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Research paper

Debt pressure and interactive use of control systems: Effects on cost of debt☆

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ABSTRACT

We study if debt pressure drives the use of interactive management accounting and control systems (MACS) and its consequences. We build on Simons (1990) and argue that financing pressures can threaten strategic investment. To alleviate debt pressures and reduce information asymmetries with lenders, managers are predicted to increase the interactive use of MACS. However, because individual MACS have different features, not all interactive use of individual MACS equally serves to assuage debt pressures. We predict that firms facing high debt pressure interactively use traditional MACS and that when individual MACS use befits the level of debt pressure, firms benefit by experiencing future decreases in their cost of debt. Our findings confirm these predictions. We contribute to the literature by showing that pressures from external stakeholders influence interactive use. We also suggest a new relevant firm outcome affected by MACS use: the future cost of debt. Finally, in additional analyses, we show that concerns over innovation may lead managers to choose apparently non-optimal MACS for interactive use, consistent with managers often juggling conflicting pressures.

1. Introduction

We examine whether debt pressure influences interactive management accounting and control systems (MACS). Debt pressure means increased scrutiny and information demands from lenders who are concerned about the firm's financial health. MACS provide information useful in decision-making, planning and evaluation (Merchant and Otley, 2006), and their interactive use allows senior managers to involve themselves, regularly and personally, in the decision activities of their subordinates, fostering the emergence of opportunities to challenge and debate data, assumptions, and action plans (Simons, 1995, 2000). Hence, the use of interactive MACS is critical in risky environments (Widener, 2007; Tessier and Otley, 2012; Janke et al., 2014), and thus, potentially, as a mean to respond to lenders' information demands and concerns. However, lenders are not equally interested in the information provided by all MACS, rather, their information needs are narrow and focused on those data that help them estimate changes to the firm probability of default.

In this paper, we build on Simons (1990), who argues that interactive use serves to focus the attention of the entire organization on the information that top managers consider of strategic importance, and we propose that interactive MACS are influenced by the information demands and pressures from external stakeholders, namely lenders. In particular, we argue that the relative importance of debt financing (i.e., debt pressure) represents a key strategic uncertainty that can derail firm financing and investment, and hence, managerial vision of the future. We expect this is a determining factor in the use of MACS and its consequences. This argumentation is in contrast with the main body of research in this area that almost exclusively takes an internal perspective (e.g., Abernethy et al., 2010; Su et al., 2015; Heinicke et al., 2016).

When firms face financing constraints, the relationship with finance providers becomes crucial for survival and continuous investment, particularly in private firms. In firms with limited access to public capital markets, lenders have access to top managers (and middle managers and often, to employees) and they can demand frequent (even weekly) updates on key financial ratios (Berry et al., 1993). That is, lenders have a position to exert real pressure and induce full disclosure from top managers. Failure to timely procure this information may lead to a deterioration of future debt terms, threatening firm survival.

Prior research provides evidence consistent with our arguments,

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showing that investment depends on the firm's financing activity (Myers, 1977, 1984; Childs et al., 2005), while financing is affected by the information generated by the firm, and the nature of the relationship between borrowers and lenders (Petersen and Rajan, 1994; Berger and Udell, 1995). Lenders are the primary external users of the reports prepared by private firms (Nair and Rittenberg, 1983; Cascino et al., 2014), and as noted in Cassar et al. (2015), firms can reduce information asymmetries with lenders by providing more decision-relevant data, thereby lowering their future cost of debt. Thus, our first prediction is that, in the presence of debt pressures and frequent information demands from lenders, managers increase interactivity to focus attention on solving debt pressures, to assuage the risk of running into financial trouble and to ensure firm survival.

The above discussion introduces two related questions that we also address. If interactive use is driven by specific lenders-driven demands for information, this raises the question of which individual MACS managers use interactively in response to debt pressures and what are their consequences. To explore these issues, we build on Simons, (2000) Levers of Control (LOC) framework that predicts that, to be successfully employed and to avoid distraction, usually only one individual MACS must be used interactively. Because not all MACS have the same characteristics and features, different MACS generate qualitatively and quantitatively different information (Chenhall and Morris, 1986; Chenhall and Langfield-Smith, 1998; Bouwens and Abernethy, 2000; Tillema, 2005), and thus, the interactive use of different individual MACS can have different consequences for organizational success (Bisbe and Malagueño, 2009).

Adopting the fit approach in Bisbe and Malagueño (2009) and in contingency theory (Grabner and Moers, 2013), we follow prior work (e.g., Hall, 2008; Franco-Santos et al., 2012) and divide MACS into 'traditional' (e.g., budgets) and 'contemporary' (e.g., balanced scorecard), consistent with these two types of MACS having idiosyncratic information effects, and providing information content with different levels of scope, aggregation, timeliness and integration (Chenhall and Langfield-Smith, 1998).[1] We expect that these differences in information content are a key element in explaining interactive MACS use and its consequences.

Under high pressure of debt, lenders intensively monitor managers and demand frequent information to update their estimates of firm default probabilities (e.g., Armstrong et al., 2010). In reaction, managers are likely to interactively use MACS that best permit focusing the attention of the entire organization on solving these pressures, and thus, mitigating agency problems, financing constraints and liquidity concerns. Firms that successfully alleviate debt pressures are predicted to enjoy better debt terms subsequently and to benefit from lower future cost of debt. Specifically, we predict that interactive traditional MACS alleviate debt pressure, because they provide information that aligns with the requests of loan officers, allowing senior managers to communicate the financial information necessary to assess firm performance and financial health. In addition, interactive traditional MACS focus organizational attention on the key strategic actions that ensure debt-repayment. To test these predictions, we examine the interactive use of traditional and contemporary MACS, and their consequences on firm future cost of debt. Our predictions thus contrast with recent developments in the area that generally report positive consequences associated almost exclusively with contemporary MACS (e.g., Henri, 2006; Widener, 2007; de Harlez and Malagueño, 2016).

Despite the relevance of interactive MACS, there is scarce evidence on the drivers of interactivity and on how managers choose individual MACS for interactive use. An unresolved question not addressed in prior work is whether external stakeholders, and the relationships and dialogue between senior managers and these stakeholders, can trigger interactive use. Further, if external stakeholders' information needs are important, this raises a second unresolved question: which stakeholders? Prior work takes an internal perspective, by looking at how top managers process information, their patterns of attention and how this, in turn, drives the patterns of attention of middle management (e.g., Henri, 2006; Su et al., 2015). Our work extends this work by focusing on an external, continuous, uncertainty condition, namely, high debt pressure, and advancing the importance of external pressures from a key stakeholder: lenders. We also provide novel evidence on the drivers of individual MACS interactive use. To the best of our knowledge, only Bisbe and Malagueño (2009) analyze the choice of individual MACS for interactive use, focusing on innovation strategy. We add to prior work by linking interactive use to the qualitative and quantitative information generated by each individual MACS. In doing so, we build on the idea that MACS-generated information is *used* by managers and within the organization *with a purpose*. We identify a novel one: informing lenders of the financial health of the firm and taking actions to successfully resolve debt pressures and ensure firm survival.

A further contribution is to link interactive use with an important firm outcome: future cost of debt. No prior research studies the impact of interactive use on future cost of debt. Our analyses thus raise and partly tackle a relevant question: What outcomes are affected and should be studied? A final contribution is that we use a research design that allows capturing the nature of this risk and its consequences *via* secondary data instead of survey measures.

The reminder of the paper is organized as follows. Section 2 reviews the prior literature. Section 3 states the hypotheses. Section 4 presents the research design and describes the sample and data. Section 5 reports the main tests and results. Finally, section 6 concludes.

2. Conceptual background and literature review

MACS are "the formal, information-based routines and procedures managers use to maintain or alter patterns in organizational activities" (Simons, 1995, p. 5). Many of these controls may be present to align individual activities with organizational goals. Their ultimate aim is to increase the probability that all actors within the organization behave consistently with the objectives of the "dominant organizational coalition" (Abernethy and Chua, 1996, p. 573). When adequately implemented, MACS can improve production and performance (Bertrand and Schoar, 2003; Bloom and Van Reenen, 2007).[2] Simons, (1995) framework advances the idea that managers use MACS to control positive and negative powers, and identifies four levers of control: interactive, belief, boundary and diagnostic. Substantial research focuses on the diagnostic and interactive levers (Henri, 2006; Su et al., 2015; de Harlez and Malagueño, 2016). However, only interactive use serves to send the message throughout the organization about the importance of identified strategic uncertainties, motivating both information gathering and debate on perceived threats (Naranjo-Gil and Hartmann, 2007; Kominis and Dudau, 2012 Kominis and Dudau, 2012).[3] Thus, in what follows, we focus on the interactive use of MACS.

[1] According to Chenhall and Langfield-Smith (1998) traditional MACS provide information to help managers understand how their organization's activities affect costs. Contemporary MACS support differentiation strategies by offering ways to evaluate the effectiveness of products, business areas or departments. Hyvönen (2007), Franco-Santos et al. (2012), Hall (2008), Van der Stede et al. (2006) or Ittner et al. (2003) also use these labels of traditional (sometimes referred to as 'financial') and contemporary (sometimes referred to as 'non-traditional') MACS. Admittedly, these labels could also be 'traditional' and 'non-traditional' or perhaps 'financial' and 'non-financial.' We opt not to develop new labels, and base our types on prior literature.

[2] Prior work on implementation finds that, under some styles of use, MACS may be active, elastic and adaptive to risky environments and, at the same time, stable to frame communication patterns (Davila and Foster, 2005).

[3] Belief and boundary systems have attracted less attention in the prior literature (e.g. Tessier and Otley, 2012), and no other efforts had been made to adjust the vagueness and ambiguity of these levers (Ferreira and Otley, 2009).

Table 1
Sophistication and features of information by individual MACS.

Design of MACS	Individual MACS	Features of information			
		Scope	Aggregation	Timeliness	Integration
Contemporary	Balanced scorecard	Broad	Aggregated	High	High
Traditional	Cost accounting	Narrow	Disaggregated	Low	Low
	Budget system	Narrow	Disaggregated	Low	High

Scope refers to the dimensions of focus, quantification, and time horizon. Aggregation denotes the capacity of MACS to offer data in various forms, ranging from provision of basic raw, unprocessed data to several aggregations across different periods of time or areas of interest. Timeliness refers to the provision of information on request and the frequency of reporting systematically collected data. Integration refers to the coordination of the various departments and areas.

2.1. Interactive MACS and information consequences

The interactive lever refers to how top-level managers use control systems to focus attention on the information that they consider to be of strategic importance. Interactivity encompasses an intensive use and strong involvement by top managers, which, in turn, leads to intensive use by operating (middle) managers, a high frequency of face-to-face challenges and debates, and a focus on strategic uncertainties (Simons, 1987; Bisbe et al., 2007). Through interactive use, top managers can guide the information gathering and the search for understanding in the entire firm, as well as manage strategic uncertainties, which are contingencies that could threaten or invalidate the assumptions underlying firm strategy (Simons, 1995; Arjaliès and Mundy, 2013). Recent studies aim to understand the management of uncertainty and risk that underlies the interactive use of MACS. Whilst these papers conceptualize different measures of uncertainty and risk in terms of perception of external crisis (Janke et al., 2014), innovation (Bisbe and Malagueño, 2009; McCarthy and Gordon, 2011), top management team composition (Naranjo-Gil and Hartmann (2006, 2007), organizational culture (Heinicke et al., 2016), or competitive uncertainties and operational risks (Widener, 2007), they generally take an internal perspective. To date, few studies have examined the contextual variables that affect interactive use and apart from Simons (1991) and Bisbe and Malagueño (2009), no other studies have paid attention to the factors that influence the choice of the individual MACS for interactive use.

Generally, only one individual MACS is used interactively (Bisbe and Otley, 2004). Otherwise, there would be information overload, leading to superficial analyses (Simons, 1991, 2000). Although any formal MACS is a potential candidate for interactive use, the choice is certainly not random, nor expected to be identical across firms. This is justified because each MACS has different characteristics and features, so that the choice has consequences for organizational success. Different MACS generate information and data with different characteristics and levels of sophistication (Chenhall and Morris, 1986; Abernethy and Brownell, 1999; Tillema, 2005; Bisbe and Malagueño, 2009). Therefore, the interactive use of different MACS drives the focus of the organization towards different information. Chenhall and Langfield-Smith (1998) disaggregate control systems depending on the qualitative attributes of the information they generate, classifying them into 'traditional' (cost accounting, or budget systems) and 'contemporary' (balanced scorecard, or employee-based measures). These labels are based on the dimensions of MACS relevant for the information they provide (see Table 1).[4]

Traditional MACS have a narrower *scope*. They offer information that pays special attention to events within the firm, quantifiable in monetary terms, and based on historical data. This is why they are often labeled 'financial' MACS (Hyvönen, 2007). In terms of *timeliness*, contemporary MACS offer continuous updating of data (Chenhall and Langfield-Smith, 2007; Hoque, 2014). A constant internal information flow may lead to information overload, which is particularly problematic when firms face external threats, such as during crisis periods (Ezzamel and Bourn, 1990). Regarding *aggregation*, traditional MACS generate disaggregated data, whilst contemporary MACS offer data that can be aggregated at different levels and for different sub-periods. This flexibility has drawbacks. Cardinaels and van Veen-Dirks (2010) show that subtle changes in the presentation of MACS data (such as aggregate performance markers), may bias the perception of users. Disaggregated data, although potentially leading to organizational conflicts (Hoque, 2014), has the benefit of presenting simpler, difficult-to-bias information that is easier for managers to defend in face-to-face discussions with external parties, and thus, it potentially leads to a perception of trustworthiness.

2.2. Debt pressure, the external dialogue with lenders and the demand for information

Lenders are the main suppliers of finance for private firms (Cascino et al., 2014). They are interested in information that permits assessing financial distress, to decide how much to lend, and on what terms – in terms of price (e.g., the interest rate) and non-price (e.g., loan maturity, collateral, covenants). Prior work studies lenders' use of information by examining the association between financial reporting attributes, firm access to debt and the cost of debt. The fundamental prediction and finding in this literature is that firms making timely and informative disclosures are less likely to withhold bad news relevant to lenders and as a result, can obtain better credit terms (e.g., Sengupta, 1998; Ashbaugh-Skaife et al., 2006).[5]

Lenders also use other information sources (Cassar et al., 2015), because they are interested in management's character, credibility and quality, as well as in understanding the firm's operations, systems and employees. This information gathering process is important in lending decisions (Berger and Udell, 1995, 2006; Petersen, 2004), particularly, in private debt, where firms develop relationships with their lenders (Petersen and Rajan, 1994; Berger et al., 2001). In *relationship lending*, through frequent private interactions, lenders obtain information from management and their subordinates. These lenders often have superior information-processing abilities and access to private information, which is used in designing the contract and particularly, in subsequent monitoring (Fama, 1985; Bhattacharya and Chiesa, 1995; Bharath et al., 2008). Hall et al. (2015) describe that, through personal interactions, risk managers of banks 'gain the ear' of firm decision makers. These risk managers may even give advice to managers.

Lending relationships can thus generate a continuous external pressure on management, where monitoring is not restricted to the loan granting decision, but extends to the full term of the loan, both formally (e.g., using covenants) and informally (e.g., direct contact with managers and subordinates). In fact, personal connections and repeated lending

[4] We focus on scope, aggregation and timeliness, as they directly determine the type of information generated (a further characteristic identified in prior work: integration, refers to an organizational feature of implementation).

[5] See Armstrong et al. (2010). More transparent and reliable information leads to more efficient debt covenants (DeFond and Jiambalvo, 1994; Sweeney, 1994), permits lenders to assess firm activities risk, health and viability (Costello and Wittenberg-Moerman, 2011) and predict future cash flows accurately (Jensen and Meckling, 1976).

often lead to lenders placing a greater weight on informal channels (Bharath et al., 2011; Engelberg et al., 2012; Erkens et al., 2014). Lenders also acquire information by offering a variety of additional financial services, such as deposits, credit lines or checking accounts (Allen et al., 1991; Petersen and Rajan, 1994). This allows them to make inferences about the firm's sales, investments, operations and health by closely monitoring the cash flowing through these accounts. Lenders can then query managers about potential concerns associated with changes in these cash flows (such as whether they are caused by decreasing sales, questionable debtor positions, illiquid inventories, etc.)

This knowledge of *what* to ask, combined with the direct access to managers, places lenders in a privileged position to pressure managers into providing timely disclosures about the firm activity and financial position. Debt pressure for additional disclosures mounts when financial condition deteriorates because lenders are more sensitive to decreases in firm value than to increases, and their monitoring efforts can be directly linked with the existence of concerns about firm financial health.[6]

Therefore, when firms raise private debt, they engage in an external dialogue with lenders, opening a multitude of communication channels. Firms with limited access to public capital markets depend on their lending relationships to ensure continuous investment. Lenders, in turn, can pressure management for decision-relevant information with greater timeliness than that allowed by external financial reporting. This may involve, as examples, requests of weekly updates on key financial ratios, constant phone calls, or visits by loan officers. Manager cannot afford to ignore these information demands if they ultimately wish to ameliorate debt terms.

3. Hypotheses development

3.1. Debt pressure and the interactive use of MACS

Environmental variables affect firm performance and information needs, often requiring intensive, direct attention from managers. Ezzamel and Bourn (1990) argue that firms facing external threats use less communication channels and suffer from information overload, leading to information distortion and unsuccessful decision-making.[7] Interactive use can alleviate these information problems. It permits establishing additional communication channels that cut across the organization hierarchy (Smart and Vertinsky, 1977; Abernethy and Brownell, 1999), strengthening lateral and external relations (Janke et al., 2014), and allowing a continual exchange among top and middle managers, and other organizational members (Bisbe and Otley, 2004). An interactive use embodies a way to cope with the increased demand for information processing, helping managers identify and eliminate trivial distractions, filter out irrelevant information and develop an agenda of priorities (Ezzamel and Bourn, 1990). This is paramount to successfully face external threats, when managers need to realign resources, roles and functions (as established procedures and routines may become inappropriate), introducing greater decision-making flexibility and individual discretion into procedures. Such discretion enables managers to better decide how goals should be achieved (Mundy, 2010).

Against this backdrop, we argue that external stakeholders' pressure can drive interactivity, and in particular, we propose high debt pressure as a threat that triggers managerial intensive action and interactive use of MACS. As noted above, lenders demand information that allows assessing the firm debt-paying ability, to decide how much to lend, and on what terms. Also noted is that when firms have strong ties with their lenders, lenders are in a position to exert pressure on management to obtain this information. By involving themselves regularly and personally in the activities of subordinates, top managers can respond to these information demands. They can gather data on emergent patterns of activity (Caldarelli et al., 2016), selecting and investing resources into key initiatives (Simons, 1995; Bedford, 2015) and aligning the whole organization with the ultimate goal of firm survival, debt repayment and continuous investment. High debt pressure firms face risk and uncertainty that puts a premium on MACS-generated information, which becomes key in the agenda of top managers in search of the information set and control mechanisms that have a bearing on the firm debt-paying ability.

Interactive use assuages debt pressures by providing managers with close control and full understanding of 1) what happens within the organization and 2) the uncertainties that might affect the firm debt-paying ability. Debt-driven interactive use focuses the organization on controlling and understanding its cash flow management and the uncertainties that concern lenders. This means that information about declines in orders and sales, problems of customer payments, projects, units and subunits, their relative profitability and cash-flow generating ability, product margins, accurate forecasts, etc., become singularly relevant across the organization hierarchy on a day-to-day basis. The extreme focus and involvement by managers, and the constant discussion and debates that characterize interactive use facilitates emergence and bottom-up initiatives, as the organization focuses its attention on financial survival. Interactive MACS is thus unlike diagnostic use (Bisbe and Otley, 2004), which are used on an exception basis (Henri, 2006), and would not help when the entire organization needs to focus on alleviating debt pressure. Indeed, diagnostic use, in a setting of high pressure, would be unlikely to lead to the necessary emergence, focus and action, as diagnostic use specifies only the desired outcomes, but not the actions that must be followed (Bedford, 2015; O'Grady et al., 2016). Conversely, interactivity means that lenders' requests, whether formal or informal, are answered swiftly, both by top and middle managers as well as by employees. Through interactive use, the organization becomes alert to the importance of liquidity concerns, the need to satisfy the information demands of lenders, and the necessary discovery and actions to ensure cash-flow management and debt-repayment become a top priority.

Although not directly examining these issues, prior research provides evidence consistent with our arguments. Arena et al. (2010) show that high debt pressure influences existing practices and the individual behavior of managers, and the work of Mundy (2010) indicates that external pressures affect interactivity.[8] Mundy (2010) shows that if customers express dissatisfaction with an aspect of any particular project, this indicates that the project might be at risk, and stimulates management to interactively use control systems to settle any problems. Given this prior work and the above argumentation, we predict that debt pressure represents a critical threat to firm strategy that increases the interactive use of MACS. This leads us to our first hypothesis:

H1. *Ceteris paribus, high debt pressure is positively associated with the interactive use of MACS.*

However, not all MACS are equally likely to provide the information

[6] As illustrated in Kothari et al. (2010), shareholders' claim is similar to a call option over the firm's assets, with an exercise price equal to the face value of debt; whilst debt holders' claim is analogous to a written put option, given that their upside is capped at the face value of debt. If the value of the firm falls below the value of debt, debt holders lose the difference between firm value and the face value of debt. The value of debt claims is thus more sensitive to decreases in firm value than to increases, and lenders treat gains and losses asymmetrically, for example, by writing up covenants that are triggered by substantial decreases in the value of the firm, but not by increases.

[7] Ezzamel and Bourn (1990) do not study interactive use but, in line with Abernethy and Brownell (1999) or Hartmann and Maas (2011), their conceptualization of Accounting and Information Systems as "dialog and idea machines" includes features that are similar to interactive use of MACS.

[8] The focus of Mundy (2010) differs from ours in that she explores how firms balance controlling and enabling uses of MACS, facilitating the creation of dynamic capabilities. Despite this different focus, her qualitative evidence is consistent with our general prediction that external pressures drive interactive use. The work of Soltes (2014) provides an interesting illustration of the pressures external stakeholders may exert in their search for information. He reports, for a single firm-year, 75 private interactions from sell-side analysts (85% over the phone; the rest at conferences and office meetings). Nearly half of those occurred within 72 h of firm news.

and drive the action that would best serve to alleviate debt pressure, and thus, interactive use may have heterogeneous consequences, as some interactive MACS may not give rise to the necessary emergence and bottom-up initiatives.[9] Indeed, certain MACS may provide information and lead to initiatives that may not be relevant in a high debt pressure situation (Braam and Nijssen, 2004). A further concern is that the design and full implementation of MACS is not trivial, and shifting MACS use requires significant time investment (Burns and Scapens, 2000; Kasurinen, 2002; Davila and Foster, 2005). Therefore, although in the short-term debt pressure can only fundamentally drive the interactive use of already implemented MACS, it is likely that not all interactive use of MACS will equally resolve debt pressures. We turn to that discussion next.

3.2. Debt pressure, individual MACS for interactive use and organizational consequences

Individual MACS are differently equipped to exercise focused control and to provide the type of information best suited to withstand high debt pressures. This, in turn, may explain the interactive use of individual MACS and their consequences. We argue that managers can better face high debt pressure by focusing organizational attention on simpler input and output measures like the data offered by traditional MACS. For high debt pressure firms, interactive use with traditional MACS, which focuses on financial metrics and disaggregated information, becomes a better fit, as financial data inform of the financial impact of a range of operational decisions, allowing better decision-making (Chapman, 1997). Consistent with this view, Tuomela (2005) notes that financial metrics from traditional MACS are well suited for interactive use in uncertain and risky environments, to promote discussion. The textual analysis in Janke et al. (2014), based on interviews with senior managers, also provides anecdotal evidence of the relevance of traditional MACS in times of crisis. Their results show the prominent role of the interactive use of MACS-provided financial data, and indicate a focus on liquidity, budgeting talks and budgeting deviations, as well as an increased relevance of financial managers within the organization hierarchy. For example, they note that in crisis firms top management "was closely involved in discussing options to ensure financial liquidity," and that senior and middle managers would often "debate about tough decisions to preserve liquidity" (p. 264).

A second benefit of traditional MACS refers to ease of communication with lenders. Financial bottom-line data aggregates heterogeneous information about a set of diverse factors into single, common, and summarized dimensions that can be easily articulated in interpretable and knowledgeable standardized terms for lenders (Van der Veeken and Wouters, 2002). Arguably, the data *provided* by traditional MACS is the data *requested* by lenders. As noted in Demerjian and Owens (2016), private loan contracts are likely to include restrictions (covenants) that protect the lender. These contracts provide important insights into the information that is of interest to lenders. Demerjian and Owens (2016) classify all financial covenants into fifteen categories and show that seven of them build on EBIT or EBITDA measures. Other commonly used measures are balance-sheet items necessary to calculate ratios such as current or quick ratios. This indicates that lenders information demands are focused on traditional financial data. Interactive use with traditional MACS aligns the focus of the organization with the information demands from lenders. For example, financial budgets are key to develop balance sheets and cash flow statements, and thus, a fundamental tool for decision making under high debt pressure.

In addition, interactive use with traditional MACS provides specific information and financial data that results in more efficient processes and better performance (Bertrand and Schoar, 2003; Bloom and Van Reenen, 2007). Traditional MACS allow managers to follow their activity's cost and time, establishing clear performance standards, focusing on liquidity and firm survival, successfully managing debt pressure. The interactive use of traditional MACS ensures it is less likely that organizations are distracted away from their focus (i.e., financial survival). In contrast, broader scope data, as that offered by contemporary MACS would likely lead to information overload in a quick response setting, generating anxiety in business managers or dysfunctional excesses.[10] Prior work suggests that contemporary MACS like balanced scorecards (BSC) are often used for within-firm coordination and for self-monitoring, rather than for day-to-day decision-making (Wiersma, 2009). Contemporary MACS may also lead to focus on details rather than on the overall picture and over-bureaucratization (Braam and Nijssen, 2004).

The evidence in Berry et al. (1993), based on relationship lending with private firms, confirms that banks demand timely financial information. Annual financial statements have low timeliness (even more so in private firms). Annual financial statements are unlikely to provide sufficiently timely information to lenders. Berry et al. (1993) show that more frequent statements of assets and liabilities or of debtors (or aged debtors) are often required. These frequent demands for this type of information (internally generated by traditional MACS) coupled with managerial focus on satisfying lenders' demands, and the subsequent exchange and dialogue (quick response by managers) likely reduces information overload, and limits managerial temptation to manage the data. This is because in this setting there is repeated and constant interaction, and opportunistic behavior would eventually unravel, i.e., it would be discovered and penalized by the lender.

Prior research confirms that traditional MACS provide more precise, less likely to be biased data (Dhaliwal et al., 2011). Also, the work of Muiño and Trombetta (2009) shows that aggregated data like the information depicted in graphs do not provide incremental information to external users, consistent with our arguments. Indeed, lenders demand financial information low in aggregation (often, for simple ratio calculation) that is less likely to be manipulated to present a favorable firm outlook. Thus, we expect that firms concerned about financing constraints interactively use those MACS that better align the economic and financial streams, preferring traditional MACS that permit the best control over the cash flow stream. Based on the above discussion, we formulate the following hypothesis:

H2a. *Ceteris paribus, high debt pressure is positively associated with the interactive use of traditional MACS.*

Our discussion above raises the question of which individual MACS may be optimal for interactive use in low debt pressure settings. Firms that face high debt pressure need to shift their focus towards satisfying the information demands of lenders and those actions that guarantee debt-repayment. In contrast, low debt pressure firms are unlikely to face financing constraints, and thus, they can focus on their investment opportunities. Interactive use with the information generated by contemporary MACS may help them detect new opportunities (Marginson, 2002; Speckbacher et al., 2003) and improve their competitiveness. The evidence in Ax and Greve (2017) confirms that, in stable firms, the

[9] As an example, suppose that some clients are late on their payments. The bank discovers, by monitoring the firm cash account, that cash is running low, or the credit line is over-drawn. The loans officer may call to enquire about this. This request for information induces interactive use, as managers become aware of the lender uncertainty. Financial data then plays an important role in scanning individual customers that are being late on their payments. Top and operating managers, through debate and continuous meetings, would search for action plans, such as offering prompt-payment discounts to those customers. New financial data and forecasts would then be shown to lenders, ameliorating the uncertain situation. Interactive use with financial data would be key to resolving debt pressure, whilst data offered by contemporary MACS such as brand awareness would be less relevant for the lender.

[10] In contrast to this view, and supporting the benefits of traditional MACS generated data, Bisbe and Sivabalan (2017, p. 26) suggest that the use of financial metrics and forecasts leads to 'peace of mind,' as managers consider the probability of success of their projects and that the results would not be below the worst-case scenario.

adoption of contemporary MACS is related with perceptions of competition and of the existence of threats to the firm market position. Low debt pressure firms may seek to create a broader, less focused portfolio of strategic initiatives, and to interactively use MACS that provide data for understanding, reasoning and predicting the broad-scope implications of strategies at consolidated levels (Bisbe and Malagueño, 2009). Managers of these types of businesses must monitor many trade-offs, and consider the costs and benefits of prioritizing any given threat. Contemporary MACS can be a channel for both top-down and bottom-up flow on selected key indicators (Davila and Foster, 2005; Hoque, 2014).

Thus, compared to high debt pressure firms, low debt pressure firms are likely to prefer interactive use of MACS to learn about the internal working of their business models, and to obtain constantly updated indicators of threats and opportunities of different business areas, to make informed decisions about investments to sustain and improve their competitive position. This is particularly true if this information is rapidly updated and provides quick feedback for decision-making in firms that are innovating (e.g., Busco and Quattrone, 2017). Therefore, managers of low debt pressure firms are likely to focus on more diverse strategic objectives, increasing their request for more complex and broader information systems, like BSC, that includes internal and external information, as well as future oriented information (Cardinaels and van Veen-Dirks, 2010). Hence, low debt pressure firms may prefer broad scope, aggregated, and high timeliness MACS for interactive use (i.e., contemporary MACS).

Despite the plausible logical appeal of the above arguments, a number of recent studies (e.g., Bisbe and Malagueño, 2009; Bedford et al., 2016) suggest that not all firms are likely to choose and benefit from the interactive use of contemporary MACS.[11] In particular, the evidence in prior work would suggest that it is firms that are innovating that benefit most from the use of contemporary MACS. The question remains, however, whether firms that do not adapt such strategies would benefit from interactive use with traditional or contemporary MACS. Indeed, for firms that have low debt pressure, it is possible that other threats to the firm are present, i.e., the absence of high debt pressure does not preclude the existence of *other* pressures, which would, in turn, determine the optimal MACS for interactive use. Thus, for low debt pressure firms, we formulate the following non-directional hypothesis:

H2b. *Ceteris paribus, low debt pressure is associated with the interactive use of contemporary MACS.*

Building on our previous discussion, we consider that when high debt pressure firms interactively use traditional MACS, they are in equilibrium.[12] The case of low debt pressure firms is less direct. They would benefit from interactive use of contemporary MACS mainly *via* managerial performance. In line with this view, Hall (2008) shows the positive effect of BSC in managerial scheduling, planning, or appraisal of proposals. This, in turn, would lead to greater investment efficiency, particularly, in low debt pressure firms firms that adopt an innovation strategy. These firms, by virtue of being financially sound and less indebted, would command better debt terms relative to their peers (e.g., Solomon, 1963; Scott, 1976; Myers, 1977). In addition, interactive use with contemporary MACS would foster optimal investment (through discovery of emergent opportunities and creation of new capabilities), innovation and the development of commercially viable new products (see, e.g., Tuomela, 2005; Bisbe and Malagueño, 2009). Such financially sound and commercially successful firms would experience future improvements to their debt terms, as lenders would likely perceive them as having low default risk.

Overall, we predict that firms using the hypothesized MACS obtain better outcomes. This means that individual MACS are not necessarily optimal in absolute terms, but rather, relative to a firm's needs. Prior literature presents inconclusive results on the links between MACS and firm outcomes, usually as measured by firm performance (Franco-Santos et al., 2012) however, the use of appropriate MACS is considered as a means to obtain the desired outcomes (Hansen et al., 2003; Bedford et al., 2016). Given our focus on debt pressures, we study cost of debt effects. We expect that the effectiveness that results from choosing the most suitable MACS for interactive use lowers future cost of debt. Formally stated:

H3. *Ceteris paribus, the interactive use of traditional MACS in firms with high debt pressure is associated with lower future cost of debt.*

To be consistent with the formulation of H2, we only establish a contingent fit hypothesis for high debt pressure firms using traditional MACS. However, in line with our non-directional hypothesis H2b, as well as the possible effect of innovation on low debt pressure firms, we define in the following section several fit specifications to provide evidence on our arguments on the links between low debt pressure and interactive use of contemporary MACS.

4. Method

4.1. Research setting

We use data from the Spanish processing Food and Beverage industry. The use of this sector is useful for several reasons. First, given that there are multiple variables and relationships involved in this study, focusing on a single industry decreases noise in our measures, and offers better controls for the variables of interest (Su et al., 2015; Messner, 2016). Second, this industry has a major impact on the Spanish economy, contributing 8.7% of GDP and over 13.5% of total employment (Acosta et al., 2011). Third, food markets are characterized by high market saturation, strong competition, unpredictable demand, low margins, relative ease of substitution, competition from retailers' private labels, and low bargaining power to distributors, implying financial constraints (Taylor and Fearne, 2006; Hirsch and Gschwandtner, 2013). Fourth, Spain is one the European countries that most severely suffered from the financial crisis. In times of crisis the consumer expenditures on food are severely affected (Brinkman et al., 2010), impacting price trends. Finally, the Spanish setting is particularly relevant for our study given the importance of relationships with lenders, that is, the banking industry (Gill-de-Albornoz and Illueca, 2007; Hernández-Cánovas and Martínez-Solano, 2007; García-Teruel and Martínez-Solano, 2008).

MACS are also especially relevant in our setting. Large buyers and retailers have the power to monitor contractual restrictions in terms of price, quality or delivery (O'Connor et al., 2011), and also in payment periods, creating pressures in terms of financial resources and financing requirements. MACS encompass areas of, among others, quality, internal processes, costs, forecasts, and finances, providing data and information to successfully negotiate (Jack et al., 2012), as well as cause-and-effect relations between different financial and non-financial measures to hold in crisis periods. Small and medium sized firms are usually associated with simple processes and organizational arrangements, but they are faced with the same challenges as larger firms (Laitinen, 2001). Indeed, Jones and Luther (2005) and Weißenberger and Angelkort (2011) explain that, even in small and medium sized companies, MACS in countries under IFRS are more financially

[11] BSC is the only MACS that explicitly includes the three perspectives linked with innovation and differentiation strategy: customer, internal business processes, and innovation and learning. Busco and Quattrone (2015) show how the ambiguity of BSC performance items and the discussion around them, as well as the interrelationship between all perspectives, contribute to their use within firms, ensuring commitment and innovation.

[12] Consistent with contingency theory, "fit" is an equilibrium in the relationship between the contingency factors and the type of MACS used (Covaleski et al., 2003; King et al., 2010; Burkert et al., 2014). Fit occurs when interactive MACS choice leads to positive impact on performance relative to alternative MACS. Hence, there is no universally effective choice of interactive MACS, as each combination of contingency factor will fit with different choices.

oriented, and Di Giuli et al. (2011) show evidence of financial sophistication in small firms. While admittedly, firm size shapes the nature and sophistication of MACS due to the limited available resources, the analyzed industry is likely to have sophisticated MACS in place, because as noted above, other important drivers of MACS development are present, like the requirements of customers, retailers, distributors and lenders (Malagueño et al., 2017).

A further benefit of using middle-sized firms is that larger firms are less likely to rely on private debt and a reduced number of banks, and thus, to suffer debt pressures. Large institutional differences exist in lenders between public and private debt, with respect to their access to information, ability to monitor, and flexibility and costs in resetting contract terms (Bharath et al., 2008). Loans in private debt markets have banks as lenders, while public debt is held by dispersed arm's-length lenders (bondholders). Generally, firms are more willing to share proprietary information and to develop strong relations with a small group of lenders (Bhattacharya and Chiesa, 1995). In addition, co-operation among private lenders is easier, resolving free-rider problems (Diamond, 1984), and ensuring active monitoring. Also, private debt contracts are easier to renegotiate, which means we may be able to observe short-term consequences on future cost of debt, as hypothesized under H3. Thus, we believe that our sample constitutes the appropriate setting to test the proposed hypotheses.

4.2. Data collection

Two primary data collection methods are used: archival and survey. We collect data that capture high debt pressure, future cost of debt and control variables from SABI Bureau van Dijk. We use a survey to gather data on interactive use of MACS and other control variables (see Appendix A). Following the five stages suggested by Dillman (2000), first e-mails were sent to all firms to corroborate the correctness of data. Second, managers were asked about their willingness to participate in this research; third, a presentation letter of the study was sent to them along with the survey; fourth, the questionnaire was re-sent and last, there were a series of phone calls to request completion of the survey. Data from managers was collected in 2011.

The study population involves companies created before 2008, and that have 10 or more employees. To select a representative sample, we use a procedure of stratified sampling by size, from the SABI database where the population of the industry consists of 5814 firms, but only 2979 disclose a contact email. We sent an email with a link to the web-questionnaire to all of them. This led to a sample of 206 firms and a response rate of 6.91%.[13] The relatively low response rate may be due to the length of the survey, which meant an average estimated response time of 25 min. The response rate is however similar to the percentages reported in a number of previous studies in the area (Homburg and Stebel, 2009; Libby and Lindsay, 2010; Nell and Ambos, 2013; Pondeville et al., 2013; Heinicke et al., 2016; Abernethy et al., 2017). Following Henri (2006), we conduct a two-step test to analyze whether the respondents differed from the non-respondents. First, they are compared with non-respondents in terms of sample characteristics (size, location and sub-industry). Second, the mean score of each variable is compared considering early and late respondents. Results are displayed in Table 2 (Panel A–C). We find no significant differences across stages.

As noted in Podsakoff et al. (2003), one of the major causes of common method variance is collecting the measures of both dependent and independent variables from the same source. We use archival and survey data to avoid this problem. We also follow other proposed ways to control for these biases through the design of the study, like allowing the respondents' answers to be anonymous, using established measures, avoiding bipolar numerical scales, and facilitating verbal labels for the midpoints of scales. We statistically control for common method bias using Harman's single factor test. We run an exploratory factor analysis (untabulated) of all items in the study that results in twelve factors with eigenvalues > 1.0, and explains 70.85% of the total variance. The first factor only accounts for 22.00 per cent of the variance. Overall, these results indicate the absence of significant common method bias.

Table 2 presents also demographic data. Sample firms show a mean (median) of 71.86 (22.00) employees and 13.12 (3.09) million sales.[14] Akin to prior work (Nell and Ambos, 2013), to ensure data was collected from those knowledgeable of the organization as a whole, we aimed to obtain responses from firm's general managers. Overall, responses from the top management team, such as general managers, CEOs and CFOs account for over 80 percent of the sample.[15]

4.3. Variable measurement

Interactive use of MACS. Interactive use was measured paying special attention to three individual MACS, specifically budget systems, cost accounting and balanced scorecard. These three individual MACS cover several combinations of features of information content, and are candidates for interactive use widely used in practice (Bisbe and Malagueño, 2009; Lopez-Valeiras et al., 2016). In particular, we adapt Bisbe and Otley (2004) and Bisbe and Malagueño (2009) instrument. Of the original four items, we select the three more closely related with relationship lending, managerial permanent attention, frequency of face-to-face debates, intensive debate, and focus on strategic uncertainties. Thus, we excluded one item measuring organizational learning.[16] Managers were asked about three characteristics for each individual MACS (see Appendix A): (i) efficiency of internal operations or for enhancing creative responses to environmental changes, (ii) occasional attention or permanent attention, and (iii) the degree to which information from MACS is discussed face-to-face with team managers. Top managers were asked to rate the items on 1–5 Likert scales. The items scored zero when a specific tool was not exploited. Unidimensionality for each individual MACS was checked running a factor analysis. The results from the assessment of the measurement model are satisfactory (see Appendix B). The internal consistency of the three scales was evaluated using Cronbach's alpha, with values in the 0.908–0.969 range. Three summated scales (one per management tool) were created by adding the scores of the three retained items related to each of the control systems: iCostAcc, iBSC, and iBudgets. The theoretical range of each summated scale was 0–15.

To test H1, and following Bisbe and Otley (2004, p. 718), interactive use of MACS was created, trying "to describe the degree to which interactivity is present in an overall control situation, regardless of the specific control system in which the interactive use is embodied." Thus, the interactive use of MACS variable was defined as the degree of interactivity presented by the control system that display the maximum interactivity score in any given firm.[17]

High debt pressure. To empirically derive a taxonomy of high debt pressure firms, we use the following variables: (i) leverage (total debt (long term debt + loans) ÷ total assets) (Minnis, 2011; Rahamman and Zamman, 2013); (ii) number of banks (number of banks financing firm)

[13] The response rate is calculated over 2979 firms. The response rate increases to 12.62% if we consider the total number of responses received (376). These responses cannot be used in the study due to significant missing data or the organization not meeting the criteria.

[14] Sample firms have higher values in terms of assets, employees and profits than the average population of companies under NACE codes 10 and 11.

[15] We run untabulated analyses for all models including OTHER_TITLE as a control variable (equal to 1 if the respondent has a different job title, 0 otherwise). Our inferences do not change when we add this control variable.

[16] We include it as a control variable (labeled as 'Interactive use. Learning'). Our inferences are unchanged if we run all models using the original instrument (four items for each individual MACS) by Bisbe and Otley (2004).

[17] Interactive use of MACS = MAX (interactive use of cost accounting, interactive use of BSC, interactive use of budgets).

Table 2
Test of non-response bias and sample structure.

Panel A: Representativeness of the sample

Number of employees	Sample		Population	
	Number	%	Number	%
10–49	168	81.55	4714	81.06
50–199	25	12.14	856	14.72
200–499	8	3.88	180	3.10
+500	5	2.43	65	1.12

Panel B: Non-response analysis for financial features of the organizations

Variable	Sample	Population	*t*-test
Debt ratio (%)	64.77	61.94	t = 0.606 (p = 0.546)
Return on capital (%)	19.80	17.61	t = 0.197 (p = 0.844)

Panel C: Comparison of main variables for early and late respondents

Variable	Mean of construct values		
	Early respondents (first 30 responses received)	Late respondents (last 30 responses received)	
iCostAcc	6.23	6.66	t = −0.318 (p = 0.752)
iBSC	3.00	3.50	t = −0.378 (p = 0.707)
iBudgets	4.33	5.07	t = −0.510 (p = 0.612)
iMACS	7.10	7.07	t = 0.023 (p = 0.981)
Debt pressure	−0.10	0.15	t = −0.942 (p = 0.350)
Cost of liabilities$_t$	0.02	0.03	t = −0.761 (p = 0.450)

Panel D: Sample descriptives

	Mean	Std. Dev	Min–Max	10%	25%	Median	75%	90%
Number of employees	71.86	256.42	10–3000	10	12	22	39	100
Sales (in thousands of euros)	13,119.11	47,054.76	8.11–597,965	811	1370	3085	7755	22,127
CEO education (%)	46.17	40.98	0–100	0	2	50	100	100
Maturity	36.78	28.71	2–111	11	17	27	46	91
Customer concentration	41.16	25.96	0–100	10	20	35	60	80
Supplier concentration	50.71	25.26	0–100	20	30	50	70	85
Exports/sales (%)	16.46	23.57	0–100	0	0	5	23	50
Imports/purchases (%)	14.97	24.96	0–100	0	0	2	16	60
Geographic market segments	1.89	1.85	0–6	0	0	1	3	5
Customer market segments	2.82	1.11	1–5	1	2	3	4	4
Family firm	0.76	0.43	0–1	0	1	1	1	1
Audited firm	0.38	0.49	0–1	0	0	0	1	1

Debt ratio = total debt ÷ total assets; Return on capital = earnings before interest and tax (EBIT) ÷ capital employed; iBSC = interactive use of balanced scorecard (summated scale of three 5-point Likert scale); iCosts = interactive use of cost accounting (summated scale of three 5-point Likert scale); iBudget = interactive use of budget system (summated scale of three 5-point Likert scale); Debt pressure = factor on leverage, number of banks, and cash on assets (INV); Cost liabilities$_t$ = financial expenses$_t$ ÷ [[short-and long-term liabilities$_t$ + short- and long-term liabilities$_{t+1}$] ÷ 2]; Number of employees = number of employees per firm; Sales = total sales in thousand of Euros; CEO education = number of board member with degree education ÷ number of total board members; Maturity = years after being founded; Customer concentration =% sales of the top three customers ÷ total sales; Supplier concentration =% purchases from the top three suppliers ÷ total purchases; Exports/sales = export sales ÷ total sales; Imports/purchases = import purchases ÷ total purchases; Geographic market segments = number of destinations of export sales (i. European Union; ii. Europe (non EU); iii. USA and Canada; iv. Asia and Oceania; v. Latin America, and vi. Africa). Customer market segments = number of sales segments (i. retail; ii. wholesale; iii. direct to end users (individual consumers and families); iv. other companies; v. public administration). Family firm = dummy variable that equals 1 if the firm was classified as a family firm; 0 otherwise; Audited firm = dummy variable that equals 1 if the firm was audited; 0 otherwise.

(Petersen and Rajan, 1994; Cotugno et al., 2013; Bigus and Hillebrand, 2017); and (iii) cash on assets ratio (inverse) ((-1)*sum of cash and short term investments ÷ total assets) (Bigelli and Sánchez-Vidal, 2012). Prior work from Gilson et al. (1990) shows that firms that have greater debt and more lenders are seen by investors as different, and for example, more likely to survive restructuring processes by re-negotiating their debt, consistent with relationship lending being stronger in these firms. Also, the evidence suggests that debt pressure exerted by a single bank leads to lower quality disclosures (Bigus and Hillebrand, 2017), whilst the pressure of a reduced number of banks leads to better bank monitoring (Diamond, 1984), and willingness to share proprietary information (Bhattacharya and Chiesa, 1995).

Similar to previous studies like Han et al. (2017), we use these three variables to classify firms into groups. Factor analysis results indicate that the three indicators loaded on a single factor (% of common variance explained = 49.09%; Eigenvalue = 1.479; KMO = 0.572; Bartlett = 34.387 (0.000); Factor loadings > 0.5; Cronbach Alpha = 0.526) which supported the unidimensionality and reliability of the variable. Cronbach Alpha may appear slightly low, albeit it is acceptable and in line with cutoffs of prior research (see, e.g., Auzair and Langfield-Smith, 2005; Mahlendorf et al., 2014; Sponem and Lambert, 2016; Kruis et al., 2016). To assuage concerns about this proxy, we validate the use of high debt pressure establishing convergent validity with an alternative measure (including in the factor analysis

only leverage and the inverse of cash on assets ratio). We find that high debt pressure is significantly correlated (r = 0.920, p < 0.01) with this alternative measure.[18] Factor scores were used to classify companies in two groups: a low debt pressure subgroup comprising the bottom half (n = 103 firms), and a high debt pressure subgroup comprising the top half (n = 103).[19]

Future cost of debt. Sample firms experience debt pressure in a given period *t*. The interactive use of traditional MACS is predicted to resolve debt pressures and thus, to lead to future benefits, i.e., to lower future cost of debt. This means that when firms renew their short-term debt (which usually would happen every 6–12 months), or renegotiate their long-term debt,[20] they should obtain better terms, alleviating debt pressure. This timing implies that firms with the theoretical fit will experience a decrease in their cost of debt which may in practice happen in either $t + 1$, $t + 2$, or both, depending on the timing of debt renewals and renegotiations. Subsequently, we would not expect to see further reductions, but also, we would not predict a reversal of the benefits, so in that sense, the effect would be sustained. Regarding the firms that have low debt pressure, investment is not compromised by funding constraints, and thus, we predict that in these firms, it is beneficial to interactively use contemporary MACS, in line with much of the prior literature. This interactive use would drive operational success, leading also to beneficial effects in future negotiations with lenders, possibly in a slightly delayed timing (i.e., not concurrent, but in subsequent negotiations), as the benefits to the interactive use of contemporary MACS accrue to the firm.

We use two proxies of future cost of debt. First, we look at changes in future cost of debt, measured using the change in the cost of liabilities. Cost of liabilities is calculated as financial expenses in the year divided by the average of short- and long-term liabilities at the beginning and end of each fiscal year (Pittman and Fortin, 2004). Since our *t* year is 2010, we report the changes of cost of liabilities over three-time periods: from 2010 to 2011, from 2010 to 2012, and from 2010 to 2013 (cost of liabilities$_{t+3,t+2,t+1}$ − cost of liabilities$_t$). In addition, we also report results for levels in future cost of liabilities in 2011, 2012 and 2013. We expect to observe effects on cost of debt for fit firms in 2011 and in 2012.

Control variables. To test H1, H2a, and H2b, we model the interactive use of MACS. To test H3, we model firm future cost of debt. These are economically different phenomena, and thus, we need to account for different determinants when modeling them. We draw from prior literature in selecting our control variables for each test, which we refer to below as we explain our *Controls*. In particular, we include the following *Controls* in the models to test H1, H2a, and H2b: (i) differentiation strategy[21] (Gong and Ferreira, 2014; Janke et al., 2014). A relevant stream of literature (e.g., Langfield-Smith, 1997; Bedford et al., 2016; de Harlez and Malagueño, 2016) notes the implications of strategic orientation for managerial practices. Chenhall (2003, p. 151) states that differentiation and prospector strategies "[…] require informal, open MCS characterized by more subjective long term controls and interactive use of budgets focused on informal communications"; (ii) consumer retail sales (customer retail sales ÷ total sales) (Maglaras et al., 2015). Following Su et al. (2015), decision-making use of MACS seems to be risk orientated as management make their decisions based on their intuition without extensive analyses and subordinates participation; (iii) patents as a proxy for knowledge in the production function (number of patents) (Bloom and Van Reenen, 2002; Xia et al., 2014). Interactive use has been associated with the translation of potential opportunities into viable outputs (Bisbe and Otley, 2004; Bedford, 2015); (iv) advertising intensity to proxy for growth opportunities (advertising as percent of Sales) (Lu and Beamish, 2001; Ahmed et al., 2002). Creativity, triggered by interactive use of MACS (Bisbe and Malagueño, 2015), has long been identified as one of the most important drivers of effective advertising, increasing levels of comprehension and awareness (Baack et al., 2016); (v) exports to proxy for managerial complexity (export sales ÷ total sales) (O'Connor et al., 2011; Dutot et al., 2014). Firms need to use MACS more interactively if they are in more dynamic environments, and also if they are pursuing more externally oriented strategies involving market expansion; (vi) environmental certification ISO 14000 as a proxy for environmental attitudes (dummy variable that equals 1 if firm is certified; 0 otherwise) (Quazi et al., 2001). Firms need to become more proactive and transparent in their management of social and environmental activities. Thus, auditing processes can trigger transparency and accountability, both functions of the interactive lever (Arjaliès and Mundy, 2013); (vii) ROA achievement (perceived ROA achievement in a 5-point Likert scale) (Bisbe and Otley, 2004); (viii) sales achievement (perceived sales achievement in a 5-point Likert scale) (Bisbe and Otley, 2004; Su et al., 2015). Perceived performance, in terms of ROA or sales, has been recognized as an important driver in the adoption of MACS, also in SMEs, or in growing and young companies (Davila and Foster, 2005); (ix) number of employees to proxy for firm size (Gong and Ferreira, 2014; Janke et al., 2014). Greater levels of interactive use are likely in larger organizations, due to the growing need for increased information flows; (x) business unit as a proxy for organizational complexity (Dummy variable that equals 1 if the firm was classified as a business unit; 0 otherwise) (Gong and Ferreira, 2014). Communication and coordination channels become more important in business units to mitigate agency problems, influencing the use of MACS (Kruis et al., 2016); and (xi) family firm (dummy variable that equals 1 if the firm was classified as a family firm; 0 otherwise) (Díaz-Díaz et al., 2016). The involvement in management and decision-making of family members and trust within the top management team influences the interactive use of MACS (Senftlechner et al., 2015).

Finally, we include the following *Controls* on the model to test H3: (i) iMACS (alternatively, iCostAcc, iBSC, and iBudgets); (ii) interactive use. Learning (a summated scale was created by adding the scores of the three retained items related to learning on each individual MACS); (iii) high debt pressure (defined as before); (iv) family firm (defined as before). We include family firm ownership into the analysis because of previous evidence on family management and cost of debt (Anderson et al., 2003); (v) maturity (years after being founded) (Bisbe and Malagueño, 2015). Research offers mixed evidence (e.g. failure rates are expected to decrease monotonically with age *versus* older firms are highly inertial and become misaligned with their environment) on the relation between firm maturity and cost of debt (Henderson, 1999), so we do not make a prediction for this variable; (vi) business unit as a proxy for organizational complexity (defined as before) (Gong and Ferreira, 2014). Business units may have agency problems that could be perceived by lenders, increasing the cost of debt; (vii) ROA as a proxy for profitability (income before extraordinary items ÷ total assets) (Barth et al., 2012). ROA will be negative if more profitable firms have lower default risk and benefit from a lower cost of borrowing; (viii)

[18] We run a robustness analysis with this alternative measure of high debt pressure. We find that the results are qualitatively unchanged, albeit slightly weaker.

[19] To assuage concerns that our debt pressure proxy captures complexity, we follow the work of Arend et al. (2017) and look at the correlation between high debt pressure and a number of proxies for complexity. The correlations are as follows: geographic market segments (Corr = 0.079; p = 0.261), customer market segments (Corr = −0.017; p = 0.803), customer concentration (Corr = 0.007; p = 0.921), supplier concentration (Corr = −0.038; p = 0.590), and maturity (Corr = −0.003; p = 0.971). This strongly suggests that high debt pressure firms are not significantly different in terms of complexity from the low debt pressure firms.

[20] This may happen at any time after the lender detects a material adverse change in the firm creditworthiness, often in anticipation of contract violations, as noted in Roberts and Sufi (2009).

[21] The construct was built based on previous studies (Acquaah, 2007; Zatzick et al., 2012; Gong and Ferreira, 2014). The following six items referring to differentiation strategy were used: (i) new products launched; (ii) new processes incorporated to production process; (iii) marketing activities; (iv) new customers/markets; (v) training plans for employees; and (vi) changes in products design. The six items showed appropriate loadings and composite reliability (eigenvalue = 2.158; % of variance = 35.97; KMO = 0.707; Cronbach's α = 0.562).

Table 3
Descriptive statistics.

	Full sample (N = 206)			High debt pressure firms (N = 103)		Low debt pressure firms (N = 103)	
	Mean	S.D.	Actual range	Mean	S.D.	Mean	S.D.
iCostAcc	7.296	5.131	0–15	7.767	5.138	6.825	5.106
iBSC	3.461	5.138	0–15	4.340**	5.503	2.583**	4.607
iBudgets	6.146	5.563	0–15	6.903*	5.640	5.388*	5.406
Leverage	0.284	0.203	0–0.741	0.425***	0.156	0.143***	0.137
Number of banks	2.243	1.494	0–7	2.942***	1.406	1.544***	1.235
Cash on assets (INV)	−0.103	0.132	(0.655)–0	−0.041***	0.048	−0.166***	0.158
New products	0.782	0.414	0–1	0.786	0.412	0.777	0.418
New processes	0.718	0.451	0–1	0.738	0.442	0.699	0.461
Marketing activities	0.743	0.438	0–1	0.699	0.461	0.786	0.412
New customers/markets	3.170	0.970	1–5	3.175	0.954	3.165	0.991
Training plans for employees	0.612	0.489	0–1	0.631	0.485	0.592	0.494
Changes in products design	0.670	0.471	0–1	0.670	0.473	0.670	0.473
Consumer retail sales	11.578	23.208	0–100	8.738*	20.546	14.417*	25.379
Patents	3.364	20.869	0–200	0.777*	1.771	5.951*	29.302
Advertising intensity	14.21	27.441	0–100	10.301**	20.371	18.117**	32.674
Exports	16.461	23.575	0–100	20.495**	24.612	12.427**	21.872
Environmental certification ISO 14000	0.126	0.333	0–1	0.126	0.334	0.126	0.334
ROA achievement	3.218	0.961	1–5	3.214	0.956	3.223	0.969
Sales achievement	3.505	0.909	1–5	3.650**	0.882	3.359**	0.917
Number of employees	71.864	256.424	10–3000	67.301	152.795	76.427	329.792
Business unit	0.170	0.376	0–1	0.184	0.390	0.155	0.364
Interactive use. Learning	5.408	4.225	0–15	5.932*	4.583	4.883*	3.784
Family firm	0.762	0.427	0–1	0.748	0.437	0.777	0.418
Maturity	36.782	28.713	2–111	36.709	30.854	36.854	26.551
ROA	0.020	0.053	(0.196)–0.220	0.012**	0.046	0.028**	0.058
Negative ROA	0.215	0.406	0–1	0.220	0.410	0.210	0.403
Current liabilities (thousand €)	4,455.200	18,972.986	8.166–259,131.143	6,314.912	26,027.745	2,595.488	6,248.937
Current ratio	2.183	2.888	0.187–30.927	1.648***	0.999	2.718***	3.897
Sales (thousand €)	13,119.107	47,054.761	8.110–597,965.000	16,435.194	60,752.517	9,803.020	27,146.483
Equity (thousand €)	4,825.868	17,776.896	(1,773.806)–213,494.891	5,886.980	23,690.685	3,764.756	8,462.372
R&D collaboration	2.024	1.070	1–5	2.068	1.069	1.981	1.075
Internationalization	2.451	1.240	1–5	2.602*	1.174	2.301*	1.290
Quality certification ISO 9000	0.417	0.494	0–1	0.466	0.501	0.369	0.485
Supplier concentration	50.709	25.264	0–100	49.575	24.891	51.660	25.718
Develop. and launch. new products	2.461	1.789	0–5	2.544	1.775	2.379	1.805
Develop. launch. improv existing products	2.522	1.755	0–5	2.501	1.702	2.532	1.767
Develop. and implementing new processes	2.777	1.845	0–5	2.913	1.821	2.641	1.867
Cost of liabilities	0.026	0.024	0–0.161	0.032***	0.021	0.021***	0.025

*, **, *** Means are significantly different at 10%, 5% and 1% levels, respectively.

negative ROA (Dummy variable that equals 1 if ROA is negative; 0 otherwise) (Barth et al., 2008). The coefficient on negative ROA is expected to be positive if it increases the expected costs; (ix) current liabilities (short-term liabilities) (García-Teruel and Martínez-Solano, 2007). We include current liabilities because research suggests that they increase default risk and, in turn, cost of liabilities; (x) number of employees to proxy for firm size (Gong and Ferreira, 2014; Janke et al., 2014). Number of employees is expected to be inversely related to the cost of liabilities, because large firms are expected to have lower default risk; (xi) current ratio (current assets ÷ current liabilities) (Minnis, 2011). We use this as a proxy for short-term financial distress. Senior debt issues take priority in liquidation, reduce bondholder risk, and generally result in a lower cost of liabilities; therefore, we expect the coefficient on current ratio to be negative; (xii) sales (log) (Xia et al., 2014). Larger firms are expected to have easier access to external finance and on better terms; (xiii) equity (book value of equity) (Barth et al., 1998). We include equity as a control for credit risk; (xiv) R&D collaboration (5-point Likert scale about firm collaboration with other companies on R&D) (Zeng et al., 2010). Previous work has documented a negative relation between R&D and default risk (Eberhart et al., 2008); (xv) internationalization as a proxy for managerial complexity (5-point Likert scale about degree of internationalization comparing with competitors) (Pangarkar, 2008). Internationalization was largely related to the cost of debt (Mansi and Reeb, 2002); (xvi) quality certification ISO 9000 as a proxy for the existence of quality management practices (dummy variable that equals 1 if firm is certified; 0 otherwise) (Lenox and King, 2004). Lenders are likely to rely more on companies with standardized protocols and processes; (xvii) supplier concentration (% purchases from the top three suppliers ÷ total purchases) (Steven et al., 2014); and (xviii) consumer retail sales (customer retail sales ÷ total sales). Supplier concentration and consumer retail sales (as proxies of competition) were included since cost of debt is expected to be higher for firms that operate in competitive product markets (Valta, 2012).

Table 3 displays the descriptive statistics for all variables for the full sample, and by subsamples based on debt pressure.

4.4. Empirical models

To test H1, H2a, H2b, and H3, we propose three main models. Using debt pressure as a predictor variable, model (1) allows for testing H1. The formulation of the postulated model (1) used to test H1 is the following:

$$iMACS = \beta_0 + \beta_1\ high\ debt\ pressure + \gamma\ \Sigma\ controls + \varepsilon, \quad (1)$$

Second, to test H2a, and similarly to model (1), we use the following formulation:

$$iCostAcc = \beta_0 + \beta_1\ high\ debt\ pressure + \gamma\ \Sigma\ controls + \varepsilon, \quad (2a)$$

$$iBudgets = \beta_0 + \beta_1\ high\ debt\ pressure + \gamma\ \Sigma\ controls + \varepsilon, \quad (2b)$$

Third, to test H2b, we formulated the following model:

Table 4
Correlation matrix.

	1	2	3	4	5	6	7	8	9
1. iCostAcc	1.000								
2. iBSC	0.567***	1.000							
3. iBudgets	0.694***	0.562***	1.000						
4. High debt pressure	0.092	0.171**	0.136*	1.000					
5. Differentiation strategy	0.336***	0.234***	0.270***	0.006	1.000				
6. Consumer retail sales	0.031	0.049	0.040	−0.123*	−0.009	1.000			
7. Patents	0.083	0.188***	0.091	−0.124*	0.079	0.001	1.000		
8. Advertising intensity	0.069	0.057	0.071	−0.143**	0.030	0.014	0.042	1.000	
9. Exports	−0.041	0.075	0.053	0.172**	0.183***	−0.221***	0.093	0.045	1.00
10. Environ. certification ISO 14000	0.032	0.091	0.111	0.000	0.102	−0.061	−0.025	−0.038	0.241***
11. ROA achievement	0.081	0.025	0.086	-0.005	0.309***	−0.019	0.118	0.041	0.144**
12. Sales achievement	0.023	0.017	0.038	0.161**	0.228***	−0.088	0.038	-0.018	0.074
13. Number of employees	0.041	0.137**	0.068	−0.018	0.176**	−0.066	0.024	0.019	0.130*
14. Business unit	0.067	0.153**	0.077	0.039	0.177**	−0.102	0.149**	0.093	0.162**
15. Family firm	0.097	0.037	−0.008	−0.034	0.238***	−0.02	0.009	0.014	−0.048
16. Interactive use. Learning	0.786***	0.726***	0.809***	0.124*	0.369***	0.023	0.091	0.073	0.076
17. Maturity	−0.055	−0.051	−0.016	-0.003	0.085	−0.064	0.047	−0.126*	−0.003
18. ROA	0.056	0.000	0.073	−0.158**	0.062	-0.005	−0.098	0.047	−0.027
19. Negative ROA	0.022	0.023	0.002	0.012	−0.154**	0.075	0.192***	−0.003	−0.045
20. Current liabilities	0.126*	0.183***	0.153**	0.098	0.110	−0.069	−0.016	−0.036	0.160**
21. Current ratio	−0.041	0.018	0.085	−0.186***	−0.027	0.001	0.006	0.148**	−0.083
22. Sales	0.155**	0.204***	0.194**	0.071	0.150**	−0.071	−0.02	−0.042	0.158**
23. Equity	0.104	0.112	0.137**	0.060	0.130*	−0.071	−0.012	−0.045	0.155**
24. R&D collaboration	0.215***	0.145**	0.281***	0.041	0.306***	−0.143**	0.044	0.053	0.119*
25. Internationalization	0.026	0.097	0.140**	0.122*	0.269***	−0.164**	0.179***	0.111	0.699***
26. Quality certification ISO 9000	0.120*	0.106	0.210***	0.098	0.143**	−0.205***	0.151*	0.000	0.183***
27. Supplier concentration	−0.003	0.035	-0.065	−0.038	−0.077	-0.011	0.065	0.184***	0.001
28. Innovation	0.067	0.031	−0.011	−0.425***	0.420***	0.047	0.083	0.088	0.013
29. Cost of liabilities	0.175**	0.112	0.149**	0.228***	0.159**	−0.085	−0.105	−0.115*	0.190***

	10	11	12	13	14	15	16	17	18	19
10. Environ. certification ISO 14000	1.000									
11. ROA achievement	0.142**	1.000								
12. Sales achievement	0.079	0.582***	1.000							
13. Number of employees	0.290***	0.103	0.139**	1.000						
14. Business unit	0.139**	0.180***	0.104	0.269***	1.000					
15. Family firm	-0.028	0.092	0.06	0.111	0.101	1.000				
16. Interactive use. Learning	0.098	0.067	-0.002	0.094	0.134*	0.008	1.000			
17. Maturity	−0.009	−0.028	0.000	0.103	0.028	0.096	−0.079	1.000		
18. ROA	0.100	0.302***	0.154**	−0.061	0.070	0.031	0.065	−0.119*	1.000	
19. Negative equity	−0.130*	−0.189***	−0.192***	0.032	−0.081	-0.076	-0.007	-0.026	−0.587***	1.000
20. Current liabilities	0.065	0.107	0.150**	0.341***	0.242***	0.088	0.189***	0.212***	0.031	−0.083
21. Current ratio	−0.065	−0.128*	−0.151**	−0.041	−0.045	−0.093	0.000	0.083	-0.061	0.147**
22. Sales	0.157**	0.174**	0.205***	0.377***	0.251***	0.107	0.204**	0.216***	0.084	−0.111
23. Equity	0.058	0.134*	0.147**	0.335***	0.288***	0.101	0.136*	0.271***	0.079	−0.086
24. R&D collaboration	0.238***	0.099	0.098	0.207***	0.196***	0.119*	0.247***	0.081	0.118*	−0.104
25. Internationalization	0.228***	0.183***	0.173**	0.142**	0.316***	0.010	0.098	−0.009	0.025	−0.147**
26. Quality certification ISO 9000	0.301***	0.033	0.137*	0.138**	0.089	−0.036	0.196***	0.107	0.033	−0.099
27. Supplier concentration	0.028	0.052	0.008	0.079	0.130*	−0.054	−0.03	−0.063	-0.03	0.045
28. Innovation	−0.053	0.031	−0.089	0.002	−0.025	0.062	0.066	−0.007	0.061	−0.027
29. Cost of liabilities	0.017	−0.005	0.049	−0.014	−0.040	−0.009	0.147**	0.011	−0.03	−0.098

	20	21	22	23	24	25	26	27	28	29
20. Current liabilities	1.000									
21. Current ratio	−0.060	1.000								
22. Sales	0.555***	-0.049	1.000							
23. Equity	0.584***	0.023	0.691***	1.000						
24. R&D collaboration	0.065	−0.020	0.135*	0.096	1.000					
25. Internationalization	0.137**	−0.062	0.162**	0.179**	0.190***	1.000				
26. Quality certification ISO 9000	0.138**	−0.049	0.172**	0.175**	0.220***	0.280***	1.000			
27. Supplier concentration	−0.083	0.048	−0.115	−0.166**	−0.077	0.047	-0.041	1.000		
28. Innovation	−0.025	0.150**	0.022	0.008	0.165**	0.032	-0.016	-0.088	1.000	
29. Cost of liabilities	0.079	−0.110	0.083	0.073	0.074	0.187***	0.208***	−0.024	−0.017	1.000

*, **, *** Significant levels at 10%, 5% and 1% respectively.

$$iBSC = \beta_0 + \beta_1\ high\ debt\ pressure + \gamma\ \Sigma\ controls + \varepsilon, \quad (2c)$$

H2b is a non-directional hypothesis, as we noted that innovation may play an important role in the interactive use of MACS and that it is plausible that only low debt pressure firms that adopt an innovation-oriented strategy may choose and benefit from the interactive use of contemporary MACS. Building on Bisbe and Malagueño (2009), we test for the role of innovation by modifying models (2a)–(2c) above, and

Table 5
Multiple regression of debt pressure on the interactive use of MACS, budgets, cost accounting, and balanced scorecard.

Panel A: Multiple regression of debt pressure on the interactive use of MACS, budgets, cost accounting, and balanced scorecard. Hypotheses 1, 2a, and 2b.

	iMACS Coefficient (*t*-stat)	*iBudgets* Coefficient (*t*-stat)	*iCostAcc* Coefficient (*t*-stat)	*iBSC* Coefficient (*t*-stat)
High debt pressure	0.166***	0.185***	0.154**	0.228***
	(2.342)	(2.577)	(2.187)	(3.235)
Differentiation strategy	0.335***	0.282***	0.359***	0.223***
	(4.566)	(3.787)	(4.908)	(3.058)
Consumer retail sales	0.016	0.051	0.014	0.080
	(0.235)	(0.730)	(0.209)	(1.169)
Patents	0.112	0.096	0.085	0.198***
	(1.642)	(1.378)	(1.250)	(2.906)
Advertising intensity	0.070	0.088	0.082	0.071
	(1.140)	(1.285)	(1.214)	(1.056)
Exports	−0.162**	−0.06	−0.148**	−0.035
	(−2.210)	(−0.807)	(−2.024)	(−0.485)
Environ. certification ISO 14000	0.094	0.101	0.024	0.068
	(1.310)	(1.392)	(0.283)	(0.956)
ROA achievement	0.058	0.025	0.024	−0.059
	(0.645)	(0.283)	(0.283)	(−0.692)
Sales achievement	−0.122	−0.069	−0.090	−0.056
	(−1.446)	(−0.807)	(−1.075)	(−0.665)
Number of employees	−0.023	0.013	−0.007	0.083
	(−0.319)	(0.180)	(−0.101)	(1.145)
Business unit	−0.023	0.004	0.003	0.069
	(−0.320)	(0.059)	(0.038)	(0.974)
Family firm	−0.003	−0.070	0.013	−0.017
	(−0.043)	(−0.994)	(0.190)	(−0.243)
Observations	206	206	206	206
R^2	0.152	0.128	0.156	0.159
R^2 adjusted	0.099	0.073	0.104	0.107
F-stat	2.872***	2.355***	2.982***	3.044***
Max. VIF	1.688	1.688	1.688	1.688
VIF mean	1.225	1.225	1.225	1.225

Panel B: Multiple regression of debt pressure and innovation on the interactive use of MACS, budgets, cost accounting, and balanced scorecard. Hypothesis 2b.

	iMACS Coefficient (*t*-stat)	*iBudgets* Coefficient (*t*-stat)	*iCostAcc* Coefficient (*t*-stat)	*iBSC* Coefficient (*t*-stat)
High debt pressure	0.152**	0.145**	0.152**	0.184**
	(1.779)	(1.679)	(1.781)	(2.168)
Innovation	−0.049	−0.101	−0.033	−0.047
	(−0.519)	(1.054)	(−0.352)	(−0.504)
High debt pressure* Innovation	−0.036	−0.014	−0.060	0.129*
	(−0.466)	(−0.177)	(−0.766)	(1.687)
Differentiation strategy	0.365***	0.333***	0.386***	0.223**
	(4.317)	(3.890)	(4.579)	(2.664)
Number of employees	−0.024	0.010	−0.008	0.080
	(−0.335)	(0.134)	(−0.106)	(1.101)
Business unit	−0.030	−0.003	−0.005	0.079
	(−0.409)	(−0.044)	(−0.074)	(1.104)
Other controls	Included	Included	Included	Included
Observations	206	206	206	206
R^2	0.155	0.135	0.161	0.171
R^2 adjusted	0.093	0.072	0.100	0.110
F-stat	2.507***	2.128***	2.627***	2.806***
Max. VIF	2.012	2.012	2.012	2.012
VIF mean	1.364	1.364	1.364	1.364

Panel C: Multiple regression of debt pressure on the interactive use of balanced scorecard by subsamples.

	iBSC in Low innovation firms Coefficient (*t*-stat)	*iBSC in High innovation firms* Coefficient (*t*-stat)
High debt pressure	0.148	0.453***
	(1.667)	(3.601)
Differentiation strategy	0.269***	−0.001
	(2.961)	(−0.004)
Number of employees	0.007	0.405**
	(0.086)	(2.478)
Business unit	0.162*	−0.399**
	(1.959)	(−2.502)

(*continued on next page*)

Table 5 (*continued*)

Panel C: Multiple regression of debt pressure on the interactive use of balanced scorecard by subsamples.		
	iBSC in Low innovation firms Coefficient (*t*-stat)	*iBSC in High innovation firms* Coefficient (*t*-stat)
Other controls	Included	Included
Observations	154	52
R^2	0.156	0.505
R^2 adjusted	0.084	0.353
F-stat	2.176**	3.320***
Max. VIF	1.676	2.560
VIF mean	1.243	1.642

*, **, *** Significant levels at 10%, 5% and 1% respectively (one-tailed when coefficient sign is predicted, two-tailed otherwise). Standardized coefficients are presented.

including the variable innovation,[22] as well as the interaction between high debt pressure and innovation.

We use, for parsimony, the following general formulation:

$$iMACS\ (iCostAcc, iBudgets, iBSC) = \beta_0 + \beta_1\ high\ debt\ pressure + \beta_2\ innovation + \beta_3\ high\ debt\ pressure * innovation + \gamma\ \Sigma\ controls + \varepsilon, \quad (3)$$

Finally, to test H3, and following Bisbe and Malagueño (2009) or Jermias and Gani (2004) firms are classified as "fit" if the MACS with the highest interactive use score coincided with the theoretically derived fit hypothesized. The formulation of the postulated fit model (4) used to test H3 is the following:[23]

$$Future\ cost\ of\ liabilities = \beta_0 + \beta_1\ FIT_i + \beta_2\ iMACS + \beta_3\ high\ debt\ pressure + \gamma\ \Sigma\ controls + \varepsilon, \quad (4)$$

Given the non-directional hypothesis on the interactive use of contemporary MACS, and our discussion on the role of innovation, we define three specifications for FIT: (i) FIT_1: captures H3 as expressed; we classified as "fit" cases high debt pressure firms where iBudget or iCostAcc > iBSC, and low debt pressure firms where iBSC > iBudget and iCostAcc (n = 89); otherwise, firms were "non-fit" cases (n = 117); (ii) FIT_2: this is the weak form interpretation of H3, where "fit" cases were high debt pressure firms where iBudget or iCostAcc > iBSC (n = 76)[24]; otherwise, firms were "non-fit" (n = 130); and finally (iii) FIT_3: where we considered the role of innovation and defined as "fit" cases high debt pressure firms where iBudget or iCostAcc > iBSC, and low debt pressure and high innovation firms where iBSC > iBudget and iCostAcc (n = 85); otherwise, firms were classified as cases of "non-fit" (n = 121).[25]

5. Results

Table 4 presents the correlation matrix. All correlations within the same model are below r = 0.6 except for the association between iCostAcc and iBSC, and also the correlation between learning and the interactive use of each individual MACS. This is consistent with correlations reported in prior analyses (Bisbe and Otley, 2004). It is also important to note that high debt pressure is negatively correlated with innovation (r = −0.425; p-val < 0.01), evidencing that managers trade-off these pressures in their decision of the individual MACS to use interactively.

Table 5 Panel A presents the regression results of testing H1 and H2a. Results indicate that multicollinearity is not a problem as the maximum VIF is 1.688, which is well below the general threshold of 10 (Hair et al., 2006). H1 predicts that managers of high debt pressure organizations are more likely to use MACS interactively. Hence, we expect a significant and positive coefficient for high debt pressure. Table 5 shows that the coefficient on iMACS is positive and significant (β_1 = 0.166; p-val < 0.01), providing support for H1. H2a predicts that high debt pressure drives the interactive use of traditional MACS. Results support the postulate, since the coefficients of high debt pressure on iBudgets, and iCostAcc are positive and significant (β_1 = 0.185; p-val < 0.01; β_1 = 0.154; p-val < 0.05).

Table 5 Panel A also shows the regression results of testing H2b (Model 2c). Contrary to our expectations that traditional MACS are a better fit for high debt pressure firms, we also find a positive and significant coefficient of high debt pressure on iBSC (β_1 = 0.228; p-val < 0.01). However, Panel B shows that this effect is driven exclusively by the high innovation firms. The coefficient on innovation is not significant in any specification, and the interaction between high debt pressure and innovation is only significant for the iBSC specification (β_1 = 0.129; p-val < 0.10). To better understand these results, we split our sample between low and high innovation firms in Panel C. As can be seen, we fail to find evidence of interactive use of contemporary MACS in firms with high debt pressure and low innovation drive (β_1 = 0.148; p-val > 0.10). This is an important result that relies that high debt pressure does not drive, when considered in isolation, the interactive use of contemporary MACS. Indeed, the effect is concentrated in the firms that are classified as high innovation (β_1 = 0.453; p-val < 0.01). This suggests that these firms are already using contemporary MACS interactively because of their innovation concerns and not because of debt pressure. This result also suggests that firms juggle many uncertainties and risks, and their interactive use of MACS may be optimal, despite the lack of fit with regards to high or low debt pressure, if they face other environmental uncertainties.

To test H3, we run model (4) for future changes in cost of liabilities. H3 posits that the future cost of liabilities is lower in fit companies. Hence, we expect a significant and negative coefficient for the variable FIT. Results reported in Table 6 show that the maximum VIF across models is 6.188, which indicates that multicollinearity is not a problem. To keep the tables manageable, we only tabulate t + 1 and t + 2 regression models. The coefficients of the variable FIT for t + 3 are non-significant across all specifications, indicating that there is no reversal of the effects in this horizon, as expected. Panel A shows that the

[22] Innovation is measured using the following three items (Bisbe and Otley, 2004; Bedford, 2015): (i) development and launching of new products (5-point Likert scale); (ii) development and launching of improved existing products (5-point Likert scale); and (iii) development and implementing new processes (5-point Likert scale). Factor analysis results indicated that the three items loaded on a single factor (percentage of common variance explained 58.99%; loading factors are in the 0.739-0.822 range; Cronbach alpha = 0.696). Factor scores were used to classify firms in both groups. Descriptive statistics are displayed in Table 3, and correlations in Table 4.

[23] We run two models for each time period (t + 1, t + 2, and t + 3): (i) controlling by iMACS, and (ii) controlling by iCostAcc, iBSC, and iBudgets. Results show multicollinearity problems if we include iMACS together with iCostAcc, iBSC, and iBudgets.

[24] Under this specification, FIT is only estimated for the high debt pressure subsample, similar to the work of Sandino (2007). We thank an anonymous reviewer for making this point.

[25] To isolate the effect of FIT_3 on future cost of liabilities, we also run these models including innovation as a control variable. These untabulated results also provide evidence for our main inferences.

Table 6
Multiple regression of debt pressure and fit on future cost of liabilities (t = 2010).

Panel A: Future changes in cost of liabilities. Hypothesis 3.

	ΔCost of liabilities$_{t+1}$						*ΔCost of liabilities$_{t+2}$*					
	Coefficient (t-stat)						Coefficient (t-stat)					
FIT_1	−0.238**	−0.239**					−0.180**	−0.213**				
	(−1.996)	(−1.895)					(−1.637)	(−1.827)				
FIT_2			−0.352***	−0.366***					−0.079	−0.097		
			(−2.639)	(−2.684)					(−0.634)	(−0.757)		
FIT_3					−0.267**	−0.268**					−0.192**	0.213**
					(−2.155)	(−2.092)					(−1.679)	(−1.810)
iMACS	0.006		0.068		0.000		0.096		0.065		0.096	
	(0.048)		(0.508)		(0.009)		(0.791)		(0.511)		(0.794)	
iCostAcc		0.021		0.058		0.023		0.110		0.070		0.105
		(0.164)		(0.456)		(0.180)		(0.908)		(0.572)		(0.867)
iBSC		−0.026		−0.090		−0.046		0.025		−0.016		0.004
		−(0.241)		(−0.865)		(−0.439)		(0.242)		(−0.162)		(0.040)
iBudgets		0.000		0.021		−0.009		0.080		0.049		0.067
		(0.001)		(0.162)		(−0.067)		(0.647)		(0.398)		(0.554)
High debt pressure	0.223**	0.227**	0.332***	0.351***	0.245**	0.251**	0.166*	0.179*	0.111	0.122	0.176*	0.185*
	(2.080)	(2.082)	(2.667)	(2.778)	(2.219)	(2.243)	(1.678)	(1.783)	(0.952)	(1.032)	(1.725)	(1.791)
Interactive use. Learn.	0.151	0.158	0.110	0.170	0.166	0.195	−0.014	−0.093	−0.040	−0.066	−0.005	−0.059
	(1.172)	(0.929)	(0.864)	(1.010)	(1.276)	(1.149)	(−0.115)	(−0.579)	(−0.328)	(−0.407)	(−0.041)	(−0.391)
Family firm	0.006	0.006	0.004	0.010	0.001	0.002	0.118*	0.122*	0.108	0.110	0.114	0.116
	(0.083)	(0.084)	(0.060)	(0.134)	(0.014)	(0.023)	(1.688)	(1.726)	(1.533)	(1.541)	(1.636)	(1.647)
Maturity	0.172**	0.172**	0.172**	0.172***	0.174**	0.174**	−0.006	−0.007	−0.011	−0.013	−0.005	−0.007
	(2.252)	(2.236)	(2.273)	(2.258)	(2.280)	(2.269)	(−0.079)	(−0.099)	(−0.156)	(−0.186)	(−0.065)	(−0.092)
Business unit	0.168**	0.169**	0.177**	0.178**	0.166**	0.167**	−0.015	0.019	0.015	0.019	0.014	0.017
	(2.014)	(2.011)	(2.142)	(2.138)	(2.000)	(1.991)	(-0.193)	(0.248)	(0.202)	(0.245)	(0.182)	(0.226)
ROA	−0.074	−0.073	−0.070	−0.066	−0.066	−0.064	−0.076	−0.077	−0.077	−0.083	−0.075	−0.079
	(−0.784)	(−0.770)	(−0.754)	(−0.487)	(−0.706)	(−0.674)	(−1.576)	(−0.998)	(−1.009)	(−1.056)	(−0.994)	(−1.016)
Negative ROA	0.082	0.081	0.084	0.088	0.090	0.090	0.089	0.087	0.087	0.084	0.095	0.092
	(0.942)	(0.932)	(0.979)	(1.018)	(1.032)	(1.036)	(1.261)	(1.215)	(1.220)	(1.160)	(1.338)	(1.290)
Current liabilities	0.239	0.244	0.232	0.243	0.234	0.241	0.230	0.231	0.232	0.237	0.225	0.228
	(1.545)	(1.564)	(1.510)	(1.569)	(1.513)	(1.546)	(1.582)	(1.577)	(1.585)	(1.602)	(1.547)	(1.555)
Number of employees	−0.110	−0.111	−0.098	−0.099	−0.113	−0.115	−0.012	−0.007	−0.012	−0.009	−0.014	−0.011
	(−1.106)	(−1.103)	(−0.986)	(−1.000)	(−1.138)	(−1.144)	(−0.134)	(−0.084)	(−0.139)	(−0.101)	(−0.161)	(−0.122)
Current ratio	−0.041	−0.038	−0.065	−0.057	−0.039	−0.034	0.528***	0.532***	0.512***	0.516***	0.530***	0.534***
	(−0.548)	(−0.498)	(−0.868)	(−0.748)	(−0.511)	(−0.439)	(7.515)	(7.339)	(7.322)	(7.122)	(7.528)	(7.346)
Sales	0.014	0.017	0.004	0.015	0.028	0.033	−0.003	−0.008	−0.004	−0.005	0.007	0.006
	(0.124)	(0.144)	(0.039)	(0.127)	(0.244)	(0.285)	(−0.025)	(−0.076)	(−0.040)	(−0.048)	(0.068)	(0.052)
Equity	−0.265	−0.270	−0.256	−0.268	−0.260	−0.268	−0.253*	−0.258*	−0.253	−0.259*	−0.249	−0.255*
	(−1.572)	(−1.588)	(−1.531)	(−1.589)	(−1.548)	(−1.576)	(−1.657)	(−1.673)	(−1.640)	(−1.665)	(−1.629)	(−1.655)
R&D collaboration	−0.163**	−0.165**	−0.165**	−0.170**	−0.161**	−0.162**	−0.010	−0.018	0.003	−0.002	−0.006	−0.012
	(−2.030)	(−2.023)	(−2.084)	(2.119)	(−2.010)	(−2.007)	(−0.138)	(−0.243)	(0.034)	(−0.031)	(−0.087)	(−0.164)
Internationalization	−0.072	−0.071	−0.070	−0.073	−0.077	−0.076	0.031	0.027	0.038	0.036	0.027	0.024
	(−0.846)	(−0.836)	(−0.768)	(-0.869)	(-0.905)	(-0.892)	(0.398)	(0.344)	(0.491)	(0.584)	(0.355)	(0.305)
Quality cer. ISO 9000	0.051	0.050	0.046	0.043	0.044	0.042	−0.021	−0.013	−0.033	−0.031	−0.028	−0.023
	(0.645)	(0.628)	(0.585)	(0.544)	(0.558)	(0.528)	(−0.291)	(0.173)	(−0.453)	(−0.413)	(−0.380)	(−0.305)
Supplier concent.	0.045	0.046	0.040	0.044	0.053	0.055	−0.051	−0.056	−0.056	−0.058	−0.046	−0.049
	(0.594)	(0.595)	(0.531)	(0.570)	(0.691)	(0.706)	(−0.727)	(−0.790)	(−0.783)	(−0.811)	(−0.648)	(−0.694)
Consumer retail sales	0.038	0.038	0.057	0.062	0.048	0.050	−0.111	−0.120*	−0.115	−0.118	−0.105	−0.111
	(0.488)	(0.484)	(0.737)	(0.781)	(0.611)	(0.629)	(−1.576)	(−1.677)	(−1.599)	(−1.628)	(−1.480)	(−1.555)
Obs.	206	206	206	206	206	206	206	206	206	206	206	206
R^2	0.156	0.157	0.170	0.174	0.159	0.161	0.285	0.288	0.275	0.277	0.285	0.288
R^2 adjusted	0.063	0.053	0.079	0.072	0.067	0.057	0.205	0.200	0.195	0.187	0.206	0.200
F-stat	1.677**	1.505*	1.859**	1.704**	1.717**	1.548*	3.583***	3.259***	3.418***	3.078***	3.593***	3.255***
Max. VIF	5.792	5.866	5.796	5.832	5.794	5.842	5.582	6.188	5.672	6.111	5.586	6.102
VIF mean	2.222	2.429	2.289	2.466	2.226	2.412	2.177	2.424	2.250	2.461	2.176	2.400

Panel B: Future cost of liabilities. Hypothesis 3.

	Cost of liabilities$_{t+1}$						*Cost of liabilities$_{t+2}$*					
	Coefficient (t-stat)						Coefficient (t-stat)					
FIT_1	−0.197***	−0.208***					−0.146*	−0.187**				
	(−2.400)	(−2.339)					(−1.344)	(−1.656)				
FIT_2			−0.239***	−0.252***					−0.001	−0.021		
			(−2.587)	(−2.676)					(−0.001)	(−0.171)		
FIT_3					−0.215***	−0.222***					−0.148*	−0.176**
					(−2.518)	(−2.524)					(−1.318)	(−1.619)
iMACS	0.049		0.077		0.050		0.111		0.058		0.109	
	(0.552)		(0.838)		(0.558)		(0.938)		(0.466)		(0.921)	

(*continued on next page*)

Table 6 (*continued*)

Panel B: Future cost of liabilities. Hypothesis 3.

	Cost of liabilities$_{t+1}$						*Cost of liabilities*$_{t+2}$					
	Coefficient (*t*-stat)						Coefficient (*t*-stat)					
iCostAcc		0.069		0.078		0.067		0.128		0.070		0.120
		(0.781)		(0.892)		(0.770)		(1.079)		(0.585)		(1.014)
iBSC		−0.014		−0.065		−0.032		0.030		−0.001		0.011
		(−0.191)		(−0.896)		(−0.446)		(0.301)		(−0.013)		(0.112)
iBudgets		0.015		0.019		0.005		0.098		0.058		0.085
		(0.160)		(0.205)		(0.056)		(0.819)		(0.479)		(0.721)
High debt pressure	0.216***	0.224***	0.265***	0.282***	0.230***	0.239***	0.142	0.161	0.047	0.060	0.146	0.158
	(2.903)	(2.959)	(3.094)	(3.223)	(3.004)	(3.070)	(1.426)	(1.581)	(0.407)	(0.507)	(1.419)	(1.519)
Interactive use. Learn.	0.120	0.108	0.086	0.122	0.131	0.140	−0.032	−0.128	−0.051	−0.100	−0.026	−0.098
	(1.356)	(0.926)	(0.985)	(1.048)	(1.468)	(1.200)	(−0.276)	(−0.819)	(−0.439)	(−0.636)	(−0.223)	(−0.631)
Cost of liabilities$_{t-1}$	0.632***	0.629***	0.646***	0.644***	0.633***	0.631***	0.280***	0.273***	0.297***	0.294***	0.281***	0.275***
	(11.840)	(11.689)	(12.134)	(12.048)	(11.887)	(11.753)	(3.824)	(3.689)	(4.068)	(3.998)	(3.830)	(3.724)
Other controls	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Obs.	206	206	206	206	206	206	206	206	206	206	206	206
R^2	0.604	0.605	0.606	0.608	0.605	0.606	0.330	0.335	0.323	0.324	0.329	0.333
R^2 adjusted	0.557	0.553	0.560	0.557	0.559	0.555	0.251	0.248	0.243	0.236	0.250	0.246
F-stat	13.029***	11.757***	13.143***	11.919***	13.100***	11.831***	4.180***	3.841***	4.046***	3.665***	4.175***	3.818***
Max. VIF	5.792	5.867	5.796	5.841	5.794	5.842	5.806	6.188	5.813	6.136	5.805	6.104
VIF mean	2.184	2.388	2.245	2.418	2.187	2.370	2.182	2.423	2.242	2.446	2.179	2.395

*, **, *** Significant levels at 10%, 5% and 1% respectively (one-tailed when coefficient sign is predicted, two-tailed otherwise). Standardized coefficients are presented.

coefficient of the variable FIT_1 is negative and significant in $t + 1$ ($\beta_1 = -0.238$; p-val < 0.05), and in $t + 2$ ($\beta_1 = -0.180$; p-val < 0.05). FIT_2 and FIT_3 in $t + 1$ are also negative and significant ($\beta_1 = -0.352$; p-val < 0.01; and $\beta_1 = -0.267$; p-val < 0.05, respectively). In $t + 2$, FIT_3 is also negative and significant ($\beta_1 = -0.192$; p-val < 0.05). The results obtained for the levels specifications are reported in Table 6 Panel B and confirm these findings. For parsimony, we only report the key variables of interest in this Panel.[26] The coefficient of the variable FIT_1 is negative and significant in $t + 1$ ($\beta_1 = -0.197$; p-val < 0.01), and $t + 2$ ($\beta_1 = -0.146$; p-val < 0.10). FIT_2 and FIT_3 are also negative and significant in $t + 1$ ($\beta_1 = -0.239$; p-val < 0.01; and $\beta_1 = -0.215$; p-val < 0.01, respectively). As before, FIT_1 and FIT_3 present negative and significant effects in $t + 2$, while FIT_2 is negative but not significant ($\beta_1 = -0.001$; p-val > 0.10).

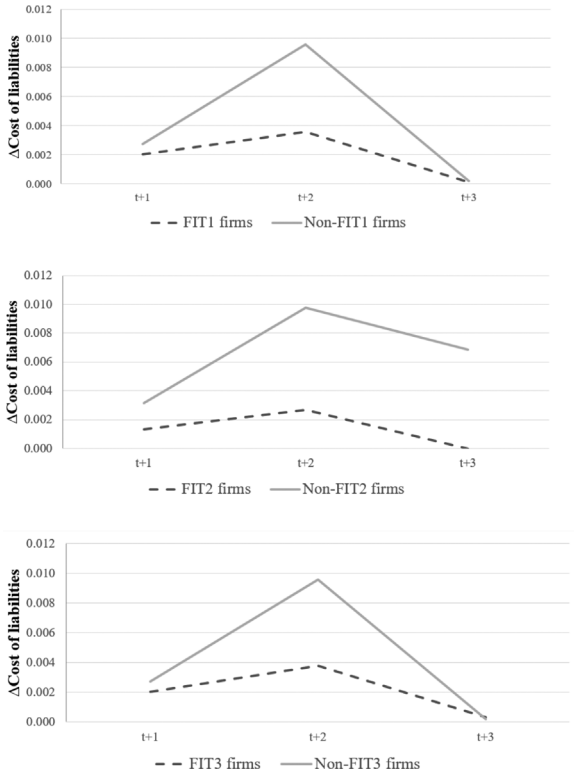

Fig. 1. Changes in cost of liabilities on fit and non-fit firms.

These results strongly suggest that: 1) 'fit' firms benefit from improvements in their future cost of debt; and 2) these improvements do not reverse even up to $t + 3$. Two interesting results emerge when we split our samples into the three FIT definitions. First, we find that high debt pressure firms that interactively use traditional MACS experience larger benefits, faster (benefits are concentrated in $t + 1$), suggesting an immediate amelioration for these firms of their debt pressure concerns. Indeed, the coefficient on FIT_2 is significantly larger than on FIT_1 and FIT_3. This is consistent with the view that this channel is direct: interactive use with traditional MACS directly resolves high debt pressure concerns. Second, the benefits to low debt pressure firms that interactively use contemporary MACS appear to take longer to fully accrue, and while significant in $t + 1$, they are also significant in $t + 2$, indicating a more progressive amelioration of debt terms, potentially linked to the improvements in managerial decision-making, and thus, in investment and operations, which would likely be spread out through more periods.

In untabulated results, we run a number of sensitivity analysis. First, if we replicate Tables 5 and 6 using only the largest companies in our sample (assets of more than ten million Euros), even in this reduced sample, the results are qualitatively similar to the reported for the full sample. Similarly, if we run the models excluding from our sample the observations where respondents replied 'no' to the interactive use of MACS (instead of coding them as zero), or if we remove the observations for which we do not know the number of banks they work with, we also find qualitatively the same results.

To further examine FIT_i, a simple slope analysis is displayed in

[26] Regression models in Table 6 Panel B (future cost of liabilities, levels specifications) include cost of liabilities$_{t-1}$ as an additional control variable. We are grateful to an anonymous reviewer for this suggestion.

Fig. 1. The dashed line represents fit cases, while the solid line depicts non-fit cases. Time periods $t + 1$, $t + 2$, and $t + 3$ are depicted on the X-axis. Change in cost of liabilities (by one) on the Y-axis. The three specifications of FIT_i show similar patterns. As an example, under the first specification of FIT, non-fit firms suffer a greater increase in the cost of liabilities as fit firms, on a +0.07% in $t + 1$, and +0.60% in $t + 2$.

6. Discussion and conclusions

We study interactive use and consequences of individual MACS within a specific uncertainty condition: high debt pressure. We focus on two related questions: (i) whether high debt pressure determines the interactive use of MACS, and (ii) how the interactive use of individual MACS (balanced scorecard, cost accounting and budget system), under different levels of debt pressure, affects the future cost of debt. Our work builds on and supports Simons, (1991, p. 50) claim that the choice of the interactive control system is linked with characteristics of the firm setting.

A distinguishing feature of individual MACS is that they generate different information content. Therefore, their interactive use may focus the attention of the organization on different issues. We predict that the individual MACS that managers use interactively is the one that better focuses the organization on the specific set of information and control mechanisms that helps to resolve the strategic uncertainties that firms face. Hence, we predict that the information content generated is a key element in explaining interactive MACS use. Against this backdrop, we expect that managers use interactively those individual MACS that provide the idiosyncratic information that best fits their perceived needs. In our setting it is high debt pressure in firms with limited access to public capital markets. When firms have strong ties with their lenders, lenders are in a position to exert pressure, gather and process information about the firm and its management. Lenders are particularly interested in information that allows assessing financial distress and the firm debt-paying ability, to decide how much to lend, and on what terms. Hence, as the threat of financing constraints grows (and thus, to the firm's continuous strategic investment), debt pressures to provide decision-relevant information also increase, and managers, through the interactive use of MACS, are predicted to pass those pressures to the whole organization, focusing firm's attention on this key strategic uncertainty.

This leads us to the general prediction that high debt pressure positively influences the interactive use of MACS. Our evidence confirms that uncertainties like high debt pressure situations drive interactive use. This means that the interactive use of MACS is employed to scan the environment. These findings also suggest that organizations use MACS interactively to manage uncertainties such as high debt pressure. This is consistent with Galbraith (1973) and Widener (2007) who claim that organizations implement mechanisms to process information and, if uncertainty increases, the information deficit increases, leading to increased dependence on mechanisms that facilitate the processing of information.

A related and important question is which individual MACS managers use interactively. We argue that managers interactively use MACS that help them to respond to the specific lenders-driven demand for information. In particular, we predict that firms that face high debt pressures interactively use traditional MACS. To test this prediction, we study if high debt pressure is associated with the interactive use of traditional MACS. Also, we analyze whether firms that interactively use the predicted MACS for their level of debt pressure ("fit" firms) benefit by experiencing decreases in future cost of debt. The results show high debt pressure is positively associated with interactive traditional MACS, and that firms with the theoretically consistent interactive MACS outperform firms with theoretically inconsistent interactive MACS. The findings imply that choosing MACS in a theory-consistent manner has a positive effect. We also add to current research by showing a setting where there is a positive effect associated with the interactive use of traditional MACS, such as budgets and cost accounting.

While the results provide novel evidence on the effect of high debt pressure over the interactive use of MACS, some limitations must be noted, which represent possible opportunities for future research. First, the sample is limited to the Spanish processing Food and Beverage industry. We must be cautious about generalizing the results to other industries or countries. Future work may replicate our study in different industries so as to extend the findings to different contexts. Second, future studies could also develop more refined measurement instruments. Third, our focus is on interactive use. Thus, we do not examine the interplay between different levers. Based on the LOC framework, a number of papers have investigated the joint use and integration between levers (Tuomela, 2005; Kruis et al., 2016), the effects of the interplay between levers on outcomes (Henri, 2006) or the multiple interdependencies among levers (Widener, 2007; Heinicke et al., 2016). Complementary to these insights, other papers provide in-depth understanding of the features and separate effects of each individual lever (e.g. Bisbe and Otley, 2004; Naranjo-Gil and Hartmann, 2007; Bisbe and Malagueño, 2009; Abernethy et al., 2010; Janke et al., 2014). We believe that both approaches can provide novel and interesting evidence. Given our research question, our focus necessarily is on the interactive use of MACS and not on the tension or interplay between systems. Interactive use is unlike diagnostic use, which is a use by exception and akin to a large internal system of blinking red lights. This system would be unlikely to help when the pressure comes from the information demands of an external stakeholder, and the entire organization needs to focus on alleviating that pressure. Red lights going off across the board would only distract. It would be like learning of a failed cholesterol test when operating for cardiac arrest. Interactive use involves focusing the whole organization in a specific strategic uncertainty, and narrowing the firm focus on solving it. This extreme focus and involvement by top managers leads to constant discussion, debates and thus, the emergence of bottom-up initiatives, as the whole organization focuses its full power of attention on a single strategic uncertainty. Despite the justified focus on interactive MACS, we acknowledge that, potentially, an interactive use could act as precursor of improvements to diagnostic use. As firms resolve their debt pressures, they may use the information and knowledge gathered to conduct an overhaul of their diagnostic systems, improving them. A time-series, sequential, analysis of the use of the different levers appears as an appealing area for further research.

A final interesting finding that perhaps grants further research is that high debt pressure is positively associated with the interactive use of contemporary MACS for a subset of our firms: the ones that are innovating. These firms appear to already have in place and be interactively using contemporary MACS, and when debt pressures emerge, top managers opt to continue interactively using contemporary MACS, even if they risk incurring worse future debt terms. This finding suggests that firms face multiple pressures and must trade-off the benefits and costs of prioritizing a given external threat. We find no further evidence of innovation driving interactive MACS, and thus, overall, our findings do not allow us to disentangle the role of different external pressures or to entirely reject the alternative possibility that, for a subset of firms in our sample, traditional MACS may serve the role of basic controls as described in Sandino (2007). These findings, we believe, open possible avenues for future research to understand how managers balance different external threats, and on the costs and benefits of shifting from interactive use of one individual MACS to another.

Appendix A. Abbreviated survey

Interactive use of MACS

Q: Has your company adopted the balanced scorecard? (Yes/No). If yes, then:
(i) Balanced scorecard is used to promote efficiency of internal operations (1) or for enhancing creative responses to environmental changes (5). (Item 1)
(ii) Managers only discuss face-to-face with their executive team about balanced scorecard results when there are deviations (1) or managers always debate the reports of balanced scorecard with their executive team (5). (Item 2)
(iii) Information from balanced scorecard is discussed face-to-face with team managers rarely (1) or continuously (5). (Item 3)
Q: Has your company adopted the budget system? (Yes/No). If yes, then:
(i) Budget system is used to promote efficiency of internal operations (1) or for enhancing creative responses to environmental changes (5). (Item 1)
(ii) Managers only discuss face-to-face with their executive team about budget system results when there are deviations (1) or managers always debate the reports of budget system with their executive team (5). (Item 3)
(iii) Information from budget system is discussed face-to-face with team managers rarely (1) or continuously (5). (Item 4)
Q: Has your company adopted the cost accounting system? (Yes/No). If yes, then:
(i) Cost accounting is used to promote efficiency of internal operations (1) or for enhancing creative responses to environmental changes (5). (Item 1)
(ii) Managers only discuss face-to-face with their executive team about cost accounting results when there are deviations (1) or managers always debate the reports of cost accounting with their executive team (5). (Item 2)
(iii) Information from cost accounting is discussed face-to-face with team managers rarely (1) or continuously (5). (Item 3)

Control variables

Q: Balanced scorecard is used for results control (1) or continuous learning (5).
Q: Budget system is used for results control (1) or continuous learning (5).
Q: Cost accounting is used for results control (1) or continuous learning (5).
Q: Does your organization belong to a group of companies? *[yes/no]*
Q: Does a family group actively participate in organizational management and control? *[yes/no]*
Q: Indicate the total number of patents registered by your company.
Q: Indicate the% of sales to the top 3 customers over the total sales of the company: ___%
Q: Indicate the% of purchases to the top 3 suppliers over the total purchases of the company: ___%
Q: What percentage of company sales are exports? ____%
Q: What percentage of company purchases are imports? ____%
Q: Does your company perform promotional activities? *[yes/no]*
Q: Indicate the percentage of managers with higher education. ___%
Q: Has your company performed any of the following actions…?
(i) Changes in product design and/or packaging: *[yes/no]*
(ii) New products launched: *[yes/no]*
(iii) New processes incorporated: *[yes/no]*
Q: Relative to your expectations, rate (Scale: (1), low and (5), high) your degree of compliance with performance goals on:
(i) Introduction into new markets or new groups of costumers
(ii) Sales
(iii) ROA
Q: Does your company have a staff training plan? *[yes/no]*
Q: Indicate the percentage of each type of client over sales…:
(i) Retail
(ii) Wholesale
(iii) Direct to end users (individual consumers and families)
(iv) Other companies
(v) Public administration
Q: Indicate the percentage of expenditure on brand promotion over company sales: ____%
Q: Do you have any of the following ISO certifications?
(i) ISO 9000 Quality *[yes/no]*
(ii) ISO 14000 Environmental *[yes/no]*
Q: Does your company collaborate with other companies in terms of innovation? ((Scale: (1), none and (5), massive).
Q: Please rate the extent to which your company is internationalized. Scale: (1), low degree of internationalization and (5), high degree of internationalization.
Q: Year the company was founded.

Appendix B. Factor analysis and reliability and discriminant validity analysis for interactive use of MACS

See Tables A1 and A2

Table A1
Discriminant validity analysis.

Constructs	Items	1	2	3
iCostAcc	Item 1. Interactive cost acc. Creative responses	0.244	0.376	*0.759*
	Item 2. Interactive cost acc. Continuous debate	0.246	0.268	*0.871*
	Item 3. Interactive cost acc. Face-to-face discussions	0.268	0.330	*0.835*
iBSC	Item 1. Interactive BSC. Creative responses	*0.891*	0.259	0.233
	Item 2. Interactive BSC. Continuous debate	*0.916*	0.228	0.250
	Item 3. Interactive BSC. Face-to-face discussions	*0.919*	0.239	0.243
iBudgets	Item 1. Interactive budgets. Creative responses	0.255	*0.861*	0.300
	Item 2. Interactive budgets. Continuous debate	0.292	*0.854*	0.342
	Item 3. Interactive budgets. Face-to-face discussions	0.233	*0.874*	0.337

We use principal components with Varimax rotation to extract all factors with eigenvalue > 1.

Table A2
Reliability analysis.

Constructs	Items	Loadings	% var.	Cronbach's α
iCostAcc	Item 1. Interactive cost acc. Creative responses	0.890	84.54	0.908
	Item 2. Interactive cost acc. Continuous debate	0.933		
	Item 3. Interactive cost acc. Face-to-face discussions	0.934		
iBSC	Item 1. Interactive BSC. Creative responses	0.957	94.30	0.969
	Item 2. Interactive BSC. Continuous debate	0.976		
	Item 3. Interactive BSC. Face-to-face discussions	0.980		
iBudgets	Item 1. Interactive budgets. Creative responses	0.939	92.00	0.956
	Item 2. Interactive budgets. Continuous debate	0.970		
	Item 3. Interactive budgets. Face-to-face discussions	0.968		

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