only by the net result of the income statement.

A decrease of EBITDA/equity and an increase in borrowing costs, compared with forecasts, might mean that entrepreneur has been overconfident in the budgeting process. For all these reasons, these three measures are important indicators of performance that entrepreneurs must be able to predict with accuracy, especially in a short period (one year).

2.3 Hypotheses

The framework we presented allows us to test two groups of hypotheses. The first (H1 and H2) based on individual differences and the second (H3 and H4) based on the contextual differences

Hypothesis n.1 (*H1*): Demographic variables play a role: Older entrepreneurs have more experience and tend to be less biased; women are less prone to start a business and less biased when they do so.

Hypothesis n.2 (*H2*): Lack of education, which represents also a weaker relationship with universities and research centers, increases the fallacy of managerial predictions.

Hypothesis n.3 (*H3*): Entrepreneurs who work alone are more overconfident than entrepreneurs supported by a board due to a more tendency to overestimate the probability of success when making decisions.

Hypothesis n.4 (*H4*): An adequate implementation of an integrated budgeting system improves the accuracy of the balance sheet predictions.

2.4 Research Method: Empirical Analysis to Test Overconfidence

We use descriptive statistics and regression analysis based on the collection of several variables, described in the following section.

2.4.1 Data

While Italy is somehow similar to EU average for what concerns small and medium enterprises (SMEs) in terms of value-added creation (37.4 vs 36.3%), it greatly differs as far as the contribution of micro-enterprises and big enterprises. The contribution of micro-enterprises to total value is 29.6% in Italy versus 21.2% in EU, while the weight of large firms in the value-added creation is 33% in Italy and 42.3% in EU. Micro and small firms represent the great majority of enterprises in the investigated area.

We took a representative random sample ($N = 151$) of the population of small and medium Italian firms, belonging to the non-financial industry. Data used in this research were retrieved in May 2013, from three chartered accountant firms in western Piedmont. They informed their customers of the use of capital budgeting information for research

analyses in an anonymous form. Forty-three customers refused to offer their data for this research, leaving a final sample of 108 firms (71.5% positive response rate). The dimension of the firms ranges from 1 to 26 employees, with a volume of business between 100,000 and 5500,000 Euros. At the cost of a relative small sample of firms, we collected a piece of information which is very difficult to retrieve. In fact, the database collected is quite unique for the presence of capital budgeting information for small firms.

The dataset contains the following variables:

- i. Basic demographic information for each respondent, including age (*agedecisor*), gender (*gender*), and the age of the firm (*firmage*);
- ii. Two dummies to capture the effect of the level of education of the main responsible of the firm (*highedu* and *lowedu*);
- iii. A dummy to capture if the entrepreneur is the only responsible or he or she is a part of a board or managerial team who makes decisions (*entralone*);
- iv. The presence of an integrated control software system helps to reduce the biased predictions (*integr*).

Three measures to capture forecast bias are operationalized in this study: the percentage difference of the EBITDA (*diffEBITDA*), the percentage difference of the equity (*diffequity*), and the percentage difference of borrowing costs (*diffborrcosts*). These differences are computed as percentage differences between what was set in the budget and what was observed in the final balance sheet. Equation 1 helps the reader to see in formula the easy calculation computed for the three measures.

$$O_t = \frac{F_t - B_t}{B_t}, \quad (1)$$

where O is the measure of overconfidence at time t , F represents the result from the final balance sheet, and B represents the value forecasted in the budget. Forecasts are unbiased if the forecaster does not systematically over-or underestimate.

2.4.2 Sample

The final sample consists of 108 firms belonging SMEs category.

The age of entrepreneurs ranges from 22 to 74, averaging 48. Among them, there is a relative low presence of women, 38 out of 108, which is an accurate representation of the gender ratio of the Italian entrepreneurs' population (Bonte and Piegeler 2013).

The average number of years of existence of the firms in the sample is 9, with a wide range of variation between 2 and 45 years.

The level of education is different within entrepreneurs: 25 of them only have a middle school diploma, 47 have a high school diploma, and 36 of them have an undergraduate or graduate degree.

Looking at the data in detail we acknowledge the presence of 55 entrepreneurs who make decisions alone¹—there is no formal committee to make decisions—and 53 entrepreneurs who make decisions jointly.

Only 27 firms in the sample have a complete integrated control software system. This number highlights the low level of innovation across small and medium firms, which mainly rely on external advice and/or on outdated and disaggregated systems.

2.5 Analysis and Results

2.5.1 The Three Major Dependent Variables: EBITDA, Equity, and Borrowing Costs

This section provides an analysis of the differences between the budget values and the final balance values for our three dependent variables. Numerous sub-industries are in the sample. However, ANOVA analysis based on the ATECO codes (similar to the US SIC classification) did not reveal any significant differences in the DV between the non-financial industries in our sample and was therefore excluded as a control variable.

¹This information comes from the Italian legal form of the company

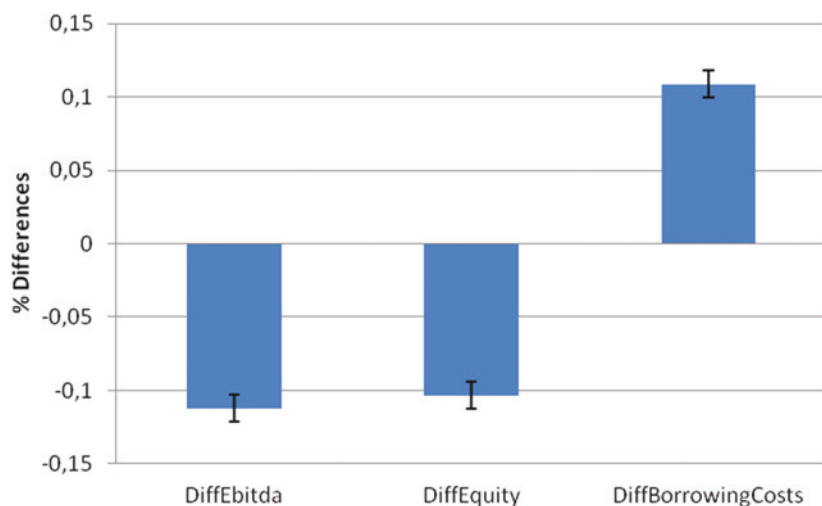


Fig. 2.1 Percentage differences of the budget values and final balance values for the three variables: EBITDA, equity and borrowing costs. *Source* Own elaboration

As we predicted, there is a general tendency toward overconfidence among entrepreneurs in predicting:

- i. The level of EBITDA,
- ii. The level of equity, and
- iii. The level of borrowing costs.

Figure 2.1 shows the results of the data analysis on the differences among the three variables for the firms presented in the sample.

To interpret the results, an increase in the variables *DiffEbitda* and *DiffEquity* must be read positively as it implies that the results of balance sheets exceeded expectations, while an increase in the variable *DiffBorrowingCosts* is read negatively because it implies a negative increase of borrowing costs on the balance sheet.

From the analysis of the previous Fig. 2.1, we find that, point sub (i), EBITDA is overestimated on average by 11.2%, which is a huge difference, considering that the budget anticipates the final

balance sheet's results of just one year. To clarify this with an absolute numeric example, this means that an average firm predicting to generate an EBITDA of 100,000 generates an actual EBITDA of 88,800. This difference is significantly different from zero ($t(107) = -12.6; p < 0.01$).

The same applies to equity, point sub (ii), which is overestimated by 10.3% ($t(107) = -12.27; p < 0.01$) and to borrowing costs, point sub (iii), which are lower in the budget, being 10.9% higher in the balance sheet ($t(107) = -12.6; p < 0.01$).

The similarity of the biases across measures can be explained by the high correlations between these dependent variables. For instance, it is reasonable to assume that if an entrepreneur planned to have a higher level of equity and then fails to reach that level, the only way to sustain the investments is to increase the level of debt, turning to an increase of borrowing costs. The level of EBITDA—by definition—is more independent from the capital structure, because EBITDA excludes other items such as interest payments depending on capital structure. For this reason, the average bias in EBITDA is not extremely similar to the level of the other two biases.

The standard errors of the three variables analyzed, measured by the whiskers in Fig. 2.1, surprisingly show how these results are pretty stable in the sample, which suggests that biases are quite homogeneous among SMEs. These first results highlight how forecast errors in small firms are quite substantial.

2.5.2 The Incidence of Independent Variables

We estimated a model for each of the three dependent variables by means of Ordinary Least Square regression (OLS), including robust standard errors using the Huber-White sandwich estimators. Such robustness check can deal with a collection of minor concerns about failure to meet assumptions, such as minor problems about normality, heteroscedasticity, or some observations that exhibit large residuals. The aim is to understand how the independent variables may affect the observed differences of the three dependent variables.

Table 2.1 The correlation among dependent and independent variables

Variables	Mean	DiffEbitda	DiffEquity	DiffB. Costs	Entralone	Agedecisor	Firmage	Gender	Integr	Highedu	Lowedu
DiffEbitda	-0.103	1									
DiffEquity	-0.112	0.808***	1								
DiffB.Costs	0.109	-0.807***	-0.687***	1							
entralone	0.509	-0.334***	-0.230*	0.292**	1						
Agedecisor	47.65	0.007	0.173	0.005	-0.203*	1					
firmage	19.43	0.325***	0.274**	-0.311**	-0.252**	0.190*	1				
gender	0.366	0.181	0.169	-0.264**	-0.072	-0.009	-0.057	1			
integr	0.250	0.204*	0.162	-0.208*	-0.075	-0.041	0.209*	-0.122	1		
highedu	0.333	0.344***	0.215*	-0.295**	-0.288**	-0.169	0.007	0.041	0.091	1	
lowedu	0.231	-0.268**	-0.152	0.222*	0.144	0.200*	-0.061	-0.093	-0.013	-0.388***	1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2.2 Regression results from data processing under different dependent variables

Variables	DiffEbitda	DiffEquity	DiffB.Costs
Firmage	0.00231*** (0.0008)	0.00167** (0.00079)	−0.00218*** (0.00076)
Gender	0.0359** (0.0167)	0.0325* (0.0165)	−0.0508*** (0.0158)
Agedecisor	−0.0000339 (0.00066)	0.00119* (0.00065)	0.000164 (0.00063)
Highedu	0.0460** (0.0192)	0.0327* (0.0189)	−0.0367** (0.0181)
Lowedu	−0.0274 (0.0208)	−0.0165 (0.0205)	0.0167 (0.0196)
Entralone	−0.0312* (0.0177)	−0.0101 (0.0174)	0.0237 (0.0167)
Integr	0.0304 (0.019)	0.0257 (0.0187)	−0.0325* (0.0179)
Constant	−0.169*** (0.0407)	−0.213*** (0.0401)	0.166*** (0.0384)
Observations	108	108	108
R-squared	0.31	0.2	0.3

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; Standard errors in brackets

Before introducing variables in the regression model, we carefully examined the data to detect problems of multicollinearity. Nonetheless, correlations were below 0.7 between independent variables, as reported in Table 2.1. Dependent variables, as expected and discussed, were significantly correlated. Therefore, we proposed three separate different regression models, each one with only one dependent variable at a time, to better highlight the predicting power. In Table 2.1, we report also the means for the analyzed variables.

Regression results are reported in Table 2.2.

From the analysis of Table 2.2 we find that the strongest significant factors across models to improve accuracy in prediction are:

- i. The age of the firm (*firmage*),
- ii. The presence of a woman (*gender*), and
- iii. A higher level of education (*highedu*).

In particular, about point sub (i), recalling that the dependent variable has to be read as a percentage variation, an additional year of the age of the firm decreases the biased prediction of EBITDA, equity, and interests (of a 2.31, 1.67, and 2.18 %_{oo}, respectively) with respect to the

average bias; the age of the firm is a factor, which we did not consider in our a priori theoretical framework and comes from Post Hoc analysis. We assumed that this factor could have been irrelevant once controlling for the age of the entrepreneur (*agedecisor*) but it was not the case.

With respect to point sub (ii), even if few entrepreneurs in our sample are women ($n = 39$), they tend to show much more accuracy in predicting the budget in terms of final balance sheet, confirming our *H1*. This effect is consistent across all the different specifications and it is more pronounced when the dependent variable is the level of borrowing costs to pay, where accuracy increases by a 5.08%.

The last variable, which is significant across all the different dependent variables, is *highedu*, point sub (iii), a variable that captures the level of education of the entrepreneurs. Results show that having a degree reduces the different biases by 4.6, 3.27, and 3.67%, respectively. This goes in partial favor of *H2*, the hypothesis that supported the negative effect of low education in terms of accuracy. In fact, we found that a high level of education increases accuracy, but there is no significant difference between a middle level of education and a low level of education, meaning that only high education has an effect on increasing accuracy.

Interestingly, there are variables that are significant predictors only of particular dependent variables and not of all the measures of overconfidence.

When measuring accuracy in terms of equity, the age of the entrepreneur plays positively: An additional year increases accuracy by 1.19‰. This result implies that the experience of older entrepreneurs may help in predicting the level of equity. Taking into account the results in terms of gender, it is evident that demographics do play a role, supporting *H1*. When measuring accuracy in terms of EBITDA, the presence of an entrepreneur who takes decisions alone weakens the power of the prediction of the final EBITDA by a significant 3.12%, favoring *H3*. Finally, when measuring the accuracy in predicting borrowing costs, the presence of an integrated control system improves the accuracy by a 3.25%, giving credit to *H4*.

Overall our results are robust even if there are other variables we do not observe here, like the differences in industries, or the impact of the crisis, on the general level of overconfidence.

2.6 Discussion and Conclusion

Implications of the results

In this contribution, we propose novel interrelated mechanisms to test for managerial overconfidence in a group of Italian small firms.

The goal of the research is to investigate how some individual and contextual dimensions, like the experience and the level of technological implementation, influence entrepreneurial accuracy, which in turn impacts on the subsequent firm survival and growth.

We devoted our analysis to three key variables of firm's health: earnings, level of equity, and borrowing costs instead of considering only investment capital or cash flows, as done in the past (Malmendier and Tate 2008). We acknowledge that cash flow related variables may be a common signal of overconfidence but in this work, we were interested in offering a different picture of the effects of overconfidence, on the capital structure and on the earning results as well.

First of all, we find that the age of entrepreneurs is positively correlated with accuracy, especially to predict equity levels. We can then say that both education and age, a proxy for *real* experience, have an effect. Women show more accuracy in their predictions. Although we are not here interested in business performance per se, this result goes in favor of the theoretical work developed by Marlow and McAdam (2013), where they dispute the association between gender and underperformance, and of the argument of Welter and Smallbone (2008), who show that it is because some local traditions that women entrepreneurs sometimes underperform. Controlling for the age of the firm, we found that this factor is indeed a moderator of the relationship between predicted budget values and results in the final balance sheet. A possible interpretation of this result is that if firms enter in the market and they are able to resist in the first turbulent years, then the probability to remain in the market and accurately predict future results increases.

The positive effect of higher education suggests the need to create and strengthen networks between academia, research centers, companies, the financial system, and institutions (Porter 1998). Universities and research centers are entrusted with the task of producing innovative

ideas and projects for business and applied research centers, which are consistent with their purposes and activities (Carlsson 2005).

Moving to contextual factors, we found that, as in Busenitz and Barney (1997), when entrepreneurs decide alone, without a joint committee to take decisions, biases (in particular in terms of EBITDA) are even more pronounced. In line with this argument, Forbes and Milliken (1999) highlight that “the very existence of the boards as an institution is rooted in the wise belief that the effective oversight of an organization exceeds the capabilities of any individual and that collective knowledge and deliberation are better suited to this task, enabling boards to achieve their full potential as strategic decision-making groups.”

Finally, this research highlights the competitive advantage of having an integrated software system. We show that the use of more sophisticated processes for information gathering and analysis leads to more accurate forecasting behavior, at least in terms of reducing inaccuracy about borrowing costs. Explanations for statistical model superiority over human forecasts are well documented by heuristic biases of the forecaster (Cassar and Gibson 2007), and by the fact that without a proper integrated system, researchers have to rely on self-assessed measures of forecasting accuracy. Even though we haven't directly tested the presence of business failure after these biased predictions, there is a stream of research showing that these inconsistencies lead to an increase in the probability of failing (Camerer and Lovo 1999; Hamilton 2000), because of a scarce accuracy in evaluating negative forecasts.

In this sense, prevention activities can be effectively exercised through the use of a strategic planning monitoring system able to detect threats and to develop a system of gradual responses to function with available information.

The information systems and internal periodic reporting assumes a support role in determining states of crisis, and for a more rational and professional implementation of the strategic plan of reorganization and control during its performance (Basile and Lusvarghi 1996). Recent research by Hormiga et al. (2013) showed how there is a positive relation between entrepreneurial aspirations and propensity to innovate. Here, we add a boundary condition: only in contexts with the

propensity to internally innovate through technological developments the performance may not be undermined.

The results on the determinants of overconfidence are not totally consistent across dependent variables.

Limitations, strengths, and directions for future research

No industry effect was found, since the overwhelmingly majority of companies in the sample belong to the non-financial industry. In any case, we acknowledge that measuring time and industry may bias the conclusions of our research. Considering also the specific geographical context investigated, caution should be exercised in generalizing the findings.

It should be investigated if the source of overconfidence is conscious, e.g., the entrepreneur knows that results will be less positive but provide higher predictions to convince stakeholders to invest, or unconscious, e.g., the entrepreneur is genuinely convinced he can reach the predicted results and if this aspect varies by country.

It may be argued that overestimating the budget may be a strategic business choice. We think that in the long run, it would not be feasible because, for example, banks would not trust anymore a biased budget after a long series of biased ones. Also, the presence of an integrated control systems shows that the small firms which are benefiting from this statistical tool are presenting less biased forecast while in principle they could have presented in any case biased prediction if the goal was only strategic.

Although forecasts from this study can suffer from biases such as reputation effects and exposure to legal liability, they measure the “true” predictions that may not be obtained using surveys.

A test out-of-sample would have helped to increase the statistical power and strengthen the stability of results. Despite a relative small sample, the significance of our results is suggesting that the main determinants we identified have a clear effect.

Future research should integrate different approaches in a combined view, on the one hand, increasing the variables that may be relevant, like the sector where the firm is operating and the marketing strategies, and on the other, obtaining personal information about entrepreneurs.

The inaccuracy in predictions may be enhanced by self-image concerns, which may be measured through surveys, or mediated by legal and statutory requirements.

The availability of a longer time series of responses with a greater time span would have allowed for an examination of learning effects. We have to leave this for future research. Longitudinal studies could also help to analyze if and when entrepreneurial overconfidence led to business failure. Further work is needed to assess causal directions: context influencing activity and vice versa.

The predisposition for entrepreneurs to be overconfident is only an issue if, as previously asserted (De Meza and Southey 1996; Hayward et al. 2006; Koellinger et al. 2007), it has a negative impact upon performance that may lead to failure. Our evidence does not measure directly these assertions. It would be therefore needed to show whether overconfidence in the budgetary forecasts of EBITDA and equity are strongly associated with an entrepreneur's decision to file for bankruptcy. It is possible to moderate entrepreneurial overconfidence by increasing the levels of educational attainment achieved by entrepreneurs and through the use of integrated budgetary control systems. While it is virtually impossible to control for all the determinants of bankruptcy and more "fine grained" information would be required, our findings point to education helping entrepreneurs to understand the limitations of heuristic methods and providing the confidence and competence to use integrated budgetary control systems effectively. The findings also indicate that overconfidence is less prevalent among women business owners.

Despite the relative small sample, the independent variables included in the models are strongly significant across different specifications. When considering the external validity of the findings, it is important to recall that entrepreneurs as a group are not homogeneous in terms of personality (Kolb and Wagner 2015), and, as a consequence, also in their overconfident attitudes. In this sense, financial planning touches upon a more complex topic of managerial decision-making and could be explored with qualitative research methods in the future.

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