New Perspectives on Incentive and Control Systems for Shareholder Value Enhancement

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Preface

Management accounting has come a long way since the beginnings of double-entry bookkeeping by Renaissance-era merchants, a process that has been precisely captured by Fra Luca Pacioli in his 1492 work "Summa Mathematica" (Bloomfield, 2015). In particular, the 20th century led to various revolutions in the field of management accounting. During that time, Germany and the United States have passed through different development phases in their management accounting techniques and philosophies.

In the prewar Germany of the early 1930s, Eugen Schmalenbach decisively influenced today's understanding of management accounting (which is known in Germany as "Controlling") (Ziegler, 1994). Schmalenbach believed that the primary purpose of accounting should be to support decisions (Schmalenbach, 1934, 7; Schildbach, 1997). The process of giving accounting its theoretical foundation led to the development of a coherent cost accounting system (Busse von Colbe, 1996). In addition to innovative ideas such as imputed costs, marginal costs, and opportunity costs, the acquired concept of *decision facilitating* still constitutes an important part of today's understanding of management accounting in firms.

After World War II, the Ford Foundation played an important role in urging reform efforts in the United States, where management accounting was only moderately developed, advocating a move away from traditional cost accounting by placing a stronger emphasis on social science research (Maher, 2001). Subsequently, management accounting research, which increasingly included components of the social sciences, was frequently conducted by non-accounting researchers because actual accounting researchers remained too inexperienced in the social sciences (Shields, 2015). One of the first socially inspired fields of research has been budgets and budgeting (Argyris, 1952; Stedry, 1960; Covaleski et al., 2003), contributing to the larger field of management control systems. Management control systems help maintain or alter organizational

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activities, guide behavior, and balance creative innovations and goal achievement (Simons, 1995; 2000). Other studies in the field of management control systems investigate how contextual factors such as environmental and task uncertainty, organizational structure, and strategy affect the design, importance, and use of management controls (Chenhall, 2003; Shields, 2015).

Behavioral research in the social sciences was accompanied by experimental research methods, which serve as a complement to study how individuals make decisions and interact with other individuals or organizations (Birnberg and Ganguly, 2012). Although management accounting researchers have always found creative ways to overcome the scarcity of available firm data via management reports, surveys, interviews, and field studies, experimental research opens up new perspectives. More precisely, an experiment attempts to observe the causal effects of independent variables on other dependent variables (Campbell and Stanley, 1963; Kerlinger and Lee, 2000). The great strength of this research method remains its control in manipulating the independent variables between treatment conditions and eventually within subjects (Cook and Campbell, 1979). Consequently, experiments enable researchers to test for the validity and assumptions predicted by a theory (Simon, 1982; Smith, 1994). Accordingly, management accounting research has found several biases in laboratory experiments that strikingly contradict economists' predictions of standard decision-making models (McFadden, 2000). Decision situations under uncertainty and performance evaluations are especially prone to biases such as anchoring, leniency, or recency effects (Tversky and Kahneman, 1974; Prendergast, 1999; Bol, 2008). As a result, the *decision influencing* function of management accounting has become an additional research focus. Decision influencing describes management accounting's approach to intentionally use specifically directed information to stimulate employee behavior in a manner that affects the individual's motivation, affect, or perception (Ben-Akiva et al., 1999; Sprinkle, 2003).

Parallel to the behavioral research stream, management accounting research of the late 1970s and early 1980s experienced influences and insights from economics-based modeling research (Maher, 2001; Krishnan, 2015; Van der Stede, 2015). Researchers such as Fama, Holmstrom, Jensen, and Meckling offered new analytical perspectives by examining agency conflicts between firms and managers or discussing the signal value of managerial agents' efforts (Jensen and Meckling, 1976; Holmstrom, 1979; Fama, 1980). Thus, management accounting in both research and practice must address not only decision facilitating and decision influencing but also its own signals given that information sent to communicate with their addressees always possesses consciously or unconsciously framed content.

However, in the 1980s US firms increasingly struggled to remain competitive against tough competition from Japanese firms in the automotive and electronics industries, which were using philosophies such as lean management, "Kanban", and "Kaizen" (Van der Stede, 2015). Subsequently, Robert Kaplan criticized the limited applicability of recent economics-based research and recommended a change in the way of thinking about management accounting by going into the field and learning from the practices of innovative firms (Kaplan, 1984). Indeed, innovative management accounting techniques (e.g., activity-based costing) actually stem from practice, not from academia (Maher, 2001).

Consequently, the 1990s amplified the value of signals from a more practically oriented perspective (e.g., by adding value-based management (Stewart, 1994; O'Byrne, 1996)) and emphasized the importance of nonfinancial performance measures included in the balanced scorecard (Kaplan and Norton, 1992; Kaplan and Norton, 1996) to contemporary management accounting (Sprinkle, 2003; Krishnan, 2015). Accordingly, the improved set of forward-looking financial and nonfinancial metrics theoretically lays the foundation for better managerial decision-making and performance evaluations (Ittner and Larcker, 1998).

In the meantime, Germany made a rather different transition. While steadily recovering from the repercussions of World War II, subsidiaries of American firms introduced the term "Controlling" to West Germany in the mid-1950s (Günther, 2013). As a result of the seminal work of Schmalenbach and his colleagues, aspects such as traditional cost accounting and budgeting have been well implemented into business processes for decades. Thus, German management accountants achieved high organizational importance over time while regularly reporting financial information to top management, enabling optimal decision support (Schäffer and Binder, 2008; Günther, 2013). However, German management accounting steadily adhered to the decision-facilitating function, not considering the opportunity to engage in decision influencing. Only the relatively new conceptualizations of management control systems, the "rationality assuring controlling approach" and the "comprehensive coordination approach" by Weber and Schäffer (1999; 2008) and Küpper (2008), respectively, included incentive systems in management accountants' area of responsibility. Regarding the role of decision influencing via incentives, today's management accounting and management control systems do not largely differ between Germany and the United States. In addition, both of these conceptions embed management accounting into a wider organizational and cultural context as a subsystem that engages in planning, coordinating, and controlling tasks via financial and nonfinancial measurement concepts (Malmi and Brown, 2008; Merchant and Van der Stede, 2012).

In summary, today's understanding of management accounting can be described as the acquisition, measurement, analysis, and reporting of financial and nonfinancial information that supports managers' decisions and enhances firm value by ensuring the organization's goals, e.g., through appropriate incentives (Sprinkle and Williamson, 2007, 415; Horngren et al., 2012, 4). Therefore, examining the role of information in business-related contexts constitutes the majority of management accounting research (Labro, 2015), with practical topics such as incentives,

management control systems, and performance measurement dominating contemporary research (Salterio, 2015).

However, management accounting research struggles with new challenges. Since the 1980s, management accounting articles appear to be underrepresented in leading journals such as the Journal of Accounting Research and the Journal of Accounting and Economics (Maher, 2001; Krishnan, 2015). Another fact that must be taken seriously is the increasing number of management accounting courses being dropped from the curriculum of leading M.B.A. programs (Merchant, 2013; Krishnan, 2015). This development can lead to a problematic downward spiral: dropped courses cannot attract students, leading to a noticeably smaller group of people interested in management accounting, leading to fewer publications and citations in leading journals and so forth (Bloomfield, 2015).

Consequently, it is important to renew people's interest by adopting new perspectives in the field of management accounting research. Management accounting research should not move away from its roots of facilitating and influencing financial-information decisions (Sprinkle, 2003). Still, it is necessary to reconsider the perspectives from which to examine specific management accounting themes. For instance, what is the practical advantage obtained when a firm introduces a value-based management system? Why and how does an employee respond to an externally provided incentive? What is the isolated effect of an incentive and what happens when it is combined with other influences under practical conditions? In sum, it is necessary to rethink the relevance of and how to conduct management accounting research. Therefore, management accounting research must insist on exploring issues that potentially extend practical knowledge rather than focusing on academically self-referential knowledge (Merchant and Van der Stede, 2006; Van der Stede, 2015). Shields (2015) frequently presses for more replication studies. Missing replication studies become a major problem when reconsidering the attempt of Luft and Shields

(2003; 2007) to map management accounting research, finding that only 17 percent of the theories employed to predict the empirical evidence are backed by more than one study. Although plausible results have been delivered, missing confirmation by follow-up studies calls into question studies' reliability and validity because the chosen theory may satisfactorily describe the tested relationship but does not describe the constellation in practice (Bisbe et al., 2007; Luft and Shields, 2014). Although reproducible study results would make a major contribution to the consistency and establishment of knowledge in management accounting (Lindsay and Ehrenberg, 1993; Lindsay, 1995), researchers frequently refrain from replicating studies, which are said to be rejected during the review process and negatively associated with status and making a contribution (Shields, 2015). It may also be possible (at least in part) that researchers consciously attempt to avoid replications of their studies because they have cherry-picked or fabricated results (Simmons et al., 2011).

This dissertation, which is entitled "New Perspectives on Incentive and Control Systems for Shareholder Value Enhancement," aspires to provide the different perspectives on management accounting that have been demanded. In particular, I concentrate on incentive and control systems—namely, value-based management—as one of the most recent management and control systems, along with incentives provided to employees—namely, gamification, target ratcheting, and relative performance information—that shall ultimately lead to increased shareholder value. Consequently, this dissertation contains five major parts, which contribute to either incentive or control systems. To ensure this claim, the studies aim to (1) derive important problems from the field, (2) partly replicate findings from prior studies, and (3) cover a broad spectrum of research methods ranging from an archival study to surveys to an experiment.

First, since the 1990s, value-based management and control systems have been the subject of intensive research coverage. The primary focus lies on those systems' performance-enhancing effects after introduction. Whereas it might be easy to examine ex-post performance effects in an

event study, such a study would neglect the explanatory determinants that motivate firms to initiate the costly implementation of a value-based management and control system. Prior research reveals that value-based performance metrics frequently enable goal-congruent decision-making and performance evaluations (Stewart, 1994; O'Byrne, 1996). Nevertheless, because of Schmalenbach's efforts, German firms are already familiar with the core components of value-based performance metrics such as imputed depreciations or imputed costs of equity. Consequently, the use of value-based management does not necessarily imply a performance increase when firms are already accustomed to applying very similar methods for performance appraisal. Thus, it is not surprising that several studies find ambiguous results, with some samples revealing performance-enhancing effects through value-based management and others finding no such effects. For that reason, the first study follows a different approach. On the one hand, this study replicates previous studies by investigating the operating performance effects of value-based management use. On the other hand, it questions the reasons that drive firms to take the fundamental step of introducing a completely new management and control system. Whereas nearly all studies examine US samples, the historical development of German management accounting indicates that non-US firms may consider value-based management based on factors other than those considered by US firms. When referring back to the perspective of signaling, the establishment and communication of value-based management can, therefore, serve as a considerable sign to capital-market participants. More specifically, it appears beneficial to use value-based management as a means to reduce information asymmetry between firm insiders and outsiders when there is strong exposure to the capital markets. In this situation, the introduction and reporting of value-based performance metrics signals that managers act in shareholders' interest by only considering the excess returns of the firm profit that remain after deducting the costs of capital demanded by both debtholders *and* shareholders. In this sense, exploring the

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determinants that lead managers to adopt value-based management techniques to signal high attractiveness to potential investors is also crucial. However, previous research concentrated on the effects of firms that have adopted this type of value-based management and control systems without asking why they tend to do so.

Second, research on value-based management mainly concentrates on listed firms. This is intuitive in that such research can be particularly helpful for overcoming agency conflicts between free-floating shareholders and managers. However, the vast majority of firms belongs to the category of unlisted small and medium-sized enterprises. These firms contribute significantly to the economy and are predominantly family-owned. Although research has examined the use of value-based management in small and medium-sized firms (Gonschorek, 2009; Krol, 2009), there has been no examination of the determinants of using value-based management for family firms, regardless of their size. This is a particularly important issue because it does not concentrate on firm size as an explanatory factor and instead focuses on the status of family ownership and its implications for creating and retaining equity value. Although family-owned firms may not exhibit the same agency conflicts as publicly listed companies, it remains likely that they can benefit from the use of value-based management and its performance metrics to reduce information asymmetry during the decision process. Whereas listed firms may experience pressure from the capital market to adopt value-based management techniques to gain shareholder trust, family firms may have other types of motivation when consciously using value-based performance metrics. Therefore, the frequent use of value-based management in family firms is likely to be associated with current or upcoming agency conflicts such as external management or an external succession. Related instruments provide goal-congruent decision-making support and performance measurement. Thus, broadening the scope from listed firms to privately held family firms enables new perspectives on firms' motivations to deploy value-based management.

Third, research on gamification has its academic origin in information technology. Thus, from its beginnings, research has concentrated on the proper design and mechanics of gamified activities, which promise to increase employees' motivation. However, there is also a considerable amount of failed gamification (Pettey and van der Meulen, 2012). Referring to arts and architecture, several adherents hold the opinion that "*form*" must follow "*function*". Transferred to gamification, it is initially important to consider the specific work environment and then to design proper forms of gamification implementation. Thereby, research on motivation demonstrates different drivers for tasks depending on whether the focus is on performance quality or performance quantity. Consequently, gamification for quantity-type tasks must consider different design choices than gamification for quality-type tasks. For instance, tasks with a focus on performance quality profit significantly more from incentives conveying autonomy than do tasks with a focus on performance quantity (Bakker et al., 2008; Simpson, 2009). In contrast, feelings of external pressure undermine creativity and similar qualitative output but have no demotivating effect for repetitive and uninteresting tasks. With respect to the number of applied theories (e.g., flow theory, self-determination theory, theory of planned behavior, theory of gamified learning), it seems that prior gamification research misses a clear conceptual relation and neglects the view of how business tasks are organized. As a result, research on gamification still lacks plausible and unambiguous design recommendations for practitioners. Instead, prior research delivers contradictory results, potentially leading to misconceptions in practice. Whereas gamification appears to be in vogue, research in the field seems overly self-referential, potentially leading to neglect of the actual issues in the practice community (Kaplan, 2011). By taking a view that is concerned with the nature of business tasks, I attempt to deliver widely applicable guidance about when to apply which elements of gamification. To ensure the success of this ambitious approach, I refer back to self-determination theory, a widely accepted theoretical construct that proved its applicability to adjacent areas such

as sports or video games (Ryan et al., 2006). This theory posits formal requirements—so-called basic psychological needs—to evoke autonomous and intrinsic motivation or controlled motivation. However, these needs not only emphasize the design parameters of gamification but also illustrate possible alternatives such as tournaments or awards that may come at a lower implementation effort and cost. Reconsidering these psychological needs, my elaborations may also explain failed approaches to gamification since not every employee task can easily incorporate a gaming layer.

Fourth, target ratcheting is a widespread practice to impose challenging performance targets on employees, which in turn promises to result in increased employee motivation and performance (Bonner and Sprinkle, 2002; Indjejikian et al., 2014). However, this mechanism of deriving target values for the next period from employees' past performance data is Janus-faced. On the one hand, the use of past performance information enables the supervisor to set targets that reflect barely observable employee skills. On the other hand, anticipation of the adjustment process can induce dysfunctional behavior in which employees withhold their real effort to avoid future target raises (*the ratchet effect*)—especially when their personal bonus depends on target attainment. The consequences can be at least twofold. First, employees refrain from performing at their highest level, leading to lower current firm performance. Second, firms' long-term planning is based on intentionally lower past performance, resulting in underestimated growth opportunities and misallocated resources. Whereas prior research has mainly concentrated on documenting the ratchet effect and its impact on performance, practitioners may be more interested in determinants that contribute to the buildup or depletion of the ratchet effect. Consequently, the present study examines both employee characteristics that have an influence on the ratcheting phenomenon and organizational discretion that may either positively or negatively contribute to the ratchet effect. Since there is no existing scale to capture behavior associated with the ratchet effect, this study

also provides a comprehensive measurement proposal. Above all, the findings urge firms to find ways to overcome employees' risk aversion related to reaching increased future targets. For instance, although target participation could mitigate these risk concerns, it may allow further room for opportunistic behavior.

Fifth and finally, risk-taking in general marks another intensively studied field of research. Thereof, a couple of studies examine the effects of incentives related to relative performance information (such as tournaments, which automatically provide relative performance information) on individuals' risk-taking behavior. Understanding the effects of instruments using relative performance information is of special practical relevance. If instruments using relative performance information can lead to excessive risk-taking, there is a social responsibility to avoid its frequent use in future since the recent global financial crisis is said to be the result of excessive risk-taking in the financial sector (Dewatripont and Freixas, 2012). Knowing how relative performance information affects employees' excessive risk-taking is important because in many real-world settings performance is a function of both effort *and* risk-taking decisions (Awasthi and Pratt, 1990; Sprinkle et al., 2008). Considering tournaments as a representative example of instruments based on relative performance considerations, research finds that tournaments significantly increase employees' risk-taking behavior. However, because tournaments rank employees on an ordinal scale based on their output and link a compensation scheme to the achieved rank (Hannan et al., 2008), it is impossible to disentangle the effect of socially relevant rank information from rank-dependent compensation. For this reason, this study partly replicates former studies investigating the relationship between instruments using relative performance information and risk-taking. Still, the study takes a particularly isolated view of the effect of relative performance information that is not linked to compensation and analyzes employees' acceptance of taking risks. In accordance with the theory of social loss aversion (but somewhat surprising in light of prior studies) (Camerer,

1998), relative performance information that is not linked to compensation has the opposite effects on risk-taking as tournaments being linked to compensation. Thus, uncompensated relative performance information can decrease excessive risk-taking. This result repeatedly demonstrates the value of (partial) replications as the effects of relative performance information become more predictable. In this case, a monetary link to relative performance information leads to a very different cause-effect-mechanism that has not been studied. Indeed, partial replications may solve the dilemma of a low assumed contribution and additional knowledge by validating or debunking prior studies.

Ultimately, management accounting research has always been and will likely be about the provision of information that either advises managers in their decision-making behavior or directs employee behavior. In general, research is about discovering new facts and revising existing knowledge. In particular, management accounting research addressed this issue with diversity and openness to alternative research methods and paradigms (Salterio, 2015). As long as management accounting research follows this principle of allowing a broad scope of research, there is a high likelihood that upcoming contributions will enrich management accounting in practice, ensuring an overall vibrant future.

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Author Contribution Statements

Study no.	1				
Title	**Determinants of the Adoption and Performance Effects of Value-Based Management Systems in Germany**				
Authors	Christian Brück, Barbara Faltynek, Thorsten Knauer, Anja Schwering				
Author contribution		Brück	Faltynek	Knauer	Schwering
	Research question/methodology	✔		✔	
	Acquisition of data	✔	✔		
	Analysis/interpretation of data	✔		✔	✔
	Writing the manuscript	✔		✔	✔
Publication status	Management Accounting Research (VHB-Jourqual 3: A) *2nd round, revise and resubmit*				
Peer-reviewed conferences	EAA Annual Congress 2015 (Brück) VHB Annual Congress 2016 (Schwering)				
Research approach	Archival study				
Abstract	This paper examines the economic determinants that lead German firms to adopt value-based management and control systems (VBMSs). Further, we investigate whether firms' operating performance improves after VBMS adoption. Using a hand-collected data set of German listed firms covering 1,575 firm-years from 2004 to 2011, we predict and find that firms are more likely to adopt a VBMS when they are large and have low market-to-book ratios and high foreign sales ratios. In addition, VBMS adoption is more likely if the free float is larger than the blocking minority of 25%. These findings support our argument that the adoption of VBMSs is more likely when information asymmetry is high. However, we do not find that VBMS adoption improves operating performance. Therefore, our results indicate that German firms adopt VBMSs to appear more attractive and transparent to investors (signaling function), but not necessarily to improve performance. We conclude that our results should be interpreted against the background of increased shareholder value orientation among German firms and a long-standing tradition of a sophisticated cost accounting system.				

Study no.	2			
Title	**The Use of Value-Based Management in Family Firms**			
Authors	Christian Brück, Jonas Ludwig, Anja Schwering			
Author contribution		Brück	Ludwig	Schwering
	Research question/methodology	✓	✓	
	Acquisition of data	✓	✓	
	Analysis/interpretation of data	✓		✓
	Writing the manuscript	✓		✓
Publication status	Journal of Management Control (VHB-Jourqual 3: C) *1ˢᵗ round submission*			
Peer-reviewed conferences	—			
Research approach	Survey			

Abstract	This study examines determinants of the use of value-based management (VBM) and its performance measures in family firms. Family firms play an important role in the economy but for the most part, are without capital market orientation. While agency conflicts between free float shareholders and managers are thus unlikely to evolve a need for VBM, other types of agency conflicts can occur in family firms. Therefore, we conduct a survey and find, as predicted, that privately held family firms also tend to use VBM when they are facing current or upcoming agency conflicts. This is particularly the case when family firms have been concerned with managerial succession in the past and now exhibit a non-family executive board or if managerial succession will be a future concern. Moreover, a large extent of international business activities serves as another driver for the use of VBM. Thereby, VBM can help family firms to improve decision-making quality by enabling consistent and goal-congruent decision support and performance measurement. Overall, our findings provide a better understanding of management accounting choices and internal decision-making of family firms.

Study no.	3
Title	**Work hard, play hard? Gamification as a New Option of Incentive System Design to Increase Employee Motivation**
Authors	Christian Brück
Author contribution	obsolete
Publication status	Organizational Behavior and Human Decision Processes (VHB-Jourqual 3: A) *1st round submission*
Peer-reviewed conferences	__
Research approach	Conceptual study
Abstract	Humans' affinity to play games makes it tempting to integrate gamification into business tasks. Gamification promises greater employee motivation and performance. However, appropriate gamification design strongly depends on the performance focus of the specific task. Using self-determination theory, I formally demonstrate that gamification for quality-type tasks (complex tasks that are challenging in a creative and cognitive way) must satisfy different psychological needs than tasks that focus on performance quantity (i.e., noncomplex tasks that are repetitive and mundane). Tasks with a focus on performance quality require gamified elements that support the employee's perceived autonomy, competence, and relatedness, such as individual avatars, unexpected rewards, and team chats. In contrast, quantity-type tasks have no considerable link to autonomous motivation and therefore, autonomy-supportive gamification can be omitted. Thus, gamification for quantity-type tasks cannot affect a motivational crowding-out and instead can use controlling elements such as trophies and leaderboard competitions. Still, from the perspective of self-determination theory, simple award and tournament schemes have the same motivational effects as their gamified counterparts. In light of the initial efforts, obligatory testing phase, and further maintenance involved, this issue calls into question the cost-benefit-ratio of gamification for repetitive and routine tasks.

Study no.	4			
Title	**Determinants of the Ratchet Effect**			
Authors	Christian Brück, Thorsten Knauer, Nicole Nikiforow, Anja Schwering			
Author contribution		Brück	Knauer	Nikiforow	Schwering
	Research question/methodology	✓		✓	
	Acquisition of data			✓	
	Analysis/interpretation of data	✓	✓	✓	✓
	Writing the manuscript	✓	✓	✓	✓
Publication status	Accounting, Organizations and Society (VHB-Jourqual 3: A) *1st round submission*			
Peer-reviewed conferences	—			
Research approach	Survey			
Abstract	Target ratcheting derives target levels for the next period by adjusting current performance data. The use of target ratcheting can evoke dysfunctional behavior, such as the ratchet effect, the phenomenon of employees strategically withholding effort in anticipation of future upward revisions of their targets. Prior research has mainly considered the existence of the ratchet effect and how it affects firm performance. We extend this stream of research and investigate determinants that potentially increase or undermine the ratchet effect. Using a unique dataset from a survey among bank employees, we observe that risk aversion, intra-organizational competition and perceived job insecurity are positively associated with the ratchet effect. Furthermore, we predict and find that target participation and career ambitions undermine the ratchet effect. Collectively, our findings suggest that firms should be aware that the ratchet effect can differ systematically.			

Study no.	5		
Title	**The Effect of Relative Performance Information on Excessive Risk-Taking**		
Authors	Christian Brück, Thorsten Knauer, Harald Meier		
Author contribution		Brück	Knauer	Meier

Author contribution		Brück	Knauer	Meier
	Research question/methodology	✓	✓	✓
	Acquisition of data	✓		✓
	Analysis/interpretation of data	✓	✓	
	Writing the manuscript	✓	✓	✓

Publication status	The Accounting Review (VHB-Jourqual 3: A+) *1st round submission*
Peer-reviewed conferences	AAA Management Accounting Section Meeting 2017 (Brück) EAA Annual Congress 2017 (Brück)
Research approach	Experimental

Abstract	Prior research has mainly investigated how relative performance information (RPI) affects performance via employee effort. We extend the prior research by considering that performance is often a joint function of effort and risk decisions. Specifically, we examine the effect of the absence or presence of RPI on excessive risk-taking because excessive risk-taking is particularly important in situations where agents compete against each other. We predict that the presence of RPI reduces excessive risk-taking because employees are social loss averse and weigh the disutility of being perceived as a low performer higher than the utility of being perceived as a high performer. We conduct a laboratory experiment and find, as predicted, that RPI decreases excessive risk-taking. In addition, we find that this effect is mainly driven by the behavior of bottom performers, supporting our theory that employees are particularly concerned with being perceived as low performers. Our results help firms to better understand the benefits and costs of RPI use.

Part I

Determinants of the Adoption and Performance Effects of Value-Based Management Systems in Germany

ABSTRACT

This paper examines the economic determinants that lead German firms to adopt value-based management and control systems (VBMSs). Further, we investigate whether firms' operating performance improves after VBMS adoption. Using a hand-collected data set of German listed firms covering 1,575 firm–years from 2004 to 2011, we predict and find that firms are more likely to adopt a VBMS when they are large and have low market-to-book ratios and high foreign sales ratios. In addition, VBMS adoption is more likely if the free float is larger than the blocking minority of 25%. These findings support our argument that the adoption of VBMSs is more likely when information asymmetry is high. However, we do not find that VBMS adoption improves operating performance. Therefore, our results indicate that German firms adopt VBMSs to appear more attractive and transparent to investors (signaling function), but not necessarily to improve performance. We conclude that our results should be interpreted against the background of increased shareholder value orientation among German firms and a long-standing tradition of a sophisticated cost accounting system.

1   Introduction

This study examines the economic determinants of the adoption of value-based management and control systems (VBMSs) in Germany. Further, we investigate whether the adoption of VBMSs improves a firm's operating performance.

Theory suggests that agency problems arise between managers and shareholders due to diverging interests and the costly verification of managers' behavior (Eisenhardt, 1989). If both parties are utility maximizers, managers pursue their own interests, which may not converge with the goals of shareholders (Jensen and Meckling, 1976). To evaluate shareholder goal attainment, VBMSs compare the firm's and/or managers' performance with the shareholders' claimed rate of return (Dekker et al., 2012). Hence, VBMSs are a potential means of better aligning the conflicting interests of managers and shareholders (Scheipers et al., 2003). VBMSs help to reduce agency conflicts in several ways. They reveal value-enhancing activities to decision makers, provide a goal-congruent way of monitoring corporate decisions, and allow managerial compensation to be based on shareholder value-related outcomes (Malmi and Ikäheimo, 2003).

Prior studies on the adoption of VBMSs and the resulting performance effects have primarily focused on Anglo-Saxon firms. This study focuses on the adoption of VBMSs and the performance effects in the German market, which differs from Anglo-Saxon markets in at least two important ways and allows understanding the benefits of VBMSs more comprehensively. First, the German market has been subject to a substantial transition process, with increasing focus on shareholder interests and important initiatives to improve transparency. Therefore, we examine whether firms with high information asymmetry between managers and shareholders are more likely to adopt VBMSs to improve investor communications due to a switch from the old debtholder-oriented governance system to a shareholder value orientation (signaling function). Second, cost accounting in Germany is particularly sophisticated compared to the rest of the world

and German firms typically include value-based components such as imputed costs of equity capital, imputed depreciation, and other imputed adjustments in their decision-making processes. Consequently, the incremental benefits of VBMS adoption for decision-making purposes may be less pronounced in German firms compared to Anglo-Saxon firms. Against this background, we investigate whether prior findings of a positive effect of VBMS adoption on operating performance (Lueg and Schäffer, 2010) also generalize to the German setting. By focusing on operating performance instead of stock performance, we rule out potential effects of VBMSs adoption on risk premium as an alternative explanation for stock outperformance and thus can assign potential performance effects to the new management practices.

To shed light on these two research issues, we study a hand-collected data set of German listed firms covering 1,575 firm–years from 2004 to 2011. We carefully analyze the annual reports of 241 sample firms that have equity securities listed on the German Prime Standard as of December 31, 2010. For each firm–year, we determine whether a specific firm has deployed a VBMS. Further, we determine when the VBMS was introduced for each VBMS adopter. We focus on the adoption of the management accounting and control system, since it marks a significant switch from traditional accounting to a more capital-focused and shareholder-oriented perspective.

Our analysis proceeds in two steps. First, we draw upon agency theory to develop and test predictions for cross-sectional differences in VBMS adoption. In general, we argue that VBMS adoption is positively associated with firms that have high levels of information asymmetry between shareholders and managers, because investors are more concerned that managers and employees within such firms act opportunistically at the shareholders' expense. While German firms generally wish to mitigate these (international) investor concerns due to increasing focus on shareholder interests, we predict that firms with high information asymmetries are particularly likely to adopt a VMBS to signal a shareholder value orientation. Our empirical analysis supports

this expectation. Using proxies from Lovata and Costigan (2002) and Dey (2008) to operationalize high levels of information asymmetry, our results show that firms are more likely to adopt a VBMS when they are large and have low market-to-book ratios and high foreign sales ratios. In addition, VBMS adoption is more likely when the free float is larger than the blocking minority of 25%.

Second, we examine changes in operating performance after VBMS adoption. Prior research suggests positive performance effects after VBMS adoption. We argue, however, that German firms have used value-enhancing metrics such as imputed costs in their decision-making processes for decades because of the long tradition of sophisticated cost accounting. Therefore, VBMS metrics may only lead to marginal improvements. We follow the research design of Ryan and Trahan (2007) and Guo et al. (2011) to analyze if different performance measures for profitability and the efficient use of assets significantly improve in the years after VBMS adoption. We find that, generally, operating performance does not significantly improve in the post-adoption period or when we adjust the adopters' performances with benchmark firms of the same industry. Therefore, our results suggest that if operating performance effects occur after VBMS adoption these effects are marginal for German firms. Overall, we conclude that German firms introduce VBMSs mainly to appear more attractive to investors (signaling function), with no or only marginal improvements in operating performance.

Our study contributes to theory and practice in several important ways. First, we extend the research stream investigating the reasons and firm characteristics for VBMS adoption. Though VBMSs have been gaining increasing interest, empirical evidence of their adoption is still scarce and inconsistent (Lueg and Schäffer, 2010). For instance, Lovata and Costigan (2002) test for the characteristics of firms using VBMSs for compensation purposes only. However, our results show that only 57.8% of German adopters use VBMSs for compensation purposes, which makes it relevant to investigate the characteristics of *all* adopters. This also questions the role of VBMSs as

a means of aligning shareholders' and managers' interests, since many German firms do not steer managerial behavior via value-based incentives. Second, we add to the literature that investigates whether VBMSs significantly improve operating performance (Ittner and Larcker, 2001). While prior research, in particular, examines the influence of VBMS adoption on stock performance (e.g., Biddle et al., 1997; Rapp et al., 2011; Stewart, 1994), our study focuses on whether operating performance increases upon the announcement of VBMS adoption. Our results indicate that VBMSs have no significant impact on the operating performance of German firms, even several years after adoption. Finally, one of the main contributions of our paper is our analysis of German firms. Prior research, in particular, examines VBMSs in Anglo-Saxon countries, which are characterized by a strong capital market orientation, strong shareholder protection, pronounced importance of financial and institutional investors, and different corporate governance systems (Goergen et al. 2008). In contrast, German firms are characterized by a long tradition of sophisticated cost accounting practices which also influences their decision-making. For this setting, our results are consistent with the reasoning that German firms adopt VBMSs to communicate with their shareholders and to reduce information asymmetry while the potential benefits of VBMS adoption on operating performance are less important. Overall, our results add to the literature on VBMSs by showing that the purposes and benefits of VBMS adoption should be evaluated carefully and hinge on the respective environment.

Our paper proceeds as follows: Section 2 develops our hypotheses. Section 3 describes the data collection process and methodology of the analysis. Section 4 reports the empirical results and the Section 5 concludes the paper.

2 Background and hypothesis development

2.1 Value-Based Management Systems (VBMSs)

Rappaport (1981) establishes the origin of VBMSs as the idea of shareholder value orientation. In brief, the main goal of managerial activities should be to deliver value to investors. Although the specific terminology and placement of variables of Rappaport's shareholder value and many other subsequent concepts vary, every value-based management concept proposes managerial accounting and control as a holistic organizational control cluster (Ittner and Larcker, 2001). In this context, we consider VBMSs as integrated management strategy and control systems to ensure shareholder value creation (Scheipers et al., 2003; Ryan and Trahan, 2007). With its firm-wide implementation regarding strategic planning, performance measurement, financial control, and incentive design, VBMSs serve as corporate governance mechanisms to align diverging interests between shareholders and managers (Ryan and Trahan, 2007; Dey, 2008). The separation of ownership and control are the cause of these conflicting interests, resulting in the delegation of decision rights, divergent objectives of owners and managers, and information asymmetry between them (Coase, 1937; Jensen and Meckling, 1976).

Generally, conflicts of interest emerge in situations in which individuals can personally benefit from actions or influences (Demski, 2003). The literature on property rights (Alchian and Demsetz, 1972) notes different incentive conflicts between shareholders and managers that end up in a loss, which shareholders have to bear (Ryan and Trahan, 2007). Similarly, agency theory addresses relationships in which principals/shareholders delegate certain responsibilities, such as decision-making authority, to agents/managers, who perform the work on behalf of the principals (Baiman, 1990). The attempt to maximize their individual utility can result in agents not acting in the best interest of the principals (Jensen and Meckling, 1976). More specifically, agency problems arise when (1) the principal and agent possess diverging interests and (2) information asymmetry

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are high and verification of the agent's actions is costly and difficult (Eisenhardt, 1989). Given the inadequacy of contracts to resolve this situation, shareholders may appreciate monitoring mechanisms that increase transparency and signal that managerial activities are likely in the investors' best interest (Jensen and Meckling, 1976). Therefore, VBMSs are important corporate governance means of signaling shareholder value orientation and reducing information asymmetry.

Key performance indicators are a central element of VBMSs. While traditional earnings measures can generate incongruence between a firm's and managers' goals (Bromwich and Walker, 1998), value-based performance metrics aim to deliver unambiguous decision making by including the cost of capital (Pfeiffer, 2004). In general, value-based performance metrics can be expressed as both discounted cash flows and residual income figures. However, in practice, value-based performance metrics are often designed as single-period residual income figures, considering the amount of capital used to generate those profits and its linked cost of capital (Rapp et al., 2011). Since value-based performance metrics indicate whether a firm's assets generate returns in excess of the cost of capital, they enable managers and shareholders to identify whether investment decisions create or destroy shareholder value. The specific organizational use of VBMSs can have different levels of sophistication (Burkert and Lueg, 2013). For instance, Ittner and Larcker (2001) suggest that VBMSs may not only comprise accounting information and performance measurement, but also serve as reward systems. Malmi and Ikäheimo (2003) even argue that only the integration of a VBMS into the compensation scheme serves as an indicator of genuine VBMS adoption.

2.2 Review of empirical studies

Though the VBMS concept has gained much attention in practice, solid empirical evidence is still scarce (Rapp et al., 2011). In particular, only few studies provide cross-sectional evidence on factors that determine the adoption of VBMSs. Lovata and Costigan (2002) focus on identifying

the characteristics of US firms adopting Economic Value Added® (EVA)[1] as a basis for compensation. The authors find that such firms possess a higher proportion of institutional ownership and a lower proportion of insider ownership. In addition, organizational strategy is important for the decision to adopt EVA, because firms more concerned with increasing efficiency than with developing new products have a higher likelihood of using EVA. Athanassakos (2007) follows a similar research approach, using survey data from the chief executive officers (CEOs) of large Canadian firms. The findings indicate that larger firms with younger managers with a higher level of education and an accounting and/or finance background are more likely to adopt VBMSs.[2] Burkert and Lueg (2013) examine differences in the sophistication of VBMSs among German HDAX firms. They provide evidence that the managers' personal characteristics influence VBMS sophistication, particularly the educational background and tenure of chief financial officers (CFOs). When considering the determinants of the use of value-based performance measures for managerial performance evaluation, Dekker et al. (2012) find that the perceived importance of those measures increases when the manager in question has more operational decision rights and intensive asset use is a crucial value driver for the firm.

Further studies focus on performance effects due to the adoption of VBMSs, deploying two different approaches to measure performance effects. The first approach measures the effects of value-based metrics on performance via stock prices. Consulting firms conducted the earliest studies and claimed a positive correlation between the use of value-based performance metrics and stock price performance (Stewart, 1994; O'Byrne, 1996). However, a more sophisticated study by Biddle et al. (1997) reveals contradictory results. Using data compiled by Stern Stewart & Co., resulting in 6,174 firm–year observations, the authors find that EVA does not significantly

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[1]   EVA is a registered trademark of Stern Stewart & Co.
[2]   Athanassakos (2007) also finds that Canadian VBMS adopters earn higher stock market returns than non-adopters do.

outperform traditional accounting measures. Similarly, Kyriazis and Anastassis (2007) analyze firms listed on the Athens Stock Exchange and report that EVA does not have more explanatory power for performance than net or operating income measures do. Griffith (2004) examines the stock price performance of 63 US-based EVA adopters, of which 30 firms adopted a complete EVA incentive system (e.g., with bonus banks) and 33 firms adopted one only partially. In a five-year post-adoption period, EVA firms significantly underperform, with a cumulative abnormal loss of 55%. However, underperformance is due to a significant loss of firms that only partially adopted an EVA incentive system. Rapp et al. (2011) study the effects of VBMS adoption on the stock market performance of German listed firms. They show that VBMS adopters exhibit positive abnormal stock market returns in the two-year adoption phase.

The second approach is to measure operating performance to avoid problems associated with analyzing capital market reactions (e.g., the precise event date). Wallace (1997) examines the differences between residual income-based compensation plans and traditional earnings-based compensation plans for US firms. The author finds that firms whose managerial compensation is tied to residual income measures are associated with decreasing new investments, increasing asset dispositions, higher share repurchases, and higher asset utilization. Kleiman (1999) shows that EVA adopters from the United States outperform the control group with respect to operating performance.[3] Cordeiro and Kent (2001) examine the association of EVA adoption with earnings forecasts. Based on a sample of US firms, they do not find a significant relation between EVA adoption and forecasts of future earnings performance. Riceman et al. (2002) study the managerial compensation plans of a single New Zealand firm and find that bonuses tied to EVA do not generally improve performance more than bonuses tied to traditional accounting measures.

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[3] Kleiman also examines stock price performance and shows that firms adopting EVA outperform their peers in the three-year period following the adoption.

However, managers whose compensation is based on EVA and who also understand the concept of EVA perform significantly better than managers with traditional bonus schemes. Prakash et al. (2003a, 2003b) investigate the differences in financial ratios and systematic and unsystematic risk based on a four-year post-adoption and a four-year pre-adoption period for US firms. They find a significant increase in asset turnover, profitability, and market value ratios while liquidity ratios and financial leverage decrease. Hogan and Lewis (2005) examine US firms adopting economic profit compensation plans and find that adopters experience post-adoption operating performance improvements. However, the improvements are similar to those realized by a non-adopting control group. By dividing EVA adopters into expected and surprising adopters, the authors find a higher impact for statistically expected VBMS adopters. Finally, based on survey data, Ryan and Trahan (2007) examine the economic performance of large, publicly held firms in the United States that adopted VBMSs during the period 1984-1997. They find that matched firm-adjusted residual income increases in the post-adoption phase. In addition, their results show that firm size is negatively related to VBMS effectiveness. Table 1 summarizes the main characteristics and findings of prior studies.

Table 1
Overview of former studies

Author (Year)	Sample	Key Findings
Biddle et al. (1997)	773 firms from Stern Stewart & Co. dataset	EVA does not dominate earnings in relative information content and traditional earnings generally outperform EVA.
Wallace (1997)	40 US firms with value-based incentives	Firms that adopt a residual income performance measure significantly increase their dispositions of assets and decrease their new investment, increase their share repurchases, and use their assets more intensively.
Kleiman (1999)	66 US firms with EVA incentives	Companies that adopt EVA generate extra total return versus the median industry competitor. Companies that adopt EVA as the basis for compensation benefit from an improvement in operating performance.
Cordeiro and Kent (2001)	739 firms from Stern Stewart & Co. dataset	There is no significant relation between EVA adoption and security analyst forecasts of future firm performance in terms of earnings per share.

Table 1 (continued)		
Riceman et al. (2002)	52 New Zealand managers with EVA incentives	As long as they understand the EVA concept, managers on EVA bonus plans outperform managers on traditional bonus plans. Increases in performance arise because of increased consistency in the evaluation reward process rather than from the superiority of EVA as a performance measure.
Lovata and Costigan (2002)	115 US firms with EVA incentives	Firms using EVA exhibit a higher percentage of institutional ownership and a lower percentage of insider ownership than non-adopters do. Prospector firms tend to use EVA less than defender firms do. Accounting adjustments are a focal point of the EVA formulation. Providing appropriate incentives may be more complex than the developers of EVA imply.
Prakash et al. (2003a, 2003b)	Up to 48 US firms with EVA incentives	There are significant increases in asset turnover, profitability, market value, and unsystematic and total risk, while liquidity ratios, systematic market, and financial leverage decrease, based on 4-year post-adoption and 4-year pre-adoption periods.
Malmi and Ikäheimo (2003)	6 Finnish-based organizations from 5 different industries	In none of the studied organizations is VBMS applied as comprehensively as suggested in the normative literature. Some apply it merely rhetorically, while others confirm an impact on decision making and control.
Griffith (2004)	63 US firms with EVA incentives, of which 30 adopted the complete EVA incentive system	In a 5-year post-adoption period, EVA firms significantly underperform, with a cumulative abnormal loss of 55%. However, underperformance is primarily due to the significant loss of partial adopters of 115% after EVA adoption.
Hogan and Lewis (2005)	108 US firms with value-based incentives	The study shows significant post-adoption improvements in operating performance and shareholder value. "Anticipated adopters" outperform "surprise non-adopters."
Athanassakos (2007)	Survey of 39 CEOs of the 300 largest publicly owned Canadian companies	VBMSs are widely used in Canada. Usage is more likely for larger companies with younger and more educated executives with an accounting/finance background. Companies using EVA have better stock price performance than non-EVA users.
Kyriazis and Anastassis (2007)	121 non-financial publicly traded Greek firms	EVA components add only marginally to the information content of accounting profit. EVA does not appear to have a stronger correlation with firms' market value added than other variables.
Ryan and Trahan (2007)	84 US firms with value-based incentives	For a 5-year post-adoption period, firm-adjusted returns improve significantly following the adoption of a VBMS. Findings show that firms reduce capital expenditures following adoption, regardless of the firm's growth opportunities. The likelihood of adopting value-based compensation plans is greater if they perform better prior to the adoption or if other firms in the industry use value-based compensation plans.
Rapp et al. (2011)	178 German firms with value-based incentives	Firms adopting VBMSs earn significant abnormal stock market returns measured within a 2-year adoption phase. Excess returns are not jeopardized by poor post-adoption returns.
Dekker et al. (2012)	Survey of 123 firm members of the Dutch Controllers Institute	The importance of value-based measures for evaluation increases with firms' need for intensive asset use, delegated authority, and reduced unit interdependencies. Simultaneously, the importance of intensive asset use limits the delegation of authority, which partially offsets the increase in importance of value-based measures.
Burkert and Lueg (2013)	Survey with 52 German respondents	CFOs have more influence on VBMS sophistication than CEOs do. The educational background and short tenure of CFOs are associated with high VBMS sophistication.

The review shows that prior studies focus on Anglo-Saxon firms and provide ambiguous evidence regarding the performance effects of VBMSs (Ittner and Larcker, 2001). However, the German setting allows to shed further light on the purposes and benefits of VBMS adoption because of two distinct characteristics: (1) a substantial transition process with increasing focus on shareholder interests as well as investor communication over the last two decades and (2) a sophisticated cost accounting that already includes value-based components such as imputed costs of equity capital, imputed depreciation, and other imputed adjustments. The first characteristic of the German setting suggests that firms could adopt VBMSs to improve investor communication to reduce information asymmetry (signaling function). Therefore, we examine whether German firms with high information asymmetry between managers and shareholders are more likely to adopt VBMSs to better communicate a shareholder value orientation. The second characteristic considers that the operating performance effects are likely path dependent and implies marginal benefits of VBMSs regarding operational decision making. Thus, we investigate the null hypothesis that VBMS adoption has no effect on operating performance when decision making prior to VBMS adoption takes main value-based components into account. We derive our hypotheses in the following, with the first set of hypotheses (H1a–H1e) focusing on the adoption decision and the second hypothesis (H2) addressing operating performance effects.

2.3   Hypotheses

2.3.1   *Determinants of VBMS adoption*

Germany differs from Anglo-Saxon countries in terms of its social, political, and legal environments (La Porta et al., 1997), which is reflected in the German corporate governance system. In particular, shareholder orientation is a relatively new concept in Germany (Jürgens et al., 2000; Fiss and Zajac, 2004). The German corporate law of 1937 stated a non-shareholder orientation, predominantly targeting the firm itself, the employees, and the state. Moreover, until

recently, German banks have played a decisive role while financing firms after World War II. In addition, financial markets are less developed than in the United States and the interests of minority shareholders are not as strongly protected as in the US (La Porta et al., 2002).

However, the situation changed due to emerging capital needs of German firms and liberalization of international capital markets since the 1990s (Fiss and Zajac, 2004; Cromme, 2005). For example, a number of firms began internationalizing their institutional investors by listing their stocks on the New York Stock Exchange. Further, various legal changes took place to improve the competitiveness of German firms on international capital markets (e.g. Equity Relief Act, Corporation Control and Transparency Act) (Tuschke and Sanders, 2003). Yet, international investors behaved reservedly, since the German understanding of corporate governance was perceived as underdeveloped and lacking in transparency (Cromme, 2005). Consequently, the German government initiated a commission to make corporate governance practices more transparent and comprehensive for foreign investors.

Additionally, German firms themselves voluntarily engaged in new accounting practices to enhance transparency and thus attractiveness. Firms interested in international investors switched to a valuation-based, capital market-oriented accounting philosophy by adopting Anglo-American accounting systems (Fülbier and Klein, 2015). By applying international accounting standards, firms respond to pressure to become more transparent and supply more reliable, timely, and relevant financial information to the capital market (Glaum, 2000).

Against the overall transition process from a stakeholder perspective toward a shareholder orientation, German firms can also adopt VBMSs to send a credible signal to investors, because VBMSs serve as corporate governance means to mitigate agency conflicts and reduce agency-related moral hazard problems (Lovata and Costigan, 2002; Dey, 2008). By signaling identification with the idea of shareholder value through VBMS adoption, firms can gain additional trust from

(foreign) investors. Therefore, we examine whether firms with strong information asymmetry between managers and shareholders are more likely to adopt VBMSs, because investors might be particularly concerned that these firms do not act in their best interest. To identify dimensions that affect information asymmetry and levels of agency conflicts, we refer to Lovata and Costigan (2002) and Dey (2008). In detail, we consider ownership structure, firm size, and the market-to-book ratio and further use the internationalization of sales as well as the degree of diversification. For these dimensions, we develop our hypotheses H1a to H1e in the following.

H1a: Ownership Structure

Publicly listed firms often have widely held ownership structures (Demsetz and Lehn, 1985), which is beneficial in the sense of optimal risk allocation (Fama, 1980). However, if managers do not own all of the residual claims, agency costs, such as monitoring costs, arise (Jensen and Meckling, 1976). Grossman and Hart (1980) show that minority shareholders have little incentive to engage in costly monitoring activities (screening) because it does not privately benefit the individual but, rather, serves as a public good (free-rider problem). However, without monitoring activities, information asymmetry between shareholders and managers remain high.

According to the German Public Companies Act, German listed firms whose free float is greater than or equal to 25% have no single shareholder with enough power to enforce all important decisions. For instance, the implementation of a controlling and profit transfer agreement generally requires the support of shareholders who hold 75% of the voting share capital. Therefore, the free-rider problem is particularly severe in firms without a shareholder holding 75% of the voting share capital, suggesting that shareholders have little incentive to reduce information asymmetry.

However, information asymmetry cannot only be reduced through screening activities but also be mitigated via signaling activities by the managers. Specifically, the adoption of a VBMS can serve as a cost-effective signaling mechanism, as outlined above. Against the background of

the transition process toward a shareholder value orientation, we expect that firms with a more severe free-rider problem are more likely to adopt VBMSs to enhance transparency and signal their attractiveness to investors. Therefore, we predict that firms whose free float is greater than the blocking minority are more likely to adopt VBMSs, leading to the following hypothesis.

H1a: Firms whose free float is greater than the blocking minority are more likely to adopt VBMSs.

H1b: Firm Size

Hypothesis H1b focuses on the relation between firm size and VBMS adoption. With increasing firm size, shareholders are less capable of monitoring managers' behavior. Since information asymmetry and the risk of moral hazard thus increase with firm size (Lovata and Costigan, 2002), shareholders could be less willing to invest in larger firms. Given an overall transition process toward a shareholder orientation, managers of larger firms could decide to adopt a VBMS to reduce investors' concerns, since VBMSs generally serve as internal control systems to reduce moral hazard.

Another line of reasoning stems from the relative advantages of voluntarily disclosing VBMS adoption for larger firms. The expenses associated with monitoring activities, such as VBMS adoption costs, are predominantly fixed (e.g., Anderson et al., 1993). This implies relatively lower costs to adopt a VBMS for signaling purposes for larger firms compared to smaller firms. Since larger firms also tend to receive more public attention and information demands from many stakeholders (Watts and Zimmerman, 1986), VBMS adoption is relatively more cost effective for larger firms.

Consequently, we predict that larger firms are more likely to adopt VBMSs and posit our hypothesis as follows.

H1b: A firm's likelihood of VBMS adoption is positively associated with firm size.

H1c: Market-to-Book Ratio

To a certain extent, financial accounting is (still) based on conservatism and realization principles, leading to a downward bias concerning the measurement of assets and earnings (Zhang, 2013). For instance, the balance sheet excludes various intangible assets such as growth potential and market shares. Further, the book value can be written down but is regularly not written up above its entry level. The market-to-book ratio reflects the difference between the assessment of what the market expects to be the economic value of common equity and the stated value in annual reports. It indicates the premium (or discount) the capital market assigns to the firm's net assets. Prior studies show that firms with high market-to-book ratios frequently outperform their peers as measured by subsequent stock returns (e.g., Fama and French, 1992).

Firms with high market-to-book ratios are well respected by investors and face less pressure to disclose value-relevant information voluntarily. In contrast, firms with low market-to-book ratios are regarded more critically by investors and must convince market participants to invest in their stocks. Prior research shows that hedge funds and other activist investors are more likely to target firms with relatively low market-to-book ratios (Brav et al., 2008; Klein and Zur, 2009). Since VBMS adoption is a potential means of voluntarily providing more insight into intangible assets, value drivers, and overall firm value, we predict it to be negatively associated with the market-to-book ratio of listed firms. If managers recognize a high value gap, that is, where the low market valuation of their firm is associated with a high degree of information asymmetry, and they are confident that the actual market value is higher than the current valuation, then VBMS adoption is an appropriate means for reducing this information asymmetry. This leads to the following hypothesis.

H1c: A firm's likelihood of VBMS adoption is negatively associated with its market-to-book ratio.

H1d: Internationalization of Sales

Organizational complexity is considered a crucial factor for information asymmetry and consequently moral hazards (Bushman et al., 2004). International firms often represent the most complex decision making environment (Prahalad, 1990). For instance, internationalization increases information processing demands, specialized knowledge of a firm's local operations, and ambiguity surrounding team members' actions (Nohria and Ghoshal, 1994). This leads to further information asymmetry for both firm insiders and outside shareholders. Consequently, agency problems are particularly severe in international firms. Prior research shows that firms adjust their governance structures accordingly, for instance, via larger top management teams and higher and longer-term CEO pay (Sanders and Carpenter, 1998). However, international firms must also deal with the increased level of information asymmetry between shareholders and managers. Since VBMSs are a potential means to signal goal congruencies to investors, we predict that the motivation to adopt VBMSs is significantly higher for international firms.

H1d: A firm's likelihood of VBMS adoption is positively associated with its degree of internationalization.

H1e: Degree of Diversification

Another indicator for organizational complexity is the degree of diversification (Dey, 2008). From an economic view, higher degrees of diversification suggest increasing information processing demands (Henderson and Fredrickson, 1996). Managers of diversified firms may have to deal with different operational styles and various corporate cultures among diverse segments (Bushman et al., 2004). To process information from different operational units, the necessary aggregation of problems leads to considerable information asymmetry between managing insiders and outside investors (Gilson et al., 2001). Thus, diversification represents a form of complexity, but it also implies greater managerial discretion compared to that of managers responsible for only one industry (Finkelstein and Hambrick, 1989). Although firms are required to disclose segment

data, such information suffers from imprecise segment presentation (Givoly et al., 1999). Hence, diversification leads to a high level of agency conflicts and therefore encourages VBMS adoption.

However, the literature shows that diversification is not in the interest of shareholders when they can diversify their own portfolios instead (Levy and Sarnat, 1970). Indeed, concentration on one selective business model or segment implies the highest transparency for the principal or shareholder. While well-diversified shareholders are primarily interested in a firm's symmetric risks, managers are also concerned with firm-specific risks, since they can balance unsuccessful projects only with other projects within the firm (Rappaport, 1986). Therefore, diversification is only in the interest of managers, because they generally receive greater private benefits (Jensen, 1986). Thus, it is especially important for diversified firms to signal a shareholder value orientation. Considering additionally the increased complexity of a diversified organization and its high information processing demands, we predict that VBMS adoption is more likely for diversified firms, since they can thus increase their credibility to investors.

H1e: A firm's likelihood of VBMS adoption is positively associated with its degree of diversification.

2.3.2 *Operating performance effects of VBMSs*

The adoption of VBMSs cannot only serve as a credible signal to overcome information asymmetry, but may also affect managerial decision making after the adoption. Specifically, VBMSs provide comprehensive opportunities to evaluate, monitor, and control managerial decision making (Malmi and Ikäheimo, 2003). Further, with increasing shareholder comprehensibility, actual managerial performance is less likely to be the target of window dressing, because VBMSs per se offer a wide variety of adjustments to control for distorting accounting effects (Young and O'Byrne, 2001). According to Wallace (1997), the usage of VBMSs should therefore lead to improvements in investing and operating decisions. Greater transparency

increases managerial awareness concerning efficient investment planning and efficient asset use (Balachandran, 2006; Wallace, 1997). These arguments are in line with prior findings of a positive effect of VBMS adoption on operating performance among Anglo-Saxon firms.

However, when investigating operating performance effects after VBMS adoption, it is important to consider the incremental effects compared to the existing accounting and control system (path dependency). In Germany, accounting systems are based on Eugen Schmalenbach's (1919) work on the necessity of separating financial and cost accounting for better decision support. Therefore, German and Anglo-American management accounting frameworks developed independently from each other and exhibit elementary differences even today (Günther, 2013).

One seminal variation that applies to our study is the German tradition of much more sophisticated cost accounting (Schildbach, 1997; Friedl et al., 2009). In particular, imputed costs, imputed interest, and imputed depreciation are widely accepted in Germany but widely unknown in Anglo-American cost accounting (Günther, 2013). Since imputed interests resemble the cost of capital in VBMSs, many German firms traditionally consider investors' expected rates of return in their decision-making processes. Consequently, German firms might exhibit a lower need for an evolutionary management and control system (such as a VBMS) when already applying certain value-enhancing instruments such as imputed interest charges or depreciation adjustments. Thus, the incremental benefits of VBMSs for decision making compared to existing management accounting systems may be small or even nonexistent.

Since it is therefore ultimately an empirical question whether or not VBMS adoption has a positive effect on operating performance among German firms, we take the conservative approach and posit the following null hypothesis:

H2:   The adoption of VBMSs has no effect on operating performance.

3   Sample and methodology

3.1   Sample

To test our hypotheses, we collect data for a comprehensive sample of German listed firms. As shown in Table 2, our initial sample consists of 364 equity securities listed in the German Prime Standard as of December 31, 2010. We select the German Prime Standard because it has the highest transparency requirements, includes all major German listed firms, and attracts considerable media and analyst coverage. Since our research question concerns the German setting, we exclude 28 foreign equities according to their International Securities Identification Number (ISIN). Further, we exclude 20 equities because the firms had both common and preferred stocks. Our final sample consists of 241 firms for which data are available. The sample period spans eight years, from 2004 to 2011, with 1,928 firm–years. Due to missing financial data of single firm–years, we end up with a panel dataset of 1,575 firm–years.

Table 2
Sample selection

	Total
Equity securities of the German Prime Standard as of December 31, 2010	364
Less: Foreign ISIN	(28)
Less: Double listings (common and preference stocks)	(20)
Less: Insufficient data available	(75)
Number of firms included in final sample	241
Maximum number of firm–years (8 · 241)	1,928
Less: Insufficient data of single firm–years	(353)
Number of firm–years in final sample	1,575

We focus on the German Prime Standard because its listing requirements are particularly sophisticated and it includes all major German listed firms. We exclude foreign firms and double listings. Within our sample period, 2004 to 2011, we analyze 241 different equity securities for eight years if sufficient data is available.

A fundamental issue in management accounting research is the lack of accessible data (Zimmerman, 2001). With regard to our study, data on the adoption of VBMSs is not publicly available via databases. While US-based studies thus generally rely on survey data, since US firms generally do not disclose information about their VBMSs in their US Securities and Exchange Commission filings, German firms use audited management reports to disclose VBMS adoption within their annual reports. Consequently, we follow Rapp et al. (2011) and conduct a content analysis of annual reports to hand-collect this information. Our data collection process is therefore not affected by a potential response bias (as is the case for survey data) and is based on one of the most prominent instruments that firms use for their capital market communication purposes. However, researcher subjectivity is a critical caveat of content analysis studies because it can affect data reliability and introduce noise in our empirical proxies. To mitigate potential concerns of subjectivity bias, we defined the coding scheme ex ante based on that of Ryan and Trahan (2007). In addition, two research assistants independently assessed each annual report. Then, we discussed and resolved conflicting assessments.

To collect the data, we carefully evaluated the latest annual reports of all our sample firms to determine whether a VBMS was in use and determined the respective year of adoption by searching for the annual report that first mentioned the VBMS.[4] We searched for relevant text passages, particularly in the management reports, to review whether a firm used a value-based performance metric as a key performance indicator and distinguish, similar to Fiss and Zajac (2004), between VBMS adopters and non-adopters. The corresponding dummy variable *VBMS* is

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[4] We also considered that firms that initially adopted VBMSs could subsequently abolish them. As we start our content analysis in 2011 and go back in time only for adopters, we could miss gathering the aforementioned constellation. Therefore, we checked for non-adopters if there had been a VBMS in use previously and carefully evaluated the annual reports for 2006 and 2009. We choose these years as they are two years ahead of our starting sample period and two years before the end. However, we do not find any case in which a VBMS had been removed. Interestingly, we find some cases of large firms (e.g., Allianz and ThyssenKrupp) that switched from more complex value-based performance measures (e.g., residual income metrics) to less complex measures, such as ROCE. Some firms explained this switch as being due to low communicational value for more complex measures.

equal to one if a firm declared using such a system and zero for firm–years with no information on VBMS adoption.[5]

We follow Ryan and Trahan (2007) and classify the following types as value-based performance metrics: absolute figures based on cash flows, return on investment ratios based on cash flows, absolute figures based on profit (residual income), and return on investment ratios based on profit.[6] In addition, we distinguish between VBMSs for performance measurement or for compensation purposes and examine whether compensation hinges on metrics that were classified as value-based performance metrics.

Subsequently, Table 3 provides a breakdown of our sample by industry, according to the two-digit Thomson Reuters Datastream industry classification, and VBMS adoption. In our analysis, 64 firms (26.6%) adopted a VBMS at the end of our sample period, while 177 (73.4%) are classified as non-adopters. Therefore, our portion of adopters is lower compared to that of Rapp et al. (2011), who report that 42% of their sample firms deployed a VBMS in 2008. Since our sample further includes, in particular, small firms that belong to the German Prime Standard (Rapp et al. 2011: HDAX and SDAX), it seems representative of the German capital market. Table 3 also reveals that many VBMS adopters belong to either the machinery/equipment or the chemicals industry, which is in line with the findings of Dekker et al. (2012) regarding the importance of value-based performance measures for firms with intensive asset use.

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[5] Throughout the paper, we refer to the term adoption also for firm–years in which firms actually *use* a VBMS.
[6] However, return on investment ratios based on profit, such as the return on capital employed (ROCE) or the return on net assets (RONA), do not directly consider the cost of capital. To ensure that firms are only considered as VBMS adopters if the performance metrics are in line with the overall VBMS concept, we paid special attention to 16 cases where firms reported only these metrics. First, we checked for statements in the annual reports indicating that firms compared these metrics to the firm-specific cost of capital. Second, if no indication was provided within the annual report, we contacted the investor relations department to assess whether a firm claiming to use, for example, the ROCE could be classified as a VBMS adopter. Whereas some investor relation departments were able to reliably answer our question, the majority either forwarded us to the respective department or reassured themselves before sending an e-mail reply.

Table 3
Industry classification

Two-Digit Industry Code[a]	Panel A: VBMS Adopters	Panel B: Control Group
16 Apparel	2 (3.1%)	3 (1.7%)
19 Automotive	4 (6.3%)	1 (0.6%)
25 Chemicals	9 (14.1%)	5 (2.8%)
28 Construction	3 (4.7%)	2 (1.1%)
31 Diversified	4 (6.3%)	1 (0.6%)
34 Drugs, Cosmetics, and Health Care	0 (0.0%)	12 (6.8%)
37 Electrical	3 (4.7%)	6 (3.4%)
40 Electronics	4 (6.3%)	31 (17.5%)
43 Financial	4 (6.3%)	20 (11.3%)
46 Food	1 (1.6%)	2 (1.1%)
49 Machinery and Equipment	10 (15.6%)	23 (13.0%)
52 Metal Producers	0 (0.0%)	1 (0.6%)
55 Metal Product Manufacturers	0 (0.0%)	2 (1.1%)
58 Oil, Gas, Coal, and Related Services	1 (1.6%)	0 (0.0%
61 Paper	1 (1.6%)	1 (0.6%)
64 Printing and Publishing	0 (0.0%)	2 (1.1%)
67 Recreation	0 (0.0%)	3 (1.7%)
70 Retailers	4 (6.3%)	4 (2.3%)
79 Transportation	3 (4.7%)	0 (0.0%)
82 Utilities	4 (6.3%)	5 (2.8%)
85 Miscellaneous	7 (10.9%)	54 (30.5%)
Total	64 (26.6%)[b]	177 (73.4%)[b]

[a] The industry classification is that of Thomson Reuters Datastream (WC06011). We use the first two digits of the actual four-digit code for a general overview of the final sample.

[b] The percentages relate to the total number for the column (either 64 or 177).

Besides, Table 4 illustrates the distribution of VBMS adopters in the final sample, sorted by year of adoption and type of value-based performance metric. The first adoptions in our sample took place in 1998.[7] Moreover, Table 4 reveals the increasing frequency of VBMS adoption for German listed firms over time. Regarding VBMS metrics, we find that some firms adopted more than a single performance measure (94 measures for 64 VBMS adopters). Moreover, our results show that value-based performance metrics based on cash flow—cash value added (CVA) and cash flow return on investment (CFROI)—are the least common. In contrast, the ROCE, return on invested capital (ROIC), and RONA are by far the most common measures, with 67.2% of adopters

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[7] For firms with a VBMS already in place in 2004, we analyzed prior annual reports to determine the year of adoption.

using them.[8] Compared to the findings of Ryan and Trahan (2007), our results suggest important country-specific differences in the adoption of value-based performance metrics, since the ROIC is the least used method among large firms in the United States while residual income-based metrics are the most frequently used.

Table 4
Distribution of VBMS adoption

Year of adoption	RI based on profit[a]	EVA® Spread	RI based on cash flow[b]	CFROI spread	Profit after RACoC[c]	ROCE, ROIC, RONA[d]	Total adoption (yearly)[e]	Cumulated rate of adoption	Compensation
1998	2	0	1	1	2	2	5 (7.8%)	5 (7.8%)	2
1999	3	0	1	1	1	2	4 (6.3%	9 (14.1%)	4
2000	1	0	0	0	1	5	6 (9.4%)	15 (23.4%)	4
2001	7	2	1	1	0	7	9 (14.1%)	24 (37.5%)	6
2002	4	1	0	0	0	1	5 (7.8%)	29 (45.3%)	4
2003	3	1	0	0	1	4	6 (9.4%)	35 (54.7%)	4
2004	0	1	0	0	2	2	3 (4.7%)	38 (59.4%)	1
2005	3	1	0	0	1	5	6 (9.4%)	44 (68.8%)	2
2006	1	0	0	0	0	5	5 (7.8%)	49 (76.6%)	2
2007	2	0	0	0	0	2	3 (4.7%)	52 (81.3%)	2
2008	1	0	0	0	0	1	1 (1.6%)	53 (82.8%)	0
2009	1	0	0	0	0	5	6 (9.4%)	59 (92.2%)	4
2010	3	0	0	0	0	2	5 (7.8%)	64 (100%)	2
Total	31 (48.4%)	6 (9.4%)	3 (4.7%)	3 (4.7%)	8 (12.5%)	43 (67.2%)	64 (100%)		37 (57.8%)

[a] Residual income (RI) concepts based on profit, for example, EVA.
[b] RI concepts based on cash flow, for example, Cash Value Added (CVA) or Cash Flow Return on Investment (CFROI).
[c] Profit after the risk-adjusted cost of capital.
[d] Return on capital employed, return on invested capital, and return on net assets.
[e] If a firm reports more than one value-based performance measure, we count the firm as a single adopter. Thereof, 16 firms exclusively use return on investment ratios based on profit. However, we carefully ascertained that these firms compare the measures with their individual cost of capital.

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[8] Recall that we treated firms only as VBMS adopters if they unambiguously declared they compared their return metric to their cost of capital.

3.2 **Methodology**

To formally test H1a to H1e, we test for systematic differences in firm-specific factors between VBMS adopters and non-adopters and follow a two-step procedure. First, we use parametric *t*-tests and non-parametric Mann–Whitney U tests to analyze group differences. Second, we test our hypotheses in a multivariate context to control for possible interfering effects. Given the panel data structure of our observations and the dichotomous dependent variable *VBMS*, we estimate a logistic panel data regression for dichotomous dependent variables (Rabe-Hesketh and Skrondal, 2008; Wooldridge, 2010). To determine whether a fixed effects model or a random effects model is employed (Greene, 2008),[9] we perform a Hausman test that rejects the fixed effects model ($p = 0.09$, two tailed, not tabulated). Further, when we compute a fixed effects logistic regression, our number of observations drops from 1,575 to 161.[10] Therefore, we decide to reject the fixed effects model and estimate the following random intercept logistic model for the binary outcome *VBMS* of firm *i* in year *t*:

$$VBMS_{i,t} = \quad \beta_0 \; + \beta_1 FLOAT_{i,t} + \beta_2 MCAP_{i,t} + \beta_3 MTB_{i,t} + \beta_4 FOS_{i,t} + \beta_5 DIV_{i,t}$$

$$+ \beta_6 ROIC_{i,t} + \beta_7 FCF_{i,t} + \beta_8 VOLAEPS_{i,t} + \beta_9 LEV_{i,t} + \varepsilon_i$$

where the dependent variable *VBMS* is equal to one for firms that adopted a VBMS in year *t* and zero for firms that did not.

Hypothesis H1a refers to the ownership structure and predicts VBMS adoption to be more likely if the firm's free float is greater than the blocking minority of 25%. Accordingly, the independent variable *FLOAT* indicates whether the free float is greater than 25% (1 = yes, 0 = no). Hypothesis H1b predicts that larger firms are more likely to adopt VBMSs. We use the variable

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[9]   Whereas a random effects model assumes that the between-entity error behaves randomly, the fixed effects model treats the between-entity error as a parameter that has to be estimated for each cross-sectional observation.

[10]   The fixed effects model loses many observations due to the "within center effect," which refers to the transformation of the dataset by centering each variable on its specific mean (Goldstein, 1995; Snijders and Bosker, 2012). Instead, the random effects estimator "partially demeans" each variable of the dataset, which means that only part of the mean is subtracted as opposed to the entire variable-specific mean (Rodríguez and Elo, 2003).

MCAP to proxy for firm size, which is defined as the market capitalization at the end of the respective firm–year. We deploy the natural logarithm in the regression analysis to consider the right-skewed distribution of this variable. Hypothesis H1c predicts that the market-to-book ratio is negatively associated with VBMS adoption. Therefore, we add the variable *MTB* to test H1c. To examine whether the degree of internationalization is positively associated with VBMS adoption (H1d), we add the variable *FOS*, which is defined as the share of foreign sales compared to total sales. Finally, we argue that the degree of diversification is positively associated with VBMS adoption (H1e). The corresponding variable *DIV* is defined as the residual percentage of sales that is not earned in the largest business segment.

We control for factors that could affect VBMS adoption and potentially confound our empirical analysis. Prior literature discusses whether firm profitability affects potential VBMS adoption (Lueg and Schäffer, 2010). We thus add *ROIC*. Moreover, Jensen (1986) predicts that conflicts of interest between management and outside shareholders are particularly severe when firms earn substantial amounts of free cash flow. Therefore, we control for the amount of free cash flow (*FCF*) divided by total assets. We also control for uncertainty regarding earnings development (*VOLAEPS*), measured by the standard deviation of earnings per share for the last three years, because shareholders can better monitor firms in a predictable environment (Demsetz and Lehn, 1985; Bloom and Milkovich, 1998). Finally, we control for firm leverage (*LEV*) because the extent of monitoring activities that debt capital provides can affect agency costs and thus the introduction of VBMSs (Myers, 1977). Table 5 summarizes the independent variables and provides details on their construction.

Table 5
Overview of independent variables for H1

Hypothesis	Symbol	Variable	Definition	Source
H1a	*FLOAT*	Free float proportion	Dummy variable equal to 1 if the free float is greater than 25%, 0 otherwise	Datastream
H1b	*MCAP*	Market capitalization	Natural logarithm of market capitalization	Worldscope
H1c	*MTB[a]*	Market-to-book ratio	Market value of equity divided by corresponding balance sheet values	Datastream
H1d	*FOS*	Foreign sales ratio	Foreign sales divided by (net) revenues	Worldscope
H1e	*DIV[a]*	Degree of diversification	(1 – sales of the largest business segment) divided by total sales	Worldscope
Control	*ROIC[a]*	Profitability	ROIC	Worldscope
Control	*FCF[a]*	Free cash flow	Free cash flows divided by total assets	Datastream/ Worldscope
Control	*VOLAEPS[a]*	Volatility of earnings per share	Standard deviation of earnings per share for the last three years	Datastream/ Worldscope
Control	*LEV[a]*	Leverage ratio	Long term debt divided by total capital	Worldscope

[a]   For our analyses, we winsorize the marked variables at the 1% and 99% levels.

With respect to H2, we investigate whether firms adopting VBMSs exhibit changes in operating performance in the post-adoption period relative to the year before adoption. We follow Ryan and Trahan (2007) by investigating operating performance for five years after VBMS adoption (years +1, +2, +3, +4, +5) and computing median changes in performance relative to the year prior to adoption (year -1) to identify systematic improvements over time (for a similar approach regarding the effects of leveraged buyouts, see, e.g., Guo et al., 2011). We exclude the year of VBMS adoption (year 0) from the analysis, since it is not unambiguously possible to disentangle pre- and post-adoption effects from each other. In addition, we compute the change in

performance in the pre-adoption period (years -2 to -1). Hence, we examine a time interval of eight consecutive years to draw conclusions on both the short- and long-run performance effects of VBMS adoption. Since our time span of observations ends in 2011 and we observe adoptions throughout until 2010, post-adoption data are not fully available for all observations (e.g., unadjusted ROIC -2 to -1, 55 observations; -1 to +5, 38 observations).

To assess the economic and statistical significance of pre- to post-VBMS adoption changes, we also compute benchmark-adjusted operating performance. Hereby, we follow the test design of Barber and Lyon (1996), which compares the percentage changes in a firm's operating performance relative to an industry benchmark. We define as a benchmark all firms belonging to the same industry group that refrain from using VBMS measures. We match the control firms with adopters based on their two-digit industry code and use the median performance of the benchmark as the benchmark value. In the case of missing control firms, we exclude the respective adopter from the analysis of industry-adjusted performance. Hence, the number of industry-adjusted observations can be lower than the number of unadjusted observations. The industry-adjusted change for each VBMS adopter represents the percentage change in the adopter's performance measure minus the median change of the corresponding control group's performance over the same period.

We test if both the unadjusted and industry-adjusted median percentage changes in the post-adoption period differ significantly from zero by using a non-parametric Wilcoxon signed rank test. Additionally, we test for differences in the pre-adoption period (years -2 to -1) to examine whether sample firms experience pre-event performance that is different from control firms.

The operating performance analysis includes two groups of business-related indicators. First, we use two profitability ratios: earnings before interest, taxes, depreciation, and amortization (EBITDA) divided by sales and the ROIC. We selected these indicators to provide financial ratios that are strongly linked to the firm's operating performance without distorting effects (e.g., interest

rate changes). Both measures are frequently used in business contexts, with EBITDA being closely related to operating cash flow.[11] Second, we analyze the effectiveness of asset utilization. Therefore, we divide EBITDA by total assets. Following Wallace (1997), we also examine a firm's asset turnover, measured by sales divided by total assets, and inventory turnover, defined as the cost of goods sold divided by the average inventory.

Finally, we consider Malmi and Ikäheimo's (2003) argument that differences in VBMS practices could have an important influence on a firm's operating performance. Therefore, we repeat all our analyses and investigate operating performance effects for VBMS adopters that also use value-based metrics for compensation purposes.

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[11] In fact, EBITDA and operating cash flow are identical if there are only cash-based earnings and expenditures.

4 Empirical analysis

4.1 Univariate results for the determinants of VBMS adoption

Table 6 presents descriptive statistics and our univariate results for VBMS adoption. Panel A summarizes the mean and median results for the whole sample, while Panel B (C) exhibits the mean values and standard deviation of firm characteristics for the subsample of firm–years with (without) VBMSs. Panel D reports the results for tests for differences.

Table 6
Univariate results (H1)

Independent Variables	Panel A: All Firm–Years (n = 1,575)		Panel B: Firm–Years with a VBMS (n = 390)		Panel C: Firm–Years without a VBMS (n = 1,185)		Panel D: Tests for Differences	
	Mean	Median	Mean	Standard Deviation	Mean	Standard Deviation	*t*-Test	Mann–Whitney U
$FLOAT^a$	0.928	1.000	0.985	0.123	0.910	0.287	$\chi^2 = 12.484$***	
$MCAP^b$	12.98	12.69	14.941	1.699	12.340	1.720	-25.986***	-21.317***
MTB^c	4.280	3.240	4.059	3.046	4.356	4.417	1.235	-1.159
FOS	48.076	50.000	59.603	21.797	44.283	28.221	-9.801***	-9.638***
DIV^c	34.968	36.396	44.135	19.175	31.951	21.367	-10.011***	-9.755***
$ROIC^c$	6.780	8.110	9.017	10.841	6.044	18.575	-2.997***	-1.379
FCF^c	0.062	0.069	0.080	0.060	0.056	0.119	-3.675***	-2.500**
$VOLAEPS^c$	0.926	0.425	1.215	1.467	0.831	1.470	-4.474***	-8.533***
LEV^c	24.466	21.360	32.522	17.990	21.815	22.715	-8.474***	-10.338***

*, **, and *** indicate significance at the 10%, 5%, and 1% levels (two tailed), respectively.
[a] Differences among the groups are tested for independence with the Pearson chi-squared test.
[b] Natural logarithm of market capitalization.
[c] Variables are winsorized at the 1% and 99% levels.

Consistent with H1a, firms with free float above the blocking minority level (*FLOAT*) are more likely to adopt VBMSs (mean 0.985 vs. 0.910), with $p < 0.001$ in a two-tailed test. In line with H1b, VBMS adopters are significantly larger than non-adopters are (mean 14.941 vs. 12.340), as indicated by *MCAP*, with $p < 0.001$ in a two-tailed test. Regarding the market-to-book ratio (*MTB*), VBMS adopters have, as expected, a lower mean *MTB* of 4.059, compared to 4.356 for non-adopters. However, the difference is not significant. Hypothesis H1d predicts that VBMS

adopters are more international than non-adopters are. In line with H1d, *FOS* is significantly higher for VBMS adopters than for non-adopters (mean 59.603 vs. 44.283), with $p < 0.001$ in a two-tailed test. Finally, VBMS adopters are significantly more diversified ($p < 0.001$) than non-adopters (mean 44.135 vs. 31.951), which supports H1e. Regarding our controls, Table 6 indicates that all control variables are important in explaining the adoption of VBMSs. VBMS adopters exhibit higher return rates and better asset use efficiency (a higher ratio of free cash flow to total assets). Furthermore, VBMS adopters display higher volatility in their earnings per share, which is in line with theory, since shareholders need better monitoring instruments in highly volatile environments. The leverage ratio is higher for VBMS adopters compared to non-adopters, indicating that VBMS adopters use the advantages of debt capital as a tax shield and bondholder monitoring more intensively.

Table 7 reports the Pearson and Spearman correlation coefficients among the independent variables. The correlation matrix suggests that multicollinearity is unlikely to affect our inferences.

Table 7
Pearson (top) and Spearman (bottom) correlations matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) *FLOAT*		**0.064**	-0.019	**0.095**	**0.067**	-0.049	**-0.051**	0.031	0.032
(2) *MCAP*	**0.050**		0.057	**0.242**	**0.262**	**0.253**	**0.169**	**0.164**	**0.293**
(3) *MTB*[a]	-0.017	**0.168**		**-0.085**	**-0.074**	0.014	0.022	-0.035	**-0.050**
(4) *FOS*	**0.098**	**0.242**	-0.032		**0.062**	0.042	**0.063**	0.104	-0.012
(5) *DIV*[a]	**0.059**	**0.237**	-0.033	**0.066**		0.041	**0.060**	**0.071**	**0.187**
(6) *ROIC*[a]	-0.048	**0.225**	**0.353**	0.034	-0.004		**0.540**	**-0.166**	**-0.130**
(7) *FCF*[a]	-0.043	**0.124**	**0.227**	0.051	-0.018	**0.404**		**-0.197**	**-0.074**
(8) *VOLAEPS*[a]	**0.059**	**0.243**	**-0.177**	**0.182**	**0.112**	**-0.173**	**-0.091**		**0.151**
(9) *LEV*[a]	0.042	**0.337**	**-0.124**	**0.067**	**0.166**	**-0.208**	**-0.136**	**0.248**	

This table shows the Pearson (top) and Spearman (bottom) correlation coefficients among the independent variables. The numbers in bold indicate significant correlations at the 95% confidence level.
[a]   Variables are winsorized at the 1% and 99% levels.

4.2 Multivariate results for the determinants of VBMS adoption

To test the association between the dependent variable and the explanatory variables, we conduct a logistic panel data regression for binary outcomes. Table 8 presents the results of the multivariate analysis. Model 1 contains the random intercept logistic regression, including the variables to test H1a to H1e. Model 2 displays the results, including the control variables. The chi-squared values of the likelihood ratio (LR) tests indicate that the independent variables are able to significantly separate VBMS adopters from non-adopters, with $p < 0.001$ in both models. In addition, all but one hypothesis testing variable contribute significantly to the explanation of VBMS adoption in both models. The respective McKelvey–Zavoina (1975) R^2 values are 36.5% for Model 1 and 38.4% for Model 2.[12]

Consistent with H1a, we find that VBMS adoption is more likely in firms whose free float is greater than the blocking minority. The coefficient of *FLOAT* is significantly positive in both models, with $p = 0.037$ ($p = 0.039$) in Model 1 (Model 2). Hypothesis H1b refers to firm size. The positive coefficient of *MCAP* ($p < 0.001$ in both models) supports our argument that larger firms are more likely to adopt VBMSs. Regarding the market-to-book ratio, we predict that firms with a lower market-to-book ratio are more likely to adopt VBMSs. Our results support H1c, since the coefficient of *MTB* is negative and significant in both models ($p = 0.015$ in Model 1, $p = 0.017$ in Model 2). Hypothesis H1d refers to the degree of internationalization. The positive and statistically significant coefficient of *FOS* ($p = 0.001$ in both models) suggests that firms that are more internationalized are more likely to adopt VBMSs. This finding is consistent with H1d. Finally, for H1e, the negative coefficient of *DIV* contradicts our expectation that diversified firms are more

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[12] We report McKelvey and Zavoina's R^2, since it is regarded as the appropriate estimation method for logistic regressions (DeMaris, 2002; Windmeijer, 1995), while using normal coefficients of determination for logit models makes it hard to find results (Snijders and Bosker, 2012). For instance, McFadden's R^2 underestimates the coefficient of determination (Veall and Zimmermann, 1992).

likely to adopt VBMSs. Further, the estimated coefficient is not significant in either Model 1 ($p = 0.216$) or Model 2 ($p = 0.250$).[13] Therefore, we find no support for H1e. One explanation could be that VBMS adoption leads to less diversification, since it induces a more shareholder-oriented management. For instance, the Siemens Group has been using an EVA-based management and control system for more than a decade (Neubürger, 2000), followed by a transition to a core operation-focused, less diversified enterprise (Boston, 2013).

Turning to the control variables, we find that VBMS adoption is positively associated with the free cash flow ratio (*FCF*), indicating that firms with a higher cash-generating efficiency are more likely to adopt VBMSs. However, the results are only marginally significant ($p = 0.073$). We also find a positive and marginally significant ($p = 0.070$) association between leverage and VBMS adoption. We do not find statistically significant coefficients for the other control variables. Therefore, neither firm profitability nor volatility are associated with VBMS adoption.

Table 8
Multivariate analysis (H1)

Model 1
$VBMS_{i,t} = \beta_0 + \beta_1 FLOAT_{i,t} + \beta_2 MCAP_{i,t} + \beta_3 MTB_{i,t} + \beta_4 FOS_{i,t} + \beta_5 DIV_{i,t} + \varepsilon_i$

Hypothesis	Variable	Expected Sign	Coefficient	Std. Err.	z	p > |z|[b]
H1a	*FLOAT*	+	3.444	1.655	2.08	0.037
H1b	*MCAP*	+	2.991	0.357	8.37	<0.001
H1c	*MTB*[a]	-	-0.248	0.102	-2.44	0.015
H1d	*FOS*	+	0.052	0.015	3.48	0.001
H1e	*DIV*[a]	+	-0.023	0.018	-1.24	0.216
	Intercept		-51.401	5.297	-9.70	<0.001
McKelvey–Zaviona R²			0.365			
Log likelihood			-230.15			
LR χ²			743.00			<0.001
Number of observations			1,575			

[a]   Variables are winsorized at the 1% and 99% levels.
[b]   The *p*-value is two tailed.

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[13]   Results are inferentially identical, except for the variable *FLOAT*, if we repeat our analysis while excluding the 16 VBMS adopters using ROCE, ROIC, or RONA as their standalone measure.

Table 8 (continued)

Model 2

$$VBMS_{i,t} = \beta_0 + \beta_1 FLOAT_{i,t} + \beta_2 MCAP_{i,t} + \beta_3 MTB_{i,t} + \beta_4 FOS_{i,t} + \beta_5 DIV_{i,t} + \beta_6 ROIC_{i,t} + \beta_7 FCF_{i,t} + \beta_8 VOLAEPS_{i,t} + \beta_9 LEV_{i,t} + \varepsilon_i$$

Hypothesis	Variable	Expected Sign	Coefficient	Std. Err.	z	p > |z|[b]
H1a	FLOAT	+	3.302	1.602	2.06	0.039
H1b	MCAP	+	2.982	0.343	8.69	<0.001
H1c	MTB[a]	-	-0.255	0.107	-2.38	0.017
H1d	FOS	+	0.052	0.015	3.45	0.001
H1e	DIV[a]	+	-0.020	0.017	-1.15	0.250
Control	ROIC[a]		-0.024	0.024	-1.03	0.303
Control	FCF[a]		6.870	3.838	1.79	0.073
Control	VOLAEPS[a]		-0.034	0.192	-0.18	0.858
Control	LEV[a]		0.032	0.018	1.81	0.070
	Intercept		-52.343	5.831	-10.27	<0.001

McKelvey–Zaviona R²	0.384	
Log likelihood	-227.08	
LR χ²	735.93	<0.001
Number of observations	1,575	

[a] Variables are winsorized at the 1% and 99% levels.
[b] The *p*-value is two tailed.

4.3   Results for operating performance effects

To evaluate whether VBMS adoption affects firm performance, we compute changes in operating performance measures relative to the year preceding the adoption.[14] Table 9 reports the results.

As shown in Panel A of Table 9, firm profitability, measured by changes in EBITDA over sales, is not significantly different post-VBMS adoption from that in the year preceding adoption. This holds for both unadjusted and industry-adjusted results. Regarding the ROIC, we find a significant change from year -1 to year +1 on an unadjusted basis, but not for industry-adjusted changes. When further analyzing long-term industry-adjusted changes, we find that the ROIC even

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[14]   We also compute changes in operating performance measures in the pre-adoption period (years -2 to -1). Table 9 provides evidence that pre-event performance of sample firms is not significantly different from control firms for all performance measures.

deteriorates from year -1 to year +5 by -22.34% ($p = 0.062$). Therefore, our results suggest that firm profitability does not increase remarkably after the introduction of a VBMS for our sample of German listed firms.

Panel B of Table 9 presents results regarding asset utilization. According to our measures EBITDA over assets, asset turnover, and inventory turnover, we find that asset utilization does not significantly improve after VBMS adoption. Moreover, our results indicate that asset utilization deteriorates from year -1 to year +5 for unadjusted and industry-adjusted asset turnover. Similarly, for inventory turnover, we find only weak support for positive results from year -1 to year +5 (on an industry-adjusted basis, $p = 0.099$), while all other results (unadjusted and industry adjusted) are insignificant. Overall, we conclude that VBMS adoption does not improve asset utilization in German firms.

According to Malmi and Ikäheimo (2003), only the integration of a VBMS into the compensation scheme reflects VBMS adoption in a genuine sense. Therefore, we repeat the analyses while restricting our sample to VBMS adopters using a value-based compensation scheme. As shown in Table 10, our results are inferentially similar and lead to the same conclusion, that German VBMS-adopting firms do not experience significant operating improvements in performance compared to non-adopters. Therefore, the empirical tests support H2, which predicts no change in operating performance following VBMS adoption for German firms.[15]

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[15] As with H1, we also perform sensitivity checks for H2 by excluding the 16 adopters using return on investment measures only. Thereby, we do find further deterioration of significance levels for both scenarios. However, these findings may be prone to decreasing sample size.

Table 9
Changes in operating performance relative to the adoption year (H2)

Panel A: Profitability

	-2 to -1	-1 to +1	-1 to +2	-1 to +3	-1 to +4	-1 to +5
EBITDA/Sales						
Unadjusted	2.61%	-0.28%	5.62%	1.41%	3.49%	-4.82%
(# observations; # positive)	(57; 31)	(59; 29)	(54; 32)	(49; 27)	(48; 27)	(44; 21)
Industry adjusted	3.35%	-2.35%	2.50%	1.19%	10.82%	-14.80%
(# observations; # positive)	(54; 29)	(57; 27)	(52; 30)	(47; 24)	(46; 26)	(42; 19)
ROIC						
Unadjusted	6.01%	**8.32%****	3.38%	-6.86%	-11.11%	-0.73%
(# observations; # positive)	(55; 29)	**(55; 31)**	(50; 25)	(49; 23)	(47; 22)	(38; 18)
Industry adjusted	13.66%	-0.77%	0.66%	1.30%	-5.71%	**-22.34%***
(# observations; # positive)	(47; 26)	(50; 23)	(44; 22)	(44; 22)	(41; 19)	**(36; 12)**

Panel B: Return on Assets and Asset Components

	-2 to -1	-1 to +1	-1 to +2	-1 to +3	-1 to +4	-1 to +5
EBITDA/Assets						
Unadjusted	0.74%	**4.32%***	-1.38%	2.13%	-3.39%	-2.71%
(# observations; # positive)	(57; 30)	**(59; 34)**	(54; 26)	(49; 26)	(48; 24)	(44; 18)
Industry adjusted	1.56%	-3.29%	-7.24%	-0.16%	-2.40%	-15.44%
(# observations; # positive)	(53; 28)	(56; 26)	(51; 22)	(46; 23)	(45; 21)	(41; 16)
Asset Turnover						
Unadjusted	0.34%	0.73%	-1.06%	-3.64%	-8.03%	**-9.52%****
(# observations; # positive)	(62; 31)	(62; 32)	(57; 25)	(51; 23)	(50; 22)	**(47; 17)**
Industry adjusted	-1.75%	-0.93%	-5.26%	-2.09%	-8.51%	**-7.94%****
(# observations; # positive)	(58; 26)	(59; 28)	(54; 21)	(48; 21)	(47; 19)	**(44; 18)**
Inventory Turnover						
Unadjusted	3.10%	2.51%	0.00%	-2.66%	-2.37%	2.56%
(# observations; # positive)	(56; 32)	(56; 33)	(53; 26)	(48; 20)	(47; 22)	(44; 24)
Industry adjusted	3.89%	-1.14%	2.34%	9.53%	4.38%	**16.78%***
(# observations; # positive)	(51; 31)	(53; 24)	(50; 27)	(45; 27)	(44; 24)	**(41; 25)**

This table presents median changes in performance indicators relative to the year ending prior to VBMS adoption (year -1). Year +1 is the first full year after VBMS adoption. The industry-adjusted percentage change is defined as the difference between the change for a VBMS adopter and the median change of a portfolio of control firms. The control firms are matched based on their two-digit industry codes. Statistical tests for the medians are based on Wilcoxon signed rank tests. The numbers in parentheses reflect total (first place) and positive (second place) observations due to the performed Wilcoxon signed-rank test. Asset turnover reflects sales divided by total assets, whereas inventory turnover consists of the cost of goods sold divided by the average inventory. The numbers in bold with *, **, and *** denote levels that are significantly different from zero at the 10%, 5%, and 1% levels, respectively.

Table 10
Changes in operating performance relative to the adoption year (H2, *compensation only*)

Panel A: Profitability

	-2 to -1	-1 to +1	-1 to +2	-1 to +3	-1 to +4	-1 to +5
EBITDA/Sales						
Unadjusted	3.26%	0.68%	5.32%	5.01%	4.97%	9.35%
(# observations; # positive)	(33; 19)	(34; 17)	(32; 20)	(29; 16)	(29; 15)	(26; 14)
Industry adjusted	8.37%	-1.46%	11.78%	-2.35%	7.04%	-9.39%
(# observations; # positive)	(32; 20)	(33; 16)	(31; 18)	(28; 13)	(28; 15)	(25; 11)
ROIC						
Unadjusted	4.58%	**8.33%***	-5.70%	-21.82%	-11.11%	2.55%
(# observations; # positive)	(29; 15)	**(31; 18)**	(28; 13)	(28; 12)	(27; 12)	(23; 12)
Industry adjusted	13.53%	-0.05%	4.67%	5.21%	-2.91%	-13.41%
(# observations; # positive)	(24; 13)	(28; 14)	(24; 13)	(25; 14)	(24; 11)	(21; 8)

Panel B: Return on Assets and Asset Components

	-2 to -1	-1 to +1	-1 to +2	-1 to +3	-1 to +4	-1 to +5
EBITDA/Assets						
Unadjusted	0.74%	**5.95%***	2.45%	**10.01%***	2.79%	4.12%
(# observations; # positive)	(33; 18)	**(34; 20)**	(32; 17)	**(29; 17)**	(29; 17)	(26; 14)
Industry adjusted	13.98%	-5.05%	1.09%	0.41%	-0.50%	0.02%
(# observations; # positive)	(31; 18)	(32; 15)	(30; 15)	(27; 15)	(27; 13)	(24; 12)
Asset Turnover						
Unadjusted	1.10%	1.58%	-0.53%	3.49%	4.61%	1.98%
(# observations; # positive)	(36; 18)	(36; 21)	(34; 15)	(30; 16)	(30; 18)	(28; 15)
Industry adjusted	-2.01%	-0.13%	-2.54%	-2.09%	-5.01%	-3.20%
(# observations; # positive)	(34; 14)	(34; 17)	(32; 13)	(28; 13)	(28; 13)	(26; 13)
Inventory Turnover						
Unadjusted	4.38%	2.68%	-0.08%	-3.04%	2.93%	8.81%
(# observations; # positive)	(33; 20)	(33; 19)	(32; 15)	(29; 11)	(29; 16)	(27; 17)
Industry adjusted	**5.15%***	-2.51%	2.24%	0.89%	9.56%	23.81%
(# observations; # positive)	**(30; 20)**	(32; 14)	(31; 16)	(28; 15)	(28; 17)	(26; 18)

This table presents the median changes in performance indicators relative to the year ending prior to VBMS adoption (year -1). Year +1 is the first full year after VBMS adoption, including compensation. The industry-adjusted change is defined as the difference between the change for a VBMS adopter and the median change of a portfolio of control firms. The control firms are matched based on their two-digit industry codes. Statistical tests for the median are based on Wilcoxon signed rank tests. The numbers in parentheses reflect total (first place) and positive (second place) observations due to the performed Wilcoxon signed rank test. Asset turnover reflects sales divided by total assets, whereas inventory turnover consists of the cost of goods sold divided by the average inventory. The numbers in bold with *, **, and *** denote levels that are significantly different from zero at the 10%, 5%, and 1% levels, respectively.

5   Conclusion

This study investigates the economic determinants of VBMS adoption in German listed firms. Further, we analyze the effects of VBMS employment on a firm's operating performance. In general, VBMSs are regarded as a means to mitigate agency conflicts by better aligning the interests of management and shareholders (Scheipers et al., 2003). Therefore, VBMSs strive to direct management behavior toward shareholder value creation. Moreover, managers are measured, evaluated, and rewarded based on what they achieved in the past period (Young and O'Byrne, 2001).

Prior research on the determinants and performance effects of VBMS adoption focuses on the analysis of Anglo-Saxon firms. The German setting offers an opportunity to advance theory for at least two important reasons. First, the German corporate governance system is characterized by a significant transition process from a stakeholder-oriented focus toward a shareholder orientation. Since German firms could adopt VBMSs to better communicate a shareholder value orientation, the setting allows us to develop theory that VBMSs can also be used for communication purposes, particularly when information asymmetry between managers and shareholders is high.

Second, German firms show a long tradition of cost accounting that embeds components such as imputed costs of equity capital, imputed depreciation, and other imputed adjustments, which represent the central elements of a VBMS. This characteristic enables us to investigate operating performance effects when the incremental benefits of VBMSs for decision making purposes are marginal, suggesting that VBMS adoption might not affect operating performance.

Our empirical results are in line with the specific characteristics of the German setting. More precisely, our empirical tests show that firms using VBMSs are large and have low market-to-book ratios and high foreign sales ratios. In addition, VBMS adoption is more likely in firms whose free float is greater than the blocking minority of 25%. Therefore, our results suggest that

firms are particularly likely to adopt VBMSs when information asymmetry is high, supporting the economic prediction that German firms use VBMSs as a signal to reduce information asymmetry and to appear more attractive to investors. With regard to the effects on operating performance, we find that operating performance does not change significantly after VBMS adoption. Overall, our results suggest that German listed firms introduce VBMSs mainly as a credible signal to investors, but not necessarily to improve decision making or firm performance.

Our study contributes in several ways to research that examines VBMSs. We focus on German firms, since the results of Anglo-American studies are hardly applicable to continental European markets due to, for example, different corporate governance attitudes (Goergen et al., 2008). We thus extend the research stream to investigating the reasons and firm characteristics for VBMS adoption in Germany. We show that German VBMS adopters have a strong interest in capital market participants and are more likely to adopt VBMSs when information asymmetry between managers and shareholders is high. Our theory and empirical results suggest that German firms thus adopt VBMSs for their investor communication and make firms more transparent and attractive to investors. Moreover, we provide further insight concerning whether VBMSs can significantly improve corporate performance (Ittner and Larcker, 2001). Our results show that VBMSs have no remarkable impact on the operating performance of German firms, even several years after adoption. Against the background that German firms use cost accounting systems that already incorporate the cost of capital as imputed costs, our analysis therefore indicates that the effects of VBMS adoption on operating performance depend on their incremental benefits. In addition, almost half of our sample firms uses VBMSs not for compensation purposes, which also puts into question the role of VBMSs as a means of improving operating performance. In sum, our study advances theory by showing that firms adopt VBMSs for investor relations purposes, stressing their signaling function, although the benefits for decision making purposes are marginal.

Our study offers several avenues for future research. First, by limiting the sample to listed firms, sample selectivity bias may influence the analyses, since listed firms likely belong to the most profitable firms (Börsch-Supan and Köke, 2002). While we primarily collect data on disclosed value-based information, we acknowledge that potential disclosure bias could, at least partly, underlie our study. Nevertheless, when only information on relative measures such as the ROCE was disclosed, we contacted the firm's investor relations departments to ensure its correct classification. Second, as Fiss and Zajac (2004) we assume a dichotomous variable to describe VBMSs. Hence, we do not differentiate between levels of VBMS sophistication (Burkert and Lueg, 2013) or investigate the proportion of value-based compensation related to the total bonus (Malmi and Ikäheimo, 2003). Research could therefore investigate the adoption of different levels of VBMS sophistication and their effects on operating performance. Further, it would be worth analyzing the interaction effect of VBMS sophistication and the sophistication of the cost accounting system on operating performance. Finally, we acknowledge potential caveats of the German setting. As the German stock market is small compared to the United States, our sample size is small. Further, it prevents us from using additional firm characteristics (e.g., firm size) to form the control group. The insignificant results for H2 may thus also arise from a lack of statistical power or an improper control group. Therefore, we interpret our results with caution. Finally, we acknowledge that a considerable part of our tests of H2 can be affected by the financial crisis. However, as we adjust these results by matching them with industry peers, potential performance effects should appear, though.

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Part II

The Use of Value-Based Management in Family Firms

ABSTRACT

This study examines determinants of the use of value-based management (VBM) and its performance measures in family firms. Family firms play an important role in the economy but for the most part, are without capital market orientation. While agency conflicts between free float shareholders and managers are thus unlikely to evolve a need for VBM, other types of agency conflicts can occur in family firms. Therefore, we conduct a survey and find, as predicted, that privately held family firms also tend to use VBM when they are facing current or upcoming agency conflicts. This is particularly the case when family firms have been concerned with managerial succession in the past and now exhibit a non-family executive board or if managerial succession will be a future concern. Moreover, a large extent of international business activities serves as another driver for the use of VBM. Thereby, VBM can help family firms to improve decision-making quality by enabling consistent and goal-congruent decision support and performance measurement. Overall, our findings provide a better understanding of management accounting choices and internal decision-making of family firms.

1 Introduction

In this study, we investigate firm characteristics that lead family firms to using value-based management (VBM). More precisely, we examine characteristics of family firms that are likely associated with the adoption and use of value-based performance metrics.

Family firms constitute an important part of the economy as 60 to 85 percent of all firms worldwide can be considered as family firms (Shanker and Astrachan 1996; Flören 1998; Klein 2000; Astrachan and Shanker 2003). However, these are not only small and medium-sized enterprises (SMEs). Instead, more than 35 percent of the S&P 500 Industrials Index can be classified as family firms (Anderson and Reeb 2003; Chen et al. 2008). Although research on family firms is steadily growing (Gedajlovic et al. 2012), management accounting studies on family firms are still rather scarce (Salvato and Moores 2010; Prencipe et al. 2014). Therefore, prior research repeatedly encourages deeper investigations of the role of (management) accounting in family firms (Moores and Salvato 2009; Prencipe et al. 2010; Gnan et al. 2011).

As such, VBM represents an important topic that has gained much attention in management accounting research, while being focused on listed firms. VBM constitutes an integrated management and control framework that encourages managers to engage in actions that maximize the owners' wealth (Rappaport 1998). Value-based performance measures are the central component to operationalize the abstract goal of wealth maximization. By comparing the firm's and/or managers' performance with the owners' claimed rate of return (Ryan and Trahan 1999; Dekker et al. 2012), VBM helps to align conflicting interests of managers and owners (Scheipers et al. 2003). In particular, value-based performance metrics aim to deliver unambiguous decision-making by revealing value-enhancing activities and providing goal-congruent monitoring (Malmi and Ikäheimo 2003; Pfeiffer 2004).

VBM seems particularly suited for capital market oriented firms, since (small) shareholders gain no individual benefit by engaging in costly monitoring which serves as a public good (*free-rider problem*, Grossman and Hart 1980). In contrast, family firms are typically characterized by a different ownership structure, with the family owning a large majority of shares and voting rights such that monitoring is rather effective (Anderson and Reeb 2003). Although the use of VBM seems less appealing to family firms, research on small and medium-sized enterprises demonstrates that SMEs—even if to a lesser extent—tend to use VBM (Gonschorek 2009; Krol 2009).[1] Thereby, Krol (2009) reports that nearly three fourths of his sample firms are family-owned. Consequently, some of them must be using VBM. Therefore, it seems an important question why firms that are not listed at a stock exchange and have no diverging owner interests should use VBM and still benefit from it. Overall, family firms should exhibit a lower level of agency conflicts since a personal union between owner and manager is likely and thus diverging goals between the firm and the manager are unlikely (Anderson and Reeb 2003; LeBreton-Miller and Miller 2006). Nevertheless, agency costs can also occur due to the family manager's lack of know-how concerning optimal decision-making (Schulze et al. 2003). In addition to this, the findings by Sirmon and Hitt (2003) suggest that family managers do not rely as heavily on formalized financial and accounting information as non-family managers do but on experience and gut feeling instead. Moreover, in rare cases it may be even possible that the family goals do not align with the specific firm goals (Davis et al. 2010). Therefore, value-based performance measures exhibit the inherent advantage to pursue goal-congruency and thus enhance decision-making quality. Hence, family firms—even without having agency conflicts typically related to free float shareholders[2]—may opt

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[1] SMEs and family firms are by far not interchangeable. However, there are certain overlaps, allowing it to transfer results from research on SMEs.

[2] Villalonga and Amit (2006) distinguish between "Type I" and "Type II" agency problems. Thereby, Type I describes the central conflict of interests because of the separation between ownership and managerial control. However, as family members usually serve as executive members or have a greater awareness of the executives'

to use VBM to improve their decision-making processes. In this study, we examine these possible peculiarities, which could influence the adoption of VBM in family firms.

We conduct our study using survey data. Our unique dataset contains 378 family firms listed in a database of a German research institute for family firms. By mailing paper based questionnaires and also enabling online participation, we received 46 usable responses. To operationalize VBM, we ask survey participants whether and how often their management uses five representative value-based performance metrics to account for the multi-faceted ways of VBM practices (Fiss et al. 2012).

We expect that family firms consciously decide to use VBM as an appropriate instrument to improve decision-making quality and to reduce agency conflicts. First, family owners being personally liable for the firm's debts bear the risk of failing and have strong incentives to ensure the best possible decision process. Further, the involvement of external managers due to planned or already completed external succession creates an environment of potential agency conflicts, in which the external managers have an information advantage over family board members that could result in opportunistic behavior. However, theory expects VBM to alleviate this conflict through value-based performance measures. Moreover, international business activities strongly increase decision complexity and uncertainty so that we predict family firms to rely on a goal-congruent concept of performance measurement. Empirical results from a regression analysis provide statistical support for our predictions that family firms use VBM when they are facing future or current agency conflicts. This is particularly the case when they are engaged in international business, are planning an external succession process or put already an external manager in charge.

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actions, it is likely that family firms require less monitoring than publicly listed firms (Jensen and Meckling 1976; Prencipe et al., 2014). Consequently, Type I agency conflicts are minimized. Type II refers to the conflict between controlling (family) owners and less influential minority owners. Controlling owners could therefore use their positions and information advantages to exploit the minority owners through shirking or free-riding (Wang 2006).

Our study contributes to the existing research on family firms in various ways. Most importantly, this is the first survey to investigate the use of VBM in family firms. Thereby, we add to Gonschorek (2009) and Krol (2009) who focus on SMEs in general, but do not investigate family firms exclusively. Thus, our scope lies on family firms that do not share substantial amounts of equity with other shareholders. Second, our study examines factors that promote the use of VBM in family firms. Therefore, we contribute to prior research that provides evidence of the general use of VBM in SMEs. Third, as Prencipe et al. (2014) point out that it is important to learn about the antecedents of management accounting choices and internal decision-making of family firms. Thus, we provide a rather new perspective that family firms are interested in improving their way of decision-making by using goal-congruent measures of VBM, especially when facing agency conflicts. If classical agency conflicts arise or are impending, family firms are also likely to use VBM as a means to reduce (future) agency costs. Finally, our study delivers new insights into the succession process of family firms by revealing how the owning family seems to establish VBM when being confronted with an executive succession to ease the transition for both family members and non-family members (Giovannoni et al. 2011).

The remainder of this paper proceeds as follows. Section 2 gives the background on VBM and family firms. Section 3 presents the hypothesis development, while Section 4 describes the method of our study. Section 5 presents the survey results and Section 6 concludes the paper.

2　Background and prior literature

In general, the relationship between shareholders and managers is considered as an agency relationship. The shareholder constitutes the principal who delegates certain responsibilities, such as decision-making authority, to managers who act as agents on behalf of the principal (Baiman 1990). In this situation, both the literature on property rights and agency theory indicate conflicting interests between shareholders and managers (Alchian and Demsetz 1972; Jensen and Meckling 1976). The shareholders' and managers' different incentives and the goal of utility maximization can result in managers not acting in the best interests of their shareholders. This problem intensifies when information asymmetry between shareholders and managers is high and the shareholder cannot verify the managers' actions without facing high costs (Eisenhardt 1989).

Value-based management is an approach to overcome these conflicts between managers and shareholders and to increase shareholder value. Rappaport (1981) identifies the creation of shareholder value as the main goal of managerial activities. Thus, VBM systems provide managers with instruments that should identify value-creating actions (Ittner and Larcker 2001). Ryan and Trahan (2007) identify four types of key performance indicators which are the central instruments of VBM systems: Discounted Cash Flow (DCF) methods (Rappaport 1998), Cash Flow Return on Investment (CFROI, Madden 1999), Return on Invested Capital (ROIC, Copeland et al. 2000), and Residual Income (RI) measures (Wallace 1997), e.g. the Economic Value Addes (EVA®, Stewart 1991). All these types of VBM metrics support shareholder value oriented decision-making by including the cost of capital (Pfeiffer 2004). Hence, VBM metrics enable managers and shareholders to identify value-creating investments by indicating whether a firm's assets generate returns in excess of the cost of capital.

Research on the adoption and performance effects of VBM focusses on listed firms. Listed firms are the most prominent example for the agency relationship between shareholders and

managers. Especially when the ownership structure is diffuse, owners have less control over the firm and agency problems occur (Berle and Means 1932; Dey 2008). Thus, prior research often investigates how agency conflicts influence the adoption of VBM. Lovata and Costigan (2002) show that compensation based on the EVA is more widespread in firms with higher agency conflicts. Based on a survey of publicly owned Canadian firms, Athanassakos (2007) finds that larger firms with younger and more educated executives with a background in accounting/finance are more likely to use VBM methods. Dekker et al. (2012) investigates the determinants of VBM metrics usage for performance evaluation. Based on a survey of Dutch firms, they find that the relevance of VBM metrics for performance evaluation increases with intensive asset use, delegated authority and reduced unit interdependencies. Burkert and Lueg (2013) rely on survey data of German HDAX firms to investigate the determinants of VBM sophistication. Their findings indicate that the managers' personal characteristics influence VBMS sophistication. In particular, they find that the chief financial officer's business-related education and short tenure is positively associated with VBM sophistication.

Taken together, VBM systems are often implemented when agency conflicts between managers and owners are high. Moreover, VBM is used more intensively by highly educated executives. This result shows that VBM is not necessarily just a means to overcome agency conflicts but a powerful management system in general. Specifically, VBM measures have an advantage over traditional performance measures in terms of goal-congruency and decision-making quality. Therefore, family firms may implement VBM systems even without having typical agency conflicts.

Prior literature on management and control systems in family firms investigates for example which of Ouchi's (1979; 1980) control types are used (Moores and Mula 2000) or how the involvement of founding family member's in the firm's management influences the use of

performance measures for incentive compensation (Speckbacher and Wentges 2012). The adoption of VBM in family firms, however, has not been examined thoroughly. Gonschorek (2009) and Krol (2009) focus on SMEs in general and do not investigate family firms exclusively. In his survey-based investigation of German SMEs, Gonschorek (2009) finds an association between the use of VBM and the size of the firm, the educational background of the management, the use of international accounting standards and the firm's culture. Krol (2009) finds similar results in his survey of German SMEs. He concludes, however, that VBM is not very common in German SMEs. Finally, in a more recent field study of 20 large family firms in Germany, Wenzel (2014) finds that VBM is not explicitly used in family firms and that these firms mostly rely on traditional performance indicators. However, all three studies on German SMEs or family firms provide evidence for at least some use of VBM. In this study, we therefore examine which factors promote the use of VBM in family firms.

3   Hypothesis development

Family firms are typically characterized by two types of governance structures. Either family owners serve as executives or family members occupy central board positions to monitor the executives' decisions. In both cases, the firm's owners have a greater awareness of the firm's actions compared to free float shareholders such that agency costs through opportunistic behaviour should be low to non-existent (Daily and Dollinger 1992; Gomez-Mejia et al. 2001; Chrisman et al. 2004). This "alignment effect" (Wang 2006; Ali et al. 2007) questions the contribution of VBM when there is no classical principal-agent constellation with information asymmetry leading to moral hazard and adverse selection (Ross 1973; Jensen and Meckling 1976).

Although family owners should have sufficient power to guarantee the firm's pursuit for their own interests (Anderson and Reeb 2003, 2004), the family firm is regularly the only asset to

pass on to future generations (James 1999). While family owners benefit from favourable business developments, the lack of adequate diversification lets them also severely suffer from poor business decisions. Hence, family owners have an increased interest in (1) firm survival and—after securing this goal—(2) maximization of firm value (Prencipe et al. 2014). These leading objectives should have direct consequences on strategies taken and the decision-making process. VBM promises to improve decision-making and consequently firm performance (Martin and Petty 2000; Morin and Jarrell 2001), which seems to be an appropriate complement of managing family firms.

Furthermore, research on family firms often takes on the resource-based view (Penrose 1959), meaning that family firms achieve returns by sustaining their competitive advantage through valuable and unique resources which cannot be imitated or substituted by competitors (Barney 1991; Teece et al. 1997). These "hard-to-duplicate capabilities" (Habbershon and Williams 1999; Habbershon et al. 2003) and resources such as human capital or the governance structure make family firms particularly suited for survival and growth and possibly different from non-family firms (Sirmon and Hitt 2003). From this perspective, we assume that family firms consciously decide to use VBM instruments to maintain or even to create competitive advantages since not every firm is concerned with VBM. Further, we predict that family firms use VBM because of their situational needs. Therefore, we argue that family firms expect these instruments to help them improve their current decision-making or analyse past performance. Thus, to investigate the use of VBM in family firms, we consider (1) aspects that reflect firm-specific needs due to family ownership and (2) complex situations of family businesses that call for enhanced decision support.

3.1   Personal liability

A family firm is considered the legacy of a family that shall be preserved for future generations such that family members are motivated to engage in long-term survival of the firm (Miller and Le Breton-Miller 2005; Miller et al. 2008). The extent of how actively family members

engage in business also affects how stakeholders perceive the firm's image and reputation (e.g. Chrisman et al. 2007; Miller and Le Breton-Miller 2006; Miller et al. 2008). As family firms exhibit a long-term orientation, maintaining and protecting the firm's reputation towards customers and suppliers is a critical success factor (Anderson et al. 2003; Wang 2006).

For example, Western European privately held banks are regularly organized as partnerships in which founding bankers are unlimitedly liable for the banks debts to increase trust and reputation. While it appears extremely risky to bear all the bank's debts, it also serves as a credible signal to stakeholders and serves as an implicit guarantee when the business partner incurs all debt. Although industrial family firms do not necessarily have to take the same risks as banks do, there is still a substantial amount of family firms to operate under the name of a partnership and guarantee with their names. With the risk of losing the capital brought in, the invested lifetime, and—overall—legacy, family firms that trade under a partnership should have an even higher interest to improve decision-making quality. In fact, VBM provides better decision-making quality through goal-congruent performance measures that are less prone to distorting effects. Hence, a family with personal liability is more likely to seek an adequate decision support by using VBM since their personal equity and legacy is directly concerned. We therefore posit H1 as follows:

H1:   *Family firms operating under the status of personal liability are more likely to use VBM.*

3.2   External succession

Since the beginnings of family business research, one of the most studied topics is the succession in family businesses (Handler 1994; Sharma 2004; Le Breton-Miller et al. 2004). Herein, one has to distinguish between a buy-out or ownership transfer and replacing former family executives. We want to study the latter aspect of executive succession since a change in ownership from family to non-family would make the examination of management accounting practices

within family firms obsolete. Moreover, executive succession can occur frequently when successive family members prove to be unqualified (Burkart et al. 2003; Perez-Gonzalez 2006) or are simply unwilling to take on the impending challenges.

Hillier and McColgan (2009) study the managerial succession process following the departure of family top managers and find evidence that new agency costs arise, supporting the management entrenchment hypothesis (Fama and Jensen 1983; Stulz 1988; Shleifer and Vishny 1989). These upcoming agency costs put family firms into a new situation. Whereas opportunistic behaviour has been virtually excluded before, hiring an external manager creates the classic setting of possible opportunistic behaviour while having a specialized agent without an ownership contribution (Jensen and Meckling 1976; Fama and Jensen 1983). In general, Giovannoni et al. (2011) find that the succession process constitutes a main catalyst to drive changes in management accounting. Therefore, introducing and using VBM measures *before* superseding the previous family executive, leaves the family owners in a better monitoring position. Using value-based performance indicators enables the determination of current equity growth. These historic values can now serve as the basis to compare the performance of the new external manager with prior performance without the danger of deception by earnings management or other window dressing instruments. Even when the external manager does not act opportunistically, it still remains an ex ante uncertainty, causing agency costs, which VBM helps to alleviate. Thus, H2 posits a positive association between the use of VBM and external succession.

> *H2:* *Family firms are more likely to use VBM when they are facing an external succession compared to an internal succession.*

3.3 External management

In accordance to H2, having an external management means that non-family succession has already taken place. The effects of integrating family outsiders into the management can be

bidirectional: On the one hand, an external management indicates the classical agency constellation of a separation of ownership and control (Jensen and Meckling 1976), causing opportunistic behavior through information asymmetry. In this case, value-based performance measures are an appropriate means to solve this conflict as it helps to provide a goal-congruent way of monitoring value-enhancing activities (Malmi and Ikäheimo 2003).

On the other hand, literature suggests that the close personal relationship between family owners and non-family managers leads the external manager to loyalty and the drive to preserve the trust of the family rather than maximizing the manager's financial return (Miller and Le Breton-Miller 2006; Prencipe et al. 2008). Furthermore, family members regularly exhibit superior knowledge of the business due to their (former) involvement in the firm's activities such that they can interact and possibly counteract managers when dysfunctional behavior is likely to occur (Anderson and Reeb 2003). However, as the external manager may indeed act in the interest of the family, value-based performance measures have a strong signal value (Rapp et al. 2011) that contribute to the notion of the manager acting in the best interest of the family owners. In this regard, the manager's voluntary self-monitoring delivers a good tool for performance evaluation and simultaneously increases trust. Overall, non-family managers have increasingly relied on new management accounting instruments in the past decades. This occurs because of intense competition, forcing external managers to exploit all available information to enhance decision-making quality (Cinquini and Tenucci 2010). Hence, we predict that the use of VBM is positively associated with the existence of non-family managers.

H3:   Family firms are more likely to use VBM when they have appointed external management.

3.4   International business

Frequently, family firms' competitive strategy relies on offering distinctive, niche products (or solutions) that are hard to imitate (Prencipe et al. 2014). However, highly specialized products offer only limited growth potential—unless the firm decides to sell its products in other regional markets. Such a move induces further organizational complexity and information asymmetry (Bushman et al. 2004). As such, international firms are considered to represent the most complex decision-making environment (Prahalad 1990). For instance, international business relations come with increased information gathering and processing demands, the requirement for specialized knowledge of a firm's local operations, and ambiguity regarding team members' actions (Nohria and Ghoshal 1994). Even if the family firm just takes an exporting role, it must deal with local warranty claims which may require local representative offices. Consequently, firms adjust their governance structures accordingly, e.g. via larger top management teams (Sanders and Carpenter 1998). Further, firms adjust their management accounting practices to cope with the increased complexity and information asymmetry. One appropriate means to manage complexity and increase decision support is the adoption of VBM. It allows family firms to deal with more complex situations and to control the development of international units. Finally, rivalry among international product markets brings family firms into contact with other market participants and their managing styles and techniques, enabling an exchange of previously less known concepts like VBM (Hansmann and Kraakman 2001). Taken together, we predict that firms who are faced with a high amount of international business activities are more likely to use VBM, which is reflected in the following hypothesis:

> *H4:   Family firms with a greater extent of international business activities are more likely to use VBM.*

4 Method

4.1 Sample description

To collect data for our empirical analyses, we conducted a survey among family firms using a unique dataset from a German research institute for family firms. Thus, we were able to contact 378 entries that are marked as family businesses. We sent paper based cover letters with a questionnaire and response envelopes attached. In addition, we provided a shortlink within the cover letter for participants who were willing to conduct the survey online.

In total, we received 68 responses, of which 63 were complete. This leads to a satisfying response rate of 17.7%. Two respondents added an informal comment that their firms have been acquired recently such that the firms cannot be considered as family firms anymore. Moreover, we exclude two firms for being listed at a stock exchange. These firms exhibit conflicting interests between family and outside shareholders. In addition, our questionnaire contains items derived from the F-PEC scale (with the subscales of *p*ower, *e*xperience, and *c*ulture), measuring the family influence or simply "familiness" of a firm (Astrachan et al. 2002; Klein et al. 2005). In detail, this scale includes items gathering the voting rights within the organization (*power*), the generation being actively engaged within the firm (*experience)*, and questions towards the understanding of family firms and their commitment to family business (*culture*). Following these questions, we exclude three responses since they reveal no considerable voting rights of the family and simultaneously lack compliance to the cultural subscale (mostly disagreeing with the influence of families on business). We exclude further ten responses from our analyses since these firms state to have less than 40 persons employed and a turnover of less than ten million euro (€3 million on average), questioning the possibility for an adequate management accounting and control system to evolve (Fisher 1995). Table 1 provides a breakdown of our sample.

Table 1

Sample selection

	Total
Addressees contacted	378
Received responses	68
Less: Incomplete questionnaires	(5)
Less: Family firms being listed at a stock exchange	(2)
Less: Non-family firms due to recent acquisition	(2)
Less: Non-family firms due to F-PEC scale	(3)
Less: Small family firms (<40 employees, <€10.000.000 turnover)	(10)
Final sample size	**46**

Most of our respondents serve as the chief executive of their family firm (71.7%), followed by heads of accounting department (15.2%), and members of the board (6.5%). The remaining respondents (6.6%) work in supporting departments such as corporate development or corporate communications.[3] Therefore, our sample seems appropriate for studying our hypotheses since the data has been provided by individuals with comprehensive knowledge about the firm's management accounting practices.

With 43.5%, the most common legal form of our surveyed family firms is limited partnership with a limited liability company as corporate general partner (GmbH & Co. KG). 28.3% operate under the form of a limited liability company (GmbH). The remainder (28.2%) consists of corporations (AG, SE; 13.1%), further mixed legal structures (e.g. GmbH & Co. KGaA; 8.7%), and partnerships (KG, OHG; 6.5%). Similar to the study of Hiebl et al. (2015), the majority of our sample firms (73.9%) belong to the manufacturing sector, while 17.4% are engaged in retail business and 8.7% state to provide services. Of the final 46 firms, average age is 104.2 years (median: 104.5), being in possession of the third family generation (median, mean generation: 3.7).

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[3] Since our survey gathers precise details such as annual turnover, full-time employees, or total assets, and nearly all of our respondents are representatives of the family firm, we refrain from inquiring further personal information to ensure respondents anonymity. Otherwise, we would have risked an increased number of incomplete queries or a reduced amount of responses. For this reason, we cannot provide clear details on respondents' average age or gender. However, this information appears to be less informative since we are interested in the firms' behavior and not the behavior of the firms' owners.

Average reported revenues account for €631.8 million (median: €145 million), while average full-time equivalent employees add up to 2,977 (median: 625). Table 2 depicts the aforementioned characteristics of our sample.

Table 2

Sample characteristics (n = 46)

Description	Absolute number	(Percentage)
Respondents' function		
Chief executive	33	(71.7)
Head of accounting	7	(15.2)
Member of the board	3	(6.5)
Corporate development/communications	2	(4.4)
Executive assistant	1	(2.2)
Family firm's legal form		
Mixed legal form (GmbH & Co. KG)	20	(43.5)
Limited liability company (GmbH)	13	(28.3)
Further mixed legal forms (e.g. GmbH & Co. KGaA)	4	(8.7)
Public corporation (AG)	4	(8.7)
European public corporation (SE)	2	(4.4)
Limited partnership (KG)	2	(4.4)
General partnership (OHG)	1	(2.2)
Firm age		
50 or less	8	(17.4)
Between 51 and 100	14	(30.4)
Between 101 and 150	20	(43.5)
More than 150 years	4	(8.7)
Full-time equivalent employees		
200 or less	14	(30.4)
Between 201 and 1,000	15	(32.6)
Between 1,001 and 5,000	11	(23.9)
More than 5,000 employees	6	(13.0)
Revenues (n = 45)		
Between €10,000,000 and €50,000,000	14	(31.1)
Between €50,000,001 and €200,000,000	13	(28.9)
Between €200,000,001 and €1,000,000,000	12	(26.7)
More than €1,000,000,001	6	(13.3)

Note: The percentages may not add up to 100% due to rounding errors.

Finally, to test for a possible response bias in our sample, we perform a two-sample *t*-test and a non-parametric two-sample Wilcoxon rank-sum test to check for differences in firm characteristics between the first and last thirds of received questionnaires. Thereby, we cannot find any significant indications for the tested variables (all *p*–values > 0.1, two-tailed). Consequently, we infer that a potential non-response bias is unlikely to affect the analyses of our hypotheses (Armstrong and Overton 1977).

4.2   Measurement model

Overall, our questionnaire consists of three main areas. First, general questions gather information about the firms' business activities, particularly surveying industry, legal structure, age, employee count and so forth. The second set of questions assesses firm governance and managerial accounting processes such as VBM. The latter category also includes the dependent variables, which form our VBM measurement. Finally, F-PEC scale serves as a supervisory element to enable a consistent identification whether the surveyed firm is indeed a family firm.

Regarding our dependent variable, a specific measurement of VBM use is hardly possible since various practices and levels of sophistication exist that aim to enhance equity's value (Malmi and Ikäheimo 2003; Burkert and Lueg 2013). Therefore, we use six value-based performance metrics to account for the multi-faceted ways of VBM practices (Fiss et al. 2012). At this, we ask survey participants to state whether and how often their management uses value-based performance metrics. We use representative concepts such as cash flow return on investment (CFROI) and economic value added (EVA®). Further, we accept measures based on "traditional" discounted cash flow (DCF) methods since value-based performance metrics target to compute the identical net present value of a DCF calculation (Preinreich 1937). Moreover, since one core objective of VBM is to include the cost of equity into investment decision-making (Scheipers et al. 2003), we also consider the use of cost of equity and weighted average cost of capital as indicators for VBM

usage. To avoid that respondents can draw conclusions on our research intentions (Podsakoff and Organ 1986), we embed our selected measures for VBM use into a set of indicators that are not necessarily value-based. Specifically, we provide further measures to choose from such as revenue, net profit, return on investment, or operating cash flow and mixed them with the aforementioned VBM measures. Thereby, the presented items do not explicitly give the impression to investigate VBM use of family firms.

We measure all items using a 7-point Likert scale on which respondents indicate how often they use a given indicator, ranging from one ("never") to seven ("very often"). To control for the possibility that respondents have no knowledge about the asked performance indicators, we also provide a box where they can check "unknown", which we count as zero. Combining these various value-based performance measures using a factor analysis allows us to control for discriminant validity. This is consistent with other studies discussing VBM on an aggregate level (Lueg and Schäffer 2010). In addition, multi-dimensional constructs appear particularly appropriate to capture theories within an organizational context (Hanisch et al. 1998; Edwards 2001).

To assess the personal liability of firm members for hypothesis H1, we query the firms legal form. Based on the legal form we can unambiguously determine whether the firm excludes family members from being liable for company's debt or not (*PERS_LIAB*). If the legal structure involves a partnership, we code this variable as one, or zero otherwise. Concerning H2, we include two questions regarding company succession plans. If respondents confirm that succession is in process or will be an issue soon, we code it as one. However, since H2 is only concerned with external successions, we additionally ask whether an internal succession is planned. Only if respondents affirmed the first question and stated that no succession is planned within the family, we assign *EXT_SUCC* as one. Furthermore, the F-PEC experience subscale assesses if family members serve as part of the executive team. When there is no family executive, we recode it as one in accordance

to H3 (*EXT_MGMT*). Finally, with regard to H4, we ask for the firm's export ratio compared to total sales (*INTL*). Due to reasons of anonymity and a low likelihood of getting exact values, we provide seven categories to choose. However, since these categories are not equally weighted, we assume a large international exposure when respondents quoted four or higher on a seven-point Likert scale, meaning an export ratio of about 50% or even higher. If the respondent answered this item with four or higher, we assign *INTL* as one. Therefore, having predominantly international sales highlights the special importance of foreign business activities for family firms and the related information asymmetry they have to deal with.

In addition to our main variables, we also analyze our independent variables with four control variables that could also explain our findings. We derive these variables by relying on prior studies on family firms or VBM.

First, firm size constitutes a frequently used variable since both management accounting research and research on family firms can repeatedly demonstrate significant associations between firm size and the studied dependent variables such as management accounting use or peculiarities of family firms (e.g. Klein 2000; Chenhall 2003; Lavia Lopez and Hiebl 2015). We use the natural logarithm of the number of full-time equivalent employees as a proxy for firm size (*EMPLOYEE*). Beyond that, several studies accompany firm size with additional firm characteristics such as firm age or industry sector (Schulze et al. 2001; Chrisman et al. 2004; Che and Langli 2015; Hiebl et al. 2015). We operationalize firm age with the natural logarithm of the respondents stated firm age (*FIRM_AGE*). With regards to the respective industry, we distinguish between manufacturing firms and firms belonging to the retail and services sector. This is because prior research indicates VBM usage to be most effective for firms being engaged in an asset-intensive industry (Wallace 1997; Balachandran 2006; Dekker et al. 2012). Therefore, we code firms with one when respondents state their firm to be in manufacturing industry and zero when respondents checked retailing business

or services, which typically comes with a low rate of fixed assets (*CAP_INTENS*). Finally, research on VBM provides evidence that management's educational background may promote VBM adoption and sophisticated use. Henceforth, Athanassakos (2007) finds that VBM usage is more likely when executives have an educational background in finance and/or accounting. Similarly, Burkert and Lueg (2013) find an educational background in business being positively associated with VBM sophistication. Consequently, we control for this potential driver when asking for the executive board's educational background. We distinguish between a business (one) and non-business background (zero) (BUSI_EDU). Hence, our final regression equation reads as follows:

$$VBM = \beta_0 + \beta_1 PERS\_LIAB + \beta_2 EXT\_SUCC + \beta_3 EXT\_MGMT + \beta_4 INTL$$
$$+ \beta_5 EMPLOYEE + \beta_6 FIRM\_AGE + \beta_7 CAP\_INTENS + \beta_8 BUSI\_EDU + \varepsilon$$

5   Results

5.1   Descriptive statistics

To ensure a reliable and valid measure of VBM use, we inquire how often the respondents use value-based performance indicators such as CFROI or EVA.[4] Since residual income models like EVA target to compute the same net present value as discounted cash flow considerations, we also consider net present value and discounted cash flows as eligible for our latent variable. Moreover, high dimensional factor loadings (DCF: 0.87; NPV: 0.65) statistically indicate that these indicators are equivalent to typical VBM indicators. To receive a one-dimensional factor measuring VBM use, we perform a principal-component factor analysis, testing how well the following indicators represent VBM as a construct: CFROI, cost of equity, DCF, EVA, NPV, and weighted average cost of capital. It is necessary to eliminate items whose factor loadings did not meet the

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[4] We use CFROI, DCF, EVA, NPV, cost of equity, and weighted average cost of capital as proxies. Table 3 provides a detailed overview.

required threshold. Hulland (1999) recommends a minimum loading of 0.40, while Hair et al. (1995, 2010) recommend 0.50 as an appropriate threshold. In our study, all items score a satisfactory individual item reliability of over 0.50. Construct validity (Cronbach's alpha) and composite reliability (CR) are also at a satisfactory level. However, the average variance extracted (AVE) fails to meet the Fornell-Larcker criterion (Fornell and Larcker 1981), which requires the AVE to be higher than the squared correlation between any two constructs (Hulland, 1999), i.e. 0.5. Therefore, we drop the indicator with the lowest factor loading (0.53), which is cost of equity. The extracted factor based on the remaining items leads to a Cronbach's alpha of 0.76. This indicates good construct validity. Moreover, a CR of 0.83 provides adequate support for convergent validity. The AVE is 0.52; the Fornell-Larcker criterion is therefore met. Table 3 lists all items used to measure VBM use of family firms and all independent variables.

Table 3

Descriptive statistics and measurement model estimates

Panel A: Latent constructs and survey items	Factor loading	Mean	Median	SD	Min	Max
VALUE-BASED MANAGEMENT (α = 0.76, CR = 0.83, AVE = 0.52)						
Please state how often your management uses the following performance measures. (1 = never; 7 = very often; 0 = unknown)						
vbm1 Cash Flow Return on Investment (CFROI)	0.63	4.04	4	2.20	0	7
vbm2 Discounted Cash Flow (DCF)	0.87	3.57	3	2.17	0	7
vbm3 Economic Value Added (EVA)	0.81	3.26	3	2.41	0	7
vbm4 Net present value (NPV)	0.65	3.91	4	2.22	0	7
~~*vbm5*~~ ~~Costs of equity*~~	~~0.53~~	~~4.15~~	~~5~~	~~2.52~~	~~0~~	~~7~~
vbm6 Weighted average cost of capital (WACC)	0.60	4.11	4.5	2.56	0	7

Note: α = Cronbach's Alpha; CR = composite reliability; AVE = average variance extracted SD = standard deviation.
* We exclude the item with the weakest factor loading in order to fulfill the Fornell-Larcker criterion.

Table 3 continued

Panel B: Independent variables		Mean	Median	SD	Min	Max
PERS_LIAB	Personally liable partners (binary)	0.59	1	0.50	0	1
EXT_SUCC	External succession scheduled (binary)	0.24	0	0.43	0	1
EXT_MGMT	Only non-family executives in place (binary)	0.26	0	0.44	0	1
INTL	International relations (exports to total sales)	0.37	0	0.49	0	1
EMPLOYEE	Logarithm of full-time equivalent employees	6.65	6.44	1.71	3.85	10.09
FIRM_AGE	Logarithm of corporate age	4.47	4.65	0.63	2.48	5.99
CAP_INTENS	Capital-intensive sector (binary)	0.74	1	0.44	0	1
BUSI_EDU	Executives with business background (binary)	0.96	1	0.21	0	1

Table 4 shows the Spearman correlation coefficients among the tested independent variables. Although two correlations appear to be significant at the 5% confidence level, the respective correlation coefficients are still well below 0.5 (with 0.331 being the highest coefficient), indicating only weak associations. Nevertheless, we compute the variance inflation factors (VIF) for our independent variables. With *EMPLOYEE* exhibiting the highest VIF of 1.38, this result is also well below both rules of thumb of 5 and 10, respectively (Chatterjee and Hadi 2012). Hence, these results suggest that multicollinearity is unlikely to infer our hypothesis tests.

Table 4

Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) PERS_LIAB	1							
(2) EXT_SUCC	-0.0473	1						
(3) EXT_MGMT	0.0962	0.0151	1					
(4) INTL	-0.0895	-0.1125	0.1605	1				
(5) EMPLOYEE	-0.1663	-0.1114	**0.3059***	**0.3308***	1			
(6) FIRM_AGE	-0.0483	-0.0884	-0.0784	0.0339	0.1452	1		
(7) CAP_INTENS	0.1049	-0.1312	0.2402	0.2497	0.1380	0.0168	1	
(8) BUSI_EDU	-0.1788	0.1195	-0.1161	0.1632	-0.1285	0.0723	-0.1267	1

Note: The table presents the Spearman correlation coefficients.
* $0.01 < p \leq 0.05$; $n = 46$.

5.2 Hypothesis tests

Considering the small sample size, we have to check for the applicability of a regression analysis first. Although our sample contains only 46 observations, Shapiro-Wilk W test does not reject the null hypothesis for normally distributed data ($p = 0.974$). Further, Breusch-Pagan test provides similar results, supporting the null hypothesis of homoscedasticity ($p = 0.622$). Therefore, Table 5 reports the results for the regression analyses. Column 1 presents the results for the main effects of hypotheses 1 to 4 only, while column 2 extends our model by adding the control variables. H1 predicts a positive association between the personal liability of the family (*PERS_LIAB*) and its proneness to VBM use. However, the regression analysis fails to provide significant support for our prediction ($p = 0.792$). H2 proposes a positive association between firms planning an external company succession (*EXT_SUCC*) and VBM use. The results presented in Table 5 support this hypothesis ($p = 0.032$). H3 predicts that the absence of family members holding an executive position (*EXT_MGMT*) will foster VBM use. The regression analysis supports this prediction ($p = 0.045$). Finally, H4 states that when the family firm exhibits a large extent of international

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business activities (*INTL*), it is likely to use VBM. Likewise, regression analysis indicates that family firms with a strong focus on international relationships reveal a significantly higher use of VBM ($p = 0.041$). Given the small size of our sample, these statistical findings appear even more considerable.

In support of these results, Cohen's f^2 measures the effect size of each variable and shall provide further insights into the independent variables impact on VBM use. More specifically, this measure focuses on differences of R^2 when excluding a particular independent variable. Values of 0.02, 0.15, and 0.35 indicate small, medium, and large effect sizes, respectively (Cohen 1988). The results depicted in Table 5 report that each variable but *PERS_LIAB* can contribute on its own to explain differences in variance of VBM use. However, the variables slightly miss the threshold of being considered as medium effect sizes, ranging from 0.105 to 0.12. Again, these results must be considered with regard to the small size of our unique sample. In sum, the four variables contribute to a satisfying R^2 of 19.2%.

Adding control variables does slightly increase explained variance to 19.8%. At the same time, significance levels of the independent variables remain stable such that H2, H3 and H4 stay significant. However, while *EXT_SUCC* ($p = 0.018$) and *INTL* ($p = 0.031$) experience even more statistical significance, the *p*–value of *EXT_MGMT* slightly deteriorates to 0.062. Moreover, as Table 5 shows, the control variables themselves cannot explain VBM use of family firms.

Table 5

Results of the linear regression analysis

Hypothesis (predicted sign)	Independent variables	Column 1: Main effects	Column 2: Control variables included	Support	Cohen's f^2
H1 (+)	PERS_LIAB	0.072 (0.792)	0.017 (0.953)	No	0.002
H2 (+)	EXT_SUCC	0.695 ** (0.032)	0.791 ** (0.018)	Yes	0.120
H3 (+)	EXT_MGMT	0.638 ** (0.045)	0.645 * (0.062)	Yes	0.105
H4 (+)	INTL	0.596 ** (0.041)	0.691 ** (0.031)	Yes	0.109
	EMPLOYEE		0.015 (0.873)		
	FIRM_AGE		0.305 (0.180)		
	CAP_INTENS		-0.139 (0.671)		
	BUSI_EDU		-0.985 (0.162)		
n		46	46		
Adjusted R²		0.192	0.198		
Model's F-Value		3.68 **	2.39 **		

Note: The table presents the results of the regressions with the dependent variable VBM. As control variables, EMPLOYEE denotes the natural algorithm of full-time equivalent employees, CORP_AGE denotes the natural algorithm of the firm's stated age, CAP_INTENS is coded 0 if the respondent states the firm to be in an industry with a low proportion of non-current assets (e.g. retail sector or services), and BUSI_EDU is coded 1 if the respondent attributes an educational background in business administration to the executive(s). The values presented for columns 1 and 2 indicate the regression coefficients, while the *p*-values stand in parentheses. Cohen's *f²* indicates the effect sizes, where the values of 0.02, 0.15, and 0.35 indicate small, medium, and large effect sizes, respectively. * $p \leq 0.1$; ** $p \leq 0.05$

5.3 Additional analysis

To further validate our latent variable measuring the use of value-based performance metrics, we derive items from Krol (2009) to gather respondents' attitude towards VBM. Henceforth, we posit the statement "*When making decisions, our company systematically considers effects on equity value.*", to which participants had to reply on a Likert scale ranging from one

("does not apply at all") to seven ("fully applies"). Regression analysis shows a highly significant positive association between our latent variable and the statement ($p = 0.006$, two-tailed, not tabulated). This provides further support that our operationalization works sufficiently.

Besides, we check for the possibility that a traditional performance measurement system could lead to the same significant associations. However, it is not possible to extract a satisfying factor variable since the items (e.g. net profit, return on investment, operating cash flow, gross margin) either show multidimensional correlations or suffer from poor item reliability (all Cronbach's alpha values < 0.63).

According to Günther (2013), the historic development of German cost accounting could lead to the point at which firms do not need value-based performance measures since German firms are already used to core elements of VBM figures such as imputed interests and imputed depreciations. Therefore, we asked respondents to estimate the frequent use of imputed interests, imputed depreciations, imputed rents, and imputed wages. Likewise, we perform a principal-component factor analysis and get a one-dimensional factor with satisfying results (all factor loadings > 0.66; Cronbach's alpha = 0.74).

Table 6 reports the statistics of the extracted factor and the results of a regression with the factor as the dependent variable. In contrast to VBM measures, the regression analysis cannot provide further support to imputed costs. Consequently, our hypotheses do not apply to imputed instruments, which may be seen as implicit VBM use. This seems rational as firms facing agency conflicts actively seek the decision support of value-based performance measures. Therefore, this analysis provides further support for our assumption that family firms consciously decide to use VBM, in order to preserve or even expand their equity.

Table 6

Additional analysis

Panel A: Latent construct and survey items

	Factor loading	Mean	Median	SD	Min	Max
IMPUTED COSTS ($\alpha = 0.74$, CR $= 0.84$, AVE $= 0.57$)						
imp_cost1 Imputed depreciations	0.66	5.93	6	1.54	1	7
imp_cost2 Imputed rents	0.73	5.09	6	2.19	0	7
imp_cost3 Imputed wages	0.74	4.48	6	2.61	0	7
imp_cost4 Imputed interests	0.88	5.07	6	2.14	0	7

Panel B: Linear regression analysis (dependent variable: imputed costs)

Hypothesis (predicted sign)	Independent variables	Column 1: Main effects	Column 2: Control variables included
H1 (+)	PERS_LIAB	0.435 (0.162)	0.421 (0.209)
H2 (+)	EXT_SUCC	0.408 (0.252)	0.351 (0.351)
H3 (+)	EXT_MGMT	0.095 (0.784)	0.211 (0.594)
H4 (+)	INTL	0.119 (0.707)	0.228 (0.531)
	EMPLOYEE		-0.071 (0.512)
	FIRM_AGE		-0.046 (0.859)
	CAP_INTENS		-0.236 (0.536)
	BUSI_EDU		0.004 (0.996)
n		46	46
Adjusted R²		-0.012	-0.092
Model's F-Value		0.68	0.83

6   Conclusion

This study examines characteristics of family firms, which could be associated with the use of value-based management. Although family firms typically lack a capital market orientation, the use of VBM instruments could be reasonable because they can improve decision-making quality by enabling consistent and goal-congruent performance measurement.

We conduct a survey using a unique dataset of 46 privately held family firms. By gathering general information about the organizational structure and information that are closely related to family-owned firms, we can make assumptions about the situational context of family firms prompting them to make use of VBM. We predict and find that family firms rely on VBM instruments when they are facing future or current agency conflicts. These conflicts are particularly salient when family firms have a large extent of international business activities and when they are facing an external management succession or put an external management already in charge.

With these findings, our study contributes to the existing research on family firms in various ways. While Gonschorek (2009) and Krol (2009) focus on VBM for SMEs and Wenzel (2014) performs a case study with 20 of the largest (publicly listed) family firms, we study a distinct setting of privately held family firms using VBM. With VBM being a further step in management accounting evolution, we provide new insights into the antecedents and drivers to implement this system of goal-congruent decision support. In particular, if classical agency conflicts arise or are impending, family firms are also likely to use VBM as a means to reduce agency costs. Finally, our study delivers new insights into the succession process of family firms. The efforts linked to an external succession seem to demand VBM to ease the transition from family executives to non-family executives.

Since our study is survey-based, it is subject to a number of limitations. As we are able to report relatively high means of value-based performance measure use, our sample could be subject

to self-selection bias. Further, our sample predominantly covers southern postal area codes in Germany, which may lead to interfering results due to the economically powerful region of southern Germany or eventually mutual cultural values. Nevertheless, our study also offers new directions for future research. Due to ambiguous study results of prior research, it is still unclear whether VBM can keep its promise to induce superior performance. Hence, it should be fruitful to study the performance effects of VBM-adoption for family firms. Moreover, it could be worth examining human factors that drive VBM-adoption in family firms such as family feuds. Lastly, our German setting may not transfer to other countries whilst other investor protection rules and diverging cultural values may lead to different drivers of VBM use. A replication study in other countries could therefore be a welcome contribution.

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Part III

Work hard, play hard? Gamification as a New Option of Incentive System Design to Increase Employee Motivation

ABSTRACT

Humans' affinity to play games makes it tempting to integrate gamification into business tasks. Gamification promises greater employee motivation and performance. However, appropriate gamification design strongly depends on the performance focus of the specific task. Using self-determination theory, I formally demonstrate that gamification for quality-type tasks (complex tasks that are challenging in a creative and cognitive way) must satisfy different psychological needs than tasks that focus on performance quantity (i.e., noncomplex tasks that are repetitive and mundane). Tasks with a focus on performance quality require gamified elements that support the employee's perceived autonomy, competence, and relatedness, such as individual avatars, unexpected rewards, and team chats. In contrast, quantity-type tasks have no considerable link to autonomous motivation and therefore, autonomy-supportive gamification can be omitted. Thus, gamification for quantity-type tasks cannot affect a motivational crowding-out and instead can use controlling elements such as trophies and leaderboard competitions. Still, from the perspective of self-determination theory, simple award and tournament schemes have the same motivational effects as their gamified counterparts. In light of the initial efforts, obligatory testing phase, and further maintenance involved, this issue calls into question the cost-benefit-ratio of gamification for repetitive and routine tasks.

1 Introduction

In this paper, I study the potential impact of gamification as an incentive option to increase employee motivation and performance. To demonstrate this assumed association, I conceptually use self-determination theory (Deci and Ryan, 1985; 2000; Ryan and Deci, 2000), a widely researched theory of motivation that has proven appropriate for investigating the motivation to play (video) games (Ryan et al., 2006).

Gamification refers to the idea of using "game design elements in non-game contexts" (Deterding et al., 2011a, p. 10). Game design elements, which motivate employees to develop a positive working attitude, promise a considerable boost to employee productivity (Nelson, 2012; Neeli, 2015). Thus, this topic has attracted substantial attention. In particular, American consultancies advertised the idea of using games to increase benefits to business (Werbach and Hunter, 2012; Deterding, 2015). However, successful gamification seems scarce: the Gartner research agency has claimed that more than 80% of firms' gamification implementations fail (Pettey and van der Meulen, 2012). Therefore, it is unclear what most firms do wrong and a fraction of firms does right in appropriately designing gamification. Here, I present the possible explanation that the specification of gamification does not fit the incentivized employee task, leading to either a crowding-out of intrinsic motivation (Frey and Jegen, 2001) or to frustration, and thus, a lack of motivation (Deci and Ryan, 2000).

Previous research on gamification has been concerned with defining the term gamification (e.g., Deterding et al., 2011a; Huotari and Hamari, 2011), testing the effects of single design parameters by using various theories from pedagogy and psychology (e.g., Nicholson, 2012; Meder et al., 2013; Robson et al., 2015), or using gamification to investigate consumer advertising (Bittner and Shipper, 2014; Robson et al., 2014). Hamari et al. (2014) examine gamification studies and find conflicting results regarding its effects on psychological and behavioral outcomes. Above all,

their literature review demonstrates that prior research applies psychological theories inconsistently and shows a lack of empirical sophistication. Thus, if studies would refer to a mutual and properly elaborated set of theories, their comparability and validity would be increased. Consequently, I propose a clear theoretical guideline concerning the effects of gamification use on employee motivation and performance using self-determination theory (Deci and Ryan, 1985; 2000; Ryan and Deci, 2000). Although self-determination theory is a general and widely applied theory on motivation, it seems to be particularly appropriate for examining gaming motivation because it has been successfully applied to explain humans' drive to play sports and leisure games (Frederick and Ryan, 1995; Hagger et al., 2003; Ryan et al., 2006; Sheldon and Filak, 2008). Individuals' drive to perform a specific task requires either extrinsic or intrinsic motivation. Extrinsic motivation leads the individual to perform a behavior to achieve an instrumental gain that lies beyond the task itself, whereas intrinsic motivation leads the individual to engage in a task for its own sake or enjoyment (Deci and Ryan, 1985). Extrinsic motivation can either support or undermine individuals' self-determined behavior, depending on the perception of the external stimulus as either autonomy-supportive or controlling (Ryan and Deci, 2000). Furthermore, the theory suggests a natural requirement to satisfy basic psychological needs such as autonomy, competence, and relatedness. Following this theory, I draw conclusions about particularly suitable elements of gamification that are useful for employee tasks that either focus on performance quality or performance quantity.

Tasks with a focus on performance quality regularly exhibit high degrees of complexity, creativity and cognitive interest (Cerasoli et al., 2014). Research finds that intrinsic motivation and autonomous extrinsic motivation are likely to have a relatively strong impact on performance quality (Lawler, 1969; Kruglanski et al., 1971; Wimperis and Farr, 1979). Autonomous extrinsic motivation requires individuals' internalization of externally provided regulations in their own

mindset. Thus, either individuals must accept the importance of the externally regulated activity as their own responsibility (identification) or the external regulation becomes an integral part of who the individuals believe themselves to be (integration) (Deci and Ryan, 2000). Both subtypes of autonomous extrinsic motivation—identification and integration—require feelings of perceived autonomy, competence, and relatedness to evolve. Thus, elements of gamification design must refrain from pressuring, frustrating, or excluding employees. Following self-determination theory, I posit elements of properly designed gamification that are in line with the motivational implications of quality-type tasks. To foster employees' perceived autonomy, the gamified activity can use elements that imply freedom of choice. For instance, narrative storytelling, meaningful missions or quests, and the option to create individual avatars works in that direction (Lindenberg and Foss, 2011; Liu et al., 2011; Dale, 2014). Similarly, gamification design must account for individuals' different types of preferred playing and therefore must enable various ways of mastering a mission (Bartle, 1996; Nicholson, 2012). Furthermore, the experience of competence requires non-pressuring feedback and unexpected rewards such as trophies and badges for successfully passing an adequately challenging action (Robson et al., 2015). Therefore, it is necessary to provide a balanced and adaptive level of difficulty and time limits (Rigby and Ryan, 2011). In addition, positive, informative, and immediate feedback summarizes one's progress towards goal completion (Deci, 1972; Rigby and Ryan, 2011). Enhancing relatedness can occur via team-leaderboards, cooperative missions, and team chats (Zhang, 2008; Rigby and Ryan, 2011). In sum, gamification for quality-type tasks must avoid controlling elements that lead employees' perception to shift from an internal to an external perceived locus of causality (Ryan and Deci, 2000).

Although firms may pursue autonomous motivation attributable to potentially greater employee engagement and performance (Connell and Wellborn, 1990; Miserandino, 1996),

employees do not always engage in interesting and enjoyable tasks that enable autonomy (Vansteenkiste et al., 2010). Research finds that quantity-type tasks, which are typically noncomplex, uninteresting, mundane, structured, and above all, repetitive, lead to an association with autonomous motivation that is weak to nonexistent (Lawler, 1969; Kruglanski et al., 1971; Wimperis and Farr, 1979; Gilliland and Landis, 1992). Thus, gamification for quantity-type tasks should omit autonomy-supportive elements, which are likely to have no effect. Instead, gamification design must focus on conveying feelings of competence and eventually feelings of relatedness. Thus, gamification for quantity-type tasks should use typically applied elements such as badges, trophies, and team-leaderboard competitions. Regarding the need for competence, the specific components do not differ largely between tasks that focus on quality versus quantity performance. Progress bars, missions, levels, adjustable difficulty levels and time limits, and immediate feedback are all components that support employees in their specific tasks. Team leaderboards bypass frustration and the deterioration of perceived relatedness caused by potential rivalries between employees.

However, it should be noticed that recommended elements such as badges and leaderboards are very similar to those used in tournaments (Lazear and Rosen, 1981) and awards (Frey, 2006). Both tournaments and awards enhance extrinsic motivation, increasing employees' performance. Although tournaments and awards lack the ludic experience of gamification, they do not demand tremendous efforts to implement and maintain a properly designed gamified workflow. Instead, framing may help overcome the issue of missing fun. Thus, gamification might not necessarily be the superior option for motivating effort in quantitative-type tasks.

This paper contributes to research and practice in several ways. From a theoretical perspective, I add to the growing body of gamification research. With respect to the diffuse deployment of psychology models of prior research, I provide clear arguments for the consistent

use of self-determination theory to analyze the effects of gamification on employee motivation and how it compares to other incentives. Furthermore, my study is the first to differentiate gamification use for tasks with a performance focus on quality or quantity, predominantly differing in the need for autonomy support. In addition, I posit that firms should reconsider the cost-benefit-ratio of gamification for quantity-type tasks because of the high implementation and maintenance efforts involved and the fact that tournaments and awards can also provide feelings of competence and relatedness through controlled extrinsic motivation, but at considerably lower costs. Finally, I provide recommendations to practitioners concerning proper gamification design to avoid failed gamification and achieve better employee performance.

This paper proceeds as follows: Section 2 provides the theoretical background of gamification and games. Section 3 introduces self-determination theory. Section 4 explains the effects of gamification on motivation, depending on whether the performance focus of the task is quality or quantity. Finally, section 5 discusses the implications, provides an outlook, and concludes.

2 Theoretical background of gamification and games

2.1 Gamification

The idea of gamification has several precursors that have either a military (e.g., Prussian officer training; Treat et al., 1996) or a communist background (socialist competition; Lenin, 1917; 1964). In the 1990s, Western management consulting firms discovered the idea of ludically easing work experience either to increase employees' motivation at low cost or to motivate employee performance and productivity that cannot be achieved with monetary incentives (Nelson, 2012).

When trying to define gamification, the definition that is probably the most cited is that of Deterding et al. (2011a, p. 10): "*Gamification is the use of game design elements in non-game*

contexts." Thereby, it is noteworthy that single elements of gamification are not necessarily exclusive to game contexts (Domínguez et al., 2013; Deterding et al., 2011b; Groh, 2012). However, Huotari and Hamari (2011) argue that both gaming experience and the discovery of the game per se are completely individual. Consequently, gamified activities must lead to ludic experiences. Further, they argue that with respect to the vague definition of game design elements the focus should be on user experience. Although Huotari and Hamari (2011, p. 19) define gamification as "a process of enhancing a service with affordances for gameful experiences to support user's overall value creation", there remains a question of whether certain game design elements will lead to the desired user experience. This is certainly the reason that previous research (and I) use the definition of Deterding et al. (2011a). They consciously formulate their definition in a way that is not restricted to a certain kind of game element, i.e., all game design elements may be considered for gamification.

Despite the short history of gamification, Burke (2014) claims that we are moving towards the "peak of the hype". Widespread attention developed shortly after the publications of Reeves and Read (2009), Zichermann and Linder (2010), and McGonigal (2011). Subsequently, American industry adopted the idea of gamifying activities to further develop applications that since early 2011 have frequently been summarized under the term gamification (Deterding, 2015). Thereby, gamification intends to leverage the business benefit provided by games (Werbach and Hunter, 2012). Consequently, gamification within firms shall only cover game design elements, which engage and motivate employees to develop a positive working attitude and exhibit productive behavior (Neeli, 2015). Hereafter, the case of Freshdesk illustrates an example of gamified business activities. Freshdesk provides helpdesk software for customer support departments. To do so, it transforms incoming customer mail or telephone inquiries into virtual tickets (Kauflin, 2015). Furthermore, helpdesk employees receive points, trophies, and status labels that appear on a

leaderboard if they solve an inquiry on the first try, have a quick response time, or gather outstanding customer ratings (Robson et al., 2016). Although it creates a real-time competitive environment, Freshdesk's gamification of routine tasks results in better employee engagement through decreased response times and increased job satisfaction (Finley, 2012).

There are a few terms related to gamification, but those terms are not equal to gamification. *Serious games* want to convey a purpose that goes beyond the actual game and is mostly related to education (Hamari and Koivisto, 2013). That notwithstanding, gamification will enhance existing systems or processes with ludic elements. *Persuasive technology* uses interactive computer systems to influence user behavior. For instance, Nike+ tracks current running performance and compares the data with those of other runners. A similar concept of directed behavior is *nudging* or libertarian paternalism (Thaler and Sunstein, 2003, 2008), which use subtle triggers to influence individual behavior. An example of this type of behavior is found in a Swedish subway station, in which citizens are encouraged to take the stairs in favor of the escalator. The stairs are authentically painted as a piano keyboard and make piano sounds so that more people tend to use the stairs. In contrast, gamification does not attempt to manipulate behavior for its own sake but instead attempts to stimulate underlying motivation that finally leads to the desired behavior (Hamari and Koivisto, 2013). *Pervasive games* use augmented reality to transfer games into public places, but those games remain games for their own sake with no higher purpose (Deterding, 2015). *Games with a purpose* denote a very similar concept to gamification. However, games with a purpose are designed to create pleasurable experiences within a closed game such as skill training as a part of tagging images (Eickhoff et al., 2012).

Prior research on gamification frequently concentrates on the development of gamified applications using the MDE framework by Hunicke et al. (2004). They posit that designers of a gamified activity have to consider the *mechanics* (rules and goals) and *dynamics* (following or

breaking the rules) it evokes. In addition, designers shall also draw attention to the participants' *emotions* because of their chosen mechanics and dynamics. Therefore, the MDE framework marks an important starting point when characterizing game elements as the essential basis of gamification.

2.2 Games and game design elements

Since the dawn of civilization, games have been a central element of everyday living (Avedon and Sutton-Smith, 1971b; Mäyrä, 2007).[1] Although games constitute a ubiquitous expression, research on games apparently struggles with a distinct definition. Caillois (1961, 9-10) posits certain criteria that games must fulfill:

"1. *Free*: in which playing is not obligatory […];

2. *Separate*: circumscribed within limits of space and time, defined and fixed in advance;

3. *Uncertain*: the course of which cannot be determined […];

4. *Unproductive*: creating neither goods, nor wealth, nor new elements of any kind […];

5. *Governed by rules*: under conventions that suspend ordinary laws […];

6. *Make-believe*: […] special awareness of a second reality […], as against real life."

With respect to the multidisciplinary origins of research on games, it appears questionable to find an appropriate definition of games (Avedon and Sutton-Smith, 1971a). In addition, the flexibility, ambiguity, and diversity of games can lead to the conclusion that definitional approaches can capture only one type of game correctly while failing at another (Mäyrä, 2007). Moreover, digital games seem to deteriorate the situation even more (Deterding, 2013). Nevertheless, Juul (2005, 36) attempts to merge definitions of games by restricting them to rule-

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[1] Impressive examples include the discoveries of a predecessor of a backgammon game in Egypt dating back to 2686 BC and Mesoamerican ball-playing games dating from 1400 BC (Juul, 2005).

based games. Accordingly, he states that a game is a rule-based system with the following specifications:

1. Variable and quantifiable outcomes,

2. Different outcomes that are assigned different values,

3. Players exerting effort to influence the outcome,

4. Players who feel emotionally attached to the outcome, and

5. Activities with negotiable consequences.

When analyzing Juul's (2005) definition, three attributes are salient. First, the definition lacks the dimension of voluntariness. Juul (2005) excludes voluntariness by stating that human motivation is too complex to distinguish between voluntary and mandatory. Instead, games target their self-purpose. Caillois (1961) argues that missing voluntariness leads to the point that playing loses a central part—i.e., affording pleasure. There is a distinct, and perhaps underestimated, difference between games and play (Groh, 2012). Indeed, Caillois (1961) posits that playing relates to the freedom of choice and voluntariness of actions, whereas gaming refers to a process with predefined and binding rules. Thus, I follow Juul (2005) and exclude voluntariness as a criterion for games. Deterding (2013) adds that gaming in a business context can lack voluntariness when an organization frames it as a socially shared set of conventions that override possible thoughts about voluntariness (Strong, 1979; Goffman, 1986; Stenros, 2010). Still, this consideration only concerns participating in the gamified activity, not the volition within the activity. Second, Juul's (2005) final criterion leaves open the possibility for a monetary reward (or gaming debts) because the consequences are negotiable. Third, the outlined components of Juul's (2005) definition only account for a game when taken together. Every single criterion could also stand for another phenomenon.

After investigating the given definition of Juul (2005) and the MDE framework, I conclude that a gamified activity must cover four specific components. First, clear *rules* are a vital part of games. They are also important to distinguish games from informal playing.

Second, gamification must include *achievement goals*, which is also part of Juul's (2005) definition. In general, achievement systems have a long tradition because badges or medals are frequently used for civil and military purposes and come with a direct (in)tangible reward (Anderson et al., 2013; Hakulinen et al., 2013). Elliot and Harackiewicz (1994) propose three different types of achievement goals: a mastery goal, a performance-approach goal, and a performance-avoidance goal. In particular, a mastery goal describes the intrinsic desire for competence in a specific task, whereas performance-approach and performance-avoidance goals are tied to extrinsic consequences but behave inversely. Performance-approach goals aim to achieve a favorable judgment, whereas performance-avoidance means the evasion of unfavorable judgments.

Third, *emotions* are significant because they induce curiosity and fantasy (Malone, 1981). Emotions develop because of the participant's involvement. Furthermore, game-related emotions can be social in nature, such as socializing as a part of a team or immersion through the exploration of new areas (Yee, 2006). Moreover, tutorials aim to avoid frustration as a negative feeling (Li, Grossman, and Fitzmaurice, 2012).

Fourth, *feedback* constitutes the final attribute, which can lead to rewards and enhance learning progress (Flatla et al., 2011). Feedback is especially likely to play a decisive role because it increases intrinsic motivation (Deci, 1972; Anderson et al., 1976). Hereafter, striving for competence and mastery leads to an inherent willingness to learn new abilities and improve existing skills (Ryan and Deci, 2004). Consequently, constructive feedback enhances job satisfaction and performance (Nadler, 1979; Baron, 1988; London, 2003).

Considering these four elements, which comprise the core of gamification, several parallels to self-determination theory become salient. Self-determination theory addresses external regulations or interventions, both of which can be seen as rules. Furthermore, it addresses emotions that arise after one achieves an objective or receives feedback. Overall, self-determination theory seems particularly appropriate for examining gaming motivation because the theory has been applied to many other recreational contexts, including sport (Frederick and Ryan, 1995; Hagger et al., 2003) and playing leisure games such as puzzles (Deci, 1975; Ryan et al., 2006).

3 Motivational foundations

In addition to task-specific abilities and an appropriate work environment, motivation marks a third influencing factor on individual work performance (Davidoff, 1987). Thus, motivation constitutes an important source of organizational success (Osterloh and Frey, 2000; Weibel et al., 2010), and the main target of gamification is to motivate employees to achieve better performance. Therefore, motivation determines the *level* of effort employees unfold during their work-related tasks, the *direction* of effort in favor of the delegated tasks, and the *time* during which employees can maintain their effort level (Robbins and Judge, 2008).

The absence of motivation—i.e., amotivation—leads to a state of lacking an intention to act (Ryan and Deci, 2000). In accordance with other motivation theories, self-determination theory (Deci and Ryan, 1985) posits that individuals' drive to perform a specific task requires either extrinsic or intrinsic motivation. In other words, both intrinsic and extrinsic motivation direct performance (Cerasoli et al, 2014). Extrinsic motivation leads the individual to perform a desired behavior to achieve an instrumental gain or outcome that lies beyond the task itself (Ryan and Deci, 2000). In contrast, intrinsic motivation leads the individual to engage in a task for its own sake or

enjoyment since it is not instrumental towards other outcomes (Deci and Ryan, 1985; Pinder, 2011).

As adults, individuals frequently do not engage in inherently interesting and enjoyable tasks. Instead, they must fulfill duties and responsibilities (Vansteenkiste et al., 2010). Therefore, firms consciously use external rewards that lead employees to satisfy their job requirements. Although it is very easy to create extrinsic motivation, this "carrot and stick" approach leads to the point that individuals will exert effort only to the extent they can reach the incentive and only until they have reached it (Vroom, 1964; Greene, 2011). Absent from such instrumental incentives, intrinsic motivation leads to the sense that the more individuals find a particular task enjoyable or identifiable with the self, the more they are likely to engage in the task (Patall et al., 2008). Thus, it is intuitive that intrinsically motivated individuals will exert more effort than their extrinsically motivated counterparts (Benware and Deci, 1984; Simons et al., 2004), even beyond the point at which they would have been rewarded (Deci, 1972; Grant, 2008). With respect to organizations, employees with intrinsic motivation not only show a higher persistence of desired behavior but also exhibit higher effective performance, particularly on tasks requiring creativity, cognitive flexibility, conceptual understanding, higher job satisfaction and organizational citizenship (Gagné and Deci, 2005).

Regarding these superior effects, research finds that positive feedback[2] (Deci, 1971) and optimally challenging activities (Danner and Lonky, 1981) enhance intrinsic motivation. However, extrinsically motivating incentives often tend to diminish intrinsic motivation (Deci, 1971) because they shift an individual's perceived locus of causality (deCharms, 1968) from internal to external (Ryan and Deci, 2000).[3] Subsequent research finds that deadlines (Amabile, et al., 1976) and

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[2] Interestingly, negative feedback decreases not only intrinsic motivation but also extrinsic motivation, leaving people amotivated (Deci and Ryan, 1985).
[3] This occurrence is also called "crowding-out" (Osterloh and Frey, 2000; Frey and Jegen, 2001).

competition pressure (Reeve and Deci, 1996) also undermine intrinsic motivation. However, other studies find conflicting results in which external incentives such as choice or self-direction increase intrinsic motivation (Zuckerman et al., 1978).

Self-determination theory answers these conflicting findings by introducing the perspectives of autonomous and controlled motivation. Henceforth, the degree to which motivation is autonomous versus controlled predicts the individual's behavior (Gagné and Deci, 2005). Primarily, the theory divides extrinsic motivation into subcategories. The outcome of extrinsically motivating incentives depends on whether the individual perceives the instrumental intervention as autonomy-supportive or controlling (Ryan and Deci, 2000). *Internalization* describes the process in which individuals incorporate externally provided regulations or values into their internal mindset such that exhibiting the desired behavior no longer requires the presence of an external contingency (Gagné and Deci, 2005). Deci and Ryan (1985) posit a continuum of internalization ranging from amotivation to active personal commitment depending on whether the incentive design is more controlling or autonomy-supportive. Therefore, a high level of internalization is critical for maintaining non-intrinsically motivated norms or behaviors (Vansteenkiste et al., 2010) and generally leads to better quality of engagement (Ryan and Deci, 2000). In other words, individuals align their behavior based on an external or internal perceived locus of causality (deCharms, 1968). Regarding the magnitude of internalization, Deci and Ryan (1985) distinguish among four types of extrinsic motivation with varying opportunities for autonomy: external regulation, introjection, identification, and integration.

To illustrate this continuum, one can say that intrinsically motivated behavior is prototypically autonomous (Gagné and Deci, 2005). At the other end of the continuum, *external regulation* follows amotivation and represents the least autonomous form of extrinsic motivation because the behavior feels controlled and is only performed to obtain an externally imposed reward

contingency (Ryan and Deci, 2000). Indeed, external regulation is the type of extrinsic motivation that studies have found to undermine intrinsic motivation (Deci et al., 1999). *Introjection* represents a partial internalization pursuant to which the individual tolerates the external regulation but that has not become part of the self-determined set of motivations (Perls, 1973; Gagné and Deci, 2005). Despite being partially internalized, the individual still perceives external control, rendering motivated behavior relatively unstable over time (Koestner et al., 1996). Instead, autonomous extrinsic motivation requires individuals' *identification* with the importance or value of the activity to accept it as their own responsibility for regulating the behavior (Deci and Ryan, 2008). Such an identified regulation leads to an internal perceived locus of causality and consequently to the point at which individuals do not feel pressured or controlled (Gagné and Deci, 2005; Deci and Ryan, 2008). Finally, *integration* describes the most developmentally advanced form of extrinsic motivation, i.e., individuals add the external regulation to their sense of self (Ryan and Deci, 2000). Thus, externally regulated behavior becomes an integral part of who individuals are and therefore is self-determined (Gagné and Deci, 2005). Firms may pursue identification and integration as autonomous types of extrinsic motivation, leading to greater engagement (Connell and Wellborn, 1990) and better performance (Miserandino, 1996).

However, it is noteworthy that the two autonomous subtypes of extrinsic motivation—identification and integration—do not belong to intrinsic motivation given that they are directed by external incentives. For instance, integrated regulation shares certain attributes with intrinsic motivation but remains extrinsic because the motivation arises from the externally provided activity, which is instrumentally important for other personal goals, not from the person's inherent interest in the activity (Gagné and Deci, 2005). In contrast, intrinsically motivated behavior means free engagement regardless of externally provided outcomes (Deci and Ryan, 2000). In sum, external regulation and introjection induce controlling motivation, whereas identification,

integration and intrinsic motivation are different types of autonomous motivation with increasing propensity. Moreover, it is possible to move on the continuum. An individual may experience an orientation shift when the externally rewarded activity permits learning about the activity's intrinsically interesting properties—and when the individual has initially identified with the activity but is later supervised by a controlling mentor (Ryan and Deci, 2000).

Moreover, both intrinsic motivation and internalized extrinsic motivation require the satisfaction of basic psychological needs (Gagné and Deci, 2005). These needs consist of the perception of *autonomy*, *competence*, and *relatedness* and constitute every human's need for optimal development and integrity regardless of individual differences (Ryan, Sheldon, Kasser, and Deci, 1996). For instance, Deci et al. (2001) find that the degree of satisfaction of employees' needs for competence, autonomy, and relatedness at work is positively associated with work engagement.

Autonomy concerns the experience of freedom or volition to self-organize and behave with one's sense of self (deCharms, 1968; Deci, 1980). Support for competence refers to offering optimal challenges and effectance-relevant feedback (White, 1959; Ryan and Deci, 2000). Finally, relatedness addresses the need to experience mutual care and concern for close others (Baumeister and Leary, 1995; Ryan, 1995). Indeed, individuals are more likely to internalize norms and values when superiors to whom people feel close (rather than distant) give them an understanding of the external intervention (Vansteenkiste et al., 2010). Ensuring the satisfaction of autonomy and competence needs form the basis for intrinsic motivation (Deci and Ryan, 2000). In contrast, introjection typically occurs in a controlling context. Thus, it does not require autonomy—but instead competence and relatedness—to evolve (Ryan and Deci, 2000; Markland and Tobin, 2010). More specifically, next to satisfaction of competence and relatedness needs, the existence (or degree) of satisfaction of the need for autonomy is what determines whether only introjection will

occur or whether it will be accompanied by identification/integration (Gagné and Deci, 2005). Table 1 outlines these associations.

Table 1
Classification of motivation[a]

Regulatory style	Amotivation	External regulation	Introjection	Identification	Integration	Intrinsic motivation
Type of motivation	Lack of motivation	Extrinsic				Intrinsic
Source of motivation	–	Controlled		Autonomous		
Internalization	–	–	Partial	Almost full	Full	Not necessary
Perceived locus of causality	Impersonal	External	Somewhat external	Somewhat internal	Internal	Internal
Psychological needs	–	–	Competence, Relatedness	Autonomy, Competence, Relatedness		Autonomy, Competence

[a] Adapted from Ryan and Deci, 2000; Vansteenkiste et al., 2010.

Consequently, appropriate gamification design must consider the aspects of autonomy-support, competence and relatedness needs when attempting to enhance employee motivation. Thus, it is likely that cases of failed gamification applications within firms may be subject to misleading design choices that undermine employees' motivation. Therefore, a proper gamification design must consider the foundations of humans' self-determination when attempting to enhance motivation and consequently performance. However, it appears problematic to generalize work performance since research has highlighted different causal relations for tasks emphasizing performance quality or quantity. Compared to *quantity* tasks such as repetitive or routine workflows, *quality* tasks typically exhibit high degrees of complexity, demand creativity and

overall are cognitively more interesting but more challenging (Gilliland and Landis, 1992; Cerasoli et al., 2014). Therefore, tasks with a focus on performance quality require more engagement or effort and an overall higher personal investment to succeed at the respective task, which is accompanied by the desire for less control and more autonomy (Ryan and Deci, 2000; Vansteenkiste et al., 2007). Accordingly, intrinsic motivation and autonomous extrinsic motivation are likely to have a relatively strong impact on performance quality but a negligible impact on performance quantity (Lawler, 1969; Kruglanski et al., 1971; Wimperis and Farr, 1979; Bakker et al., 2008; Simpson, 2009). In contrast, extrinsic incentives are likely to be more suited to predict quantity-type tasks (Jenkins et al., 1998). This is important with respect to possible gamification design choices, which could induce different motivational triggers. Thus, I subdivide my analysis of gamification into two parts based on the following research questions:

RQ1:   *What is an appropriate gamification design to enhance an employee's motivation for better <u>qualitative</u> performance?*

RQ2:   *What is an appropriate gamification design to enhance an employee's motivation for better <u>quantitative</u> performance?*

4   Motivational effects of gamification deployment

4.1   Employment focusing on performance quality

Autonomous motivation tends to yield better performance on complex tasks with a focus on performance quality that require creativity, cognitive flexibility, or deep processing of information, whereas it confers no advantage over controlled motivation for mundane tasks (McGraw and McCullers, 1979; Amabile, 1982; Grolnick and Ryan, 1987; Gagné and Deci, 2005). In contrast, many external incentives interfere with openness and creativity because of the counterproductive focus on reaching the incentive (Byron and Khazanchi, 2012). Consequently,

gamification—which remains an external contingency—must concentrate on enabling autonomous extrinsic motivation, i.e., identification or even integration. With respect to rules as a decisive element of games, gamification must find the right regulation between supporting organizational goals and supporting employees. To do so, appropriately designed gamification must consist of elements that lead employees to accept the regulated behavior or that lead to the point at which employees integrate the regulation into their own mindset. As noted above, the main component that contributes to the buildup of these forms of autonomous extrinsic motivation is satisfaction of the psychological needs of autonomy, competence, and relatedness. Therefore, appropriate gamification design must constantly ensure the satisfaction of those needs.

Above all, computer-based gamification offers widespread opportunities to foster employees' *perceived autonomy*. In particular, the gamified activity should make use of storytelling in the sense of building a narrative and interesting storyline (Dale, 2014). A fictional or even fantasy setting opens up individual freedom to experiencing novelty and fun, socially interacting with other participants, or at least accomplishing fictional missions or quests to obtain rewards that are bestowed after the accomplishment. Moreover, such missions are a special form of goal framing (Lindenberg and Foss, 2011), which implies higher commitment and responsibility. Given an immersive storyline, the gamified activity must provide the possibility for employees to interact with the story and experience changes that are primarily caused by their own actions, which refers to the autonomy of choice. Nevertheless, these choices must be meaningful (Vansteenkiste et al., 2010). Another item, which is related to freedom of choice, is the option to create individual avatars that are to one's own taste (Liu et al., 2011). Customizable avatars add to perceived autonomy such that employees can identify with their story-experiencing protagonist; in addition, such avatars supplement a factor of relatedness. The simplest form of an avatar is a customizable profile image, which does not necessarily require computer-based gamification. However, in most cases,

gamification is tied to a computer-based application, which enables far more options. For instance, the gamified activity can provide elements of role-playing games that allow avatars with different clothing styles, hairstyles, tattoos, skin tones, etc. Peng et al. (2012) and Shi et al. (2014) find support for a positive association between a free choice of avatar and perceived autonomy because a player with a freely chosen avatar is likely to identify with the game's protagonist.

Experiencing *competence* involves the perception of satisfying feelings during or after successfully completing a challenging action, which is accompanied by rewards or other positive feedback (Rigby and Ryan, 2011). Flow theory (Csikszentmihalyi, 1991) similarly implicates positive feelings after mastering an optimal challenge. Therefore, gamification design must ensure a balanced level of difficulty and time limits, leading to achievable goals and personal improvement (Rigby and Ryan, 2011). In addition, computer-based gamification can enable an adaptive level of difficulty and time limits so that (too much) frustration can nearly be ruled out. Since the interaction between goals and feedback directs performance (Locke and Bryan, 1969; Latham et al., 1978), it is essential to provide summary feedback that illustrates employees' progress towards goal completion (Locke and Latham, 2002; 2006). After achieving both ambitious and balanced goals, feedback must also be positive and informative to foster employees' perceived competence and ongoing performance (Deci, 1972; Rigby and Ryan, 2011). It is particularly important for negative events such as poor performance to be conveyed in a manner that does not frustrate the player. Although giving feedback and eventually bestowing a reward constitute external events, introducing them in an informational manner increases the likelihood that the employee perceives it as competence-relevant and non-controlling (Deci and Ryan, 1985). Accordingly, the term "informational" refers to a non-judgmental, transparent and comprehensible method of providing feedback (Vansteenkiste et al., 2010), without incorporating controlling or pressuring elements (Gagné and Deci, 2005). Beyond that, computer-based gamification should use its ability to provide

immediate feedback, which is potentially more pleasurable than feedback on a discrete basis (Juul, 2012; Vorderer et al., 2012). This can occur via progress bars, experience points, and level-ups (Antin and Churchill, 2011; Singer and Schneider, 2012; Hsu et al., 2013). Computer-based gamification can also use these resources to illustrate positive feedback via visual and sound effects. In addition to experience points and levels, firms should use leaderboards (Farzan et al., 2008), preferably team-leaderboards, which can fulfill the psychological need of relatedness.

Team-leaderboards induce feelings of *relatedness* while belonging to a meaningful group (Rigby and Ryan, 2011). Moreover, they foster cooperation within the team through constructive-minded competition (Burguillo, 2010; Robson et al., 2015). Above all, they alleviate the counterproductive aspect of individuals' competition, which may lead to sabotage when rankings are based on individual performance (Song et al., 2013; Charness et al., 2014). In addition, one-on-one competition has been found to undermine creativity and autonomous motivation, directly weakening the main purpose of gamification (Amabile et al., 1990; Reeve and Deci, 1996). To enhance the sense of belonging to a team, it is possible to embed non-player characters within the narrative storyline (Rigby and Ryan, 2011; Groh, 2012). In addition to communicating with computer characters, team chats (Zhang, 2008) are another way to enhance employees' relatedness. Finally, unexpected achievement rewards with social significance (e.g., badges, trophies) indicate social standing within the team and are powerful signals of employees' success and development (Robson et al., 2015).

Although self-determination theory posits that the psychological needs of autonomy, competence, and relatedness are relevant to every individual, the need for autonomy simultaneously requires the freedom for participants to perform the gamified task based on their preferred type of gaming. Bartle (1996) distinguishes between four types of players: achievers,

explorers, socializers, and killers.[4] Achievers will be focused on elements documenting competence, explorers will be interested in discovering novelty due to the storyline, socializers will benefit from elements of relatedness, and, so-called killers will highly value status incentives from a leaderboard (Nicholson, 2012). Thus, gamification design must satisfy humans' general psychological needs. However, autonomy as one of those needs requires perceived freedom and volition, which translates into providing a variety of ways to act out personal player preferences, e.g., offering several ways to master a task.

Furthermore, it is important for firms to pay attention to reward provision within gamified tasks regardless of their tangible or intangible value. Applied gamification designs frequently incorporate a focus on badges and comparable achievements, which crowd out autonomous motivation caused by employees' expectations of the reward leading to a shift from an internal to an external perceived locus of causality (Deci et al., 1999; Bénabou and Tirole, 2006). To avoid this shift, firms can choose between two options. First, the rewards must be in line with the desired behavior (e.g., features to master the task such as level-ups and improved tools). Second, given that even a creative task can be exhaustive and can come with decreasing fun, it is also possible to bestow rewards that lie beyond the task (e.g., refreshments, gratifications). Nevertheless, to avoid the potential shift of the locus of causality, unexpected rewards should be administered only after completion of task engagement and cannot either thwart autonomy or be perceived as controlling (Vansteenkiste et al., 2010). In addition, it is important that these performance rewards come without salience and immediacy such that employees cannot directly work towards the firm's desired behavior to attain the reward (Greene, 2011; Gallus and Frey, 2016). Accordingly, achieving the unexpected reward encourages employees to believe that their recently performed

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[4]   *Achievers* are driven by attaining goals, gaining new levels, and accumulating experience points. *Explorers* want to find out as much new impressions as possible. *Socializers* utilize the gaming platform to interact with other participants. *Killers* want to distress other players, thus promoting their own satisfaction.

activities are important and appreciated. Thus, the individual mentally integrates the employer's goals and values as a part of his or her personal sense of self given that the employer rewards previous behavior. In sum, unexpected rewards enhance identified regulation or integrated regulation and potentially increase the employee's interest in the activity itself.

4.2   Employment focusing on performance quantity

Quantity-type tasks tend to be noncomplex (requiring no substantial cognitive judgments), repetitive, mundane, structured, and generally less intrinsically interesting and enjoyable than quality-type tasks (Gilliland and Landis, 1992; Cerasoli et al., 2014). In addition, employees are likely to experience such tasks as pressuring them towards a particular outcome and controlling them (Deci and Ryan, 1985; Frey, 1994). Thus, the link between tasks that emphasize performance quantity and autonomous motivation is weak to nonexistent (Lawler, 1969; Kruglanski et al., 1971; Wimperis and Farr, 1979). In contrast, the prospect of instrumental gain provided by extrinsic incentives better predicts employee behavior during quantity-type tasks (Jenkins et al., 1998). Because of the negligible association between autonomous motivation and quantity performance, extrinsic incentives need not consider potential crowding-out effects. Consequently, quantity-type tasks only require external or introjected regulation so that gamification design can omit autonomy-supportive elements such as narrative storylines with avatars.

Thus, gamification for quantity-type tasks can assuredly make use of classic game elements such as badges, trophies, and leaderboard competitions. However, certain underlying conditions are worth considering. For instance, targeting introjection as a subtype of controlled extrinsic motivation appears to be a more fruitful approach than external regulation because it involves considerations of self-esteem in which the employee wants to master the specific task either to feel pride or to avoid shame (Ryan, 1982; Nicholls, 1984). To support introjection, missions and levels constitute an adequate design option since they enhance relatedness and competence attributable

to progress feedback. Overall, feedback remains an important component for conveying competence to employees with a quantity performance focus. Otherwise, negative feedback would frustrate employees, leading to amotivation (Deci and Ryan, 1985). The recommended feedback components do not differ largely between tasks with a quality performance focus and tasks with a quantity performance focus. Progress bars, levels, adjustable difficulty levels and time limits, and immediate feedback are all components that support employees to engage in their tasks. Moreover, although leaderboards can certainly motivate employees to outperform each other, the resignation of poor performers is also possible and is likely to endanger employees' acceptance ("It is just a game.") of the gamified activity (Werbach and Hunter, 2012). Thus, as a special form of feedback, leaderboards also require adjustments to prevent frustration. Leaderboards that depend on individual performance cause interpersonal rivalry that may lead individuals to feel alienated from others, harming their basic need for relatedness (Vansteenkiste et al., 2007). The easiest option is that of team leaderboards. Other options include round-based leaderboards with fresh starts for each round or varied criteria for winning.

Despite providing affirmative feedback, quantity-type tasks, which frequently are repetitive in nature, tend to be perceived as boring over time. Boredom typically accompanies a lack of interest in an unwanted activity (Cheyne et al., 2006) and is likely to occur during monotonous, unchallenging work (Vroom, 1964). Thus, gamification for routine tasks must target the implementation of fun elements to induce positive feelings about employees' work (Edery and Mollick, 2009). Accordingly, the fun of the gamified activity does not necessarily involve the induction of autonomous motivation. Instead, the gamification of routine tasks puts a fun layer onto an inherently uninteresting employment, which does not increase the interest in the original occupation itself but tries to mask the demotivating character of the task (Mollick and Rothbard, 2014). In doing so, gamification leads to the often-proclaimed enhancement of enjoyment at work

while the employee recognizes work itself remains unchanged. Still, fun is a positive feeling of spontaneity when experiencing something new or succeeding at a challenge (Koster, 2013). Because fun evokes due to novel experiences, mastering challenges or a pleasing atmosphere, too much familiarity diminishes the emotional state of fun in different brain areas (Koelsch, 2013). In addition, gamified activity can offer a variation of new, interesting, balanced, and challenging work-related missions over time that convince the employee to remain eager and curious about the gamified activity.

Thus, if the rewards of gamification lack variety and become almost as repetitive as the actual occupation, the long-term success of gamification for quantity-type tasks is called into question. However, the firm implementing gamification is somewhat forced to maintain rewards because suspending them without replacement can lead to performance levels that are significantly lower than at the beginning (Kohn, 1999; Zichermann and Cunningham, 2011). However, operant conditioning can decrease employees' expectations for a reward schedule (Skinner, 1938). For instance, casinos perfected their reward schedules to stimulate gamblers to continue playing slot machines by dispensing rewards of different strengths at various times (Kuhnen and Knutson, 2005; Nicholson, 2015).

When generally considering the recommended elements of gamification for quantity-type tasks, it becomes salient that elements such as badges and leaderboards make tournaments (Lazear and Rosen, 1981) and awards (Frey, 2006) appear as surrogates given that both incentive design choices intend similar outcomes. Indeed, tournaments rank employees' output on an ordinal scale so that employees receive either the more attractive winner prize or the less attractive loser prize (Hannan et al., 2008), which can be a trophy or even money. Awards are a special subtype of tournament in which individuals compete to receive the winner prize (Frey and Neckermann, 2008). Thus, awards contain imprecise relative performance information by implicitly allowing a

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distinction between the awarded and the non-awarded group. Markham, Scott, and McKee (2002) define awards as extrinsic and predominantly non-monetary incentives allocated through an institutionalized recognition program.

Both tournaments (Harbring and Irlenbusch, 2003) and awards (O'Reilly and Chatman, 1986; Markham et al., 2002) can significantly increase individuals' effort and performance. Moreover, both types of extrinsic incentive systems can provide recognition and contain competitive elements that are also delivered in gamification for quantity-type tasks. The only missing aspect is the provision of fun attributable to the game frame and humans' ludic drive. However, labeling an award or a tournament may provide a surrogate that frames the contest in a way such that working towards the achievement of the desired behavior also provides procedural utility (Frey et al., 2004; Knauer et al., 2017). Indeed, organizations actively engage in giving people positive titles such as "employee of the month" or "senior vice president" (Frey, 2006; Malmendier and Tate, 2009).

In sum, for quantity-type tasks, the expected outcomes of gamification and tournaments are likely to be very similar. This issue must be considered in light of the tremendous efforts and resources necessary to implement a properly designed gamified workflow. Tournaments and awards offer design flexibility similar to that of gamification and may not necessarily be linked to monetary rewards. In contrast, tournaments and award recognitions have relatively low implementation and maintenance costs. Thus, not only gamification for quantity-type tasks but also gamification for quality-type tasks must prove their ability to fulfill their promise of increased performance in terms of cost-benefit considerations. Table 2 summarizes the appropriate elements of gamification for both tasks with a focus on performance quality and performance quantity.

Table 2
Recommended elements of gamification use based on performance focus

Quality-type tasks	Concerned psychological needs	Quantity-type tasks	Concerned psychological needs
Narrative storyline	Autonomy, Relatedness	**Points**	Competence
Quests	Autonomy, Competence	**Missions**	Competence
Avatars	Autonomy, Relatedness		
Unexpected rewards/badges	Competence	**Badges**	Competence
Progress bars	Competence	**Progress bars**	Competence
Levels	Competence	**Levels**	Competence
Immediate feedback (pleasurable)	Competence	**Immediate feedback (pleasurable)**	Competence
Balanced difficulty levels and time limits	Competence	**Balanced difficulty levels and time limits**	Competence
Team leaderboards	Competence, Relatedness	**(Team) Leaderboards**	Competence, Relatedness
Team chats	Relatedness		
		Alternatives: Tournaments, Awards	(Competence)

5   Discussion and conclusion

The use of gamification as game design elements in a business context promises to increase employees' motivation and performance. Understandably, many firms try to take advantage of the human drive to play games. However, the multi-facetedness of gamification can become a problem

when designing a gamified business process for tasks that are focused on either performance quality or performance quantity. Quality-type tasks regularly allow the volition to master complex, cognitively engaging and creativity demanding work. Specifically, the literature on motivation provides evidence that employees' productivity is positively associated with the satisfaction of the basic psychological needs of autonomy, competence, and relatedness. In contrast, there is a weak to nonexistent link between autonomy and quantity-type tasks that require mundane, repetitive and uninteresting work. Consequently, elements for quantity tasks such as trophies and leaderboards put a fun layer on interesting tasks, conferring feelings of competence and relatedness and ultimately increasing extrinsic motivation. However, incentive schemes such as awards or tournaments have similar effects on extrinsic motivation, questioning gamification's value added to quantity-type tasks. In contrast, gamification for quality-type tasks must concentrate on autonomy-enhancing elements such as the freedom to create individual avatars, either allowing different methods of mastering a task (player types) or integrating choices to interact with a narrative storyline. Thus, providing multi-faceted ways to master a single gamified task substantially increases complexity and demands tremendous resources of time, creativity, programming effort, testing capacities. Moreover, it is likely that maintenance efforts to fix recurring problems will increase the costs of gamification (McGonigal, 2011; Domínguez et al., 2013). Therefore, gamified workflows hinge on the question of their final implementation costs, which is understandable given the broad variety of design options (Farzan, et al., 2008; Flatla et al., 2011).

Overall, the cost-benefit-ratio between productivity and performance gains on one side and implementation costs on the other side remains to be further analyzed. Recalling that gamification provides incentives, which management directs from a top-down position, there is a risk that introduced gamification design lacks acceptance among employees. Although this is of particular

importance when gamification aims to induce the extrinsic motivations of identification or integration, a lack of acceptance can also lead to gaming behavior, i.e., employees' self-interested manipulation of an incentive system to the disadvantage of the incentivizing institution (Oyer, 1998; Prendergast, 1999). In other words, employees tend to bypass the intended purpose of gamification. Opportunistic behavior may occur not only because of a lack of acceptance but also because of frustration. Although gamification will allow different ways of mastering a specific task, it is not guaranteed that gamification design will sufficiently cover employees' diversified performance spectrum (e.g., verbal skills vs. mathematical skills). In addition, not every corporate culture may be appropriate for gamification, especially if there is a strong focus on monetary compensation and conservatism (e.g., investment banks and consulting firms), making it difficult to establish autonomous motivation mechanisms (Thom et al., 2012). Although games have a long cross-cultural history, it seems possible that the acceptance of gamification in business contexts can largely differ between cultures with strongly diverging working philosophies (e.g., Asia vs. the United States).

Finally, one must consider that it may not be possible to disentangle tasks that are completely focused on either performance quality or performance quantity. Like the continuum between extrinsic and intrinsic motivation, there is also a continuum between quality- and quantity-type tasks. The case of Freshdesk may serve as an illustrative example. Whereas employees are concerned with recurring routine tasks (IT support), high customer satisfaction serves as an important success factor. Although the presence of elements that require qualitative output will demand autonomy-supportive design choices, the effect is likely to be lower than for tasks that are concerned with output quality. The danger of crowding out potential intrinsic motivation makes the satisfaction of autonomy needs obligatory but again questions the net benefit of gamification.

All things considered, this calls for a much tighter empirical investigation of gamification, its use, and its usefulness, leaving a broad field of exploration for future research.

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Part IV

Determinants of the Ratchet Effect

ABSTRACT

Target ratcheting derives target levels for the next period by adjusting current performance data. The use of target ratcheting can evoke dysfunctional behavior, such as the ratchet effect, the phenomenon of employees strategically withholding effort in anticipation of future upward revisions of their targets. Prior research has mainly considered the existence of the ratchet effect and how it affects firm performance. We extend this stream of research and investigate determinants that potentially increase or undermine the ratchet effect. Using a unique dataset from a survey among bank employees, we observe that risk aversion, intra-organizational competition and perceived job insecurity are positively associated with the ratchet effect. Furthermore, we predict and find that target participation and career ambitions undermine the ratchet effect. Collectively, our findings suggest that firms should be aware that the ratchet effect can differ systematically.

1   Introduction

Performance-based targets and incentives represent an important instrument to increase employee motivation and performance (Bonner and Sprinkle, 2002). In particular, challenging targets are regarded as suitable for employee motivation, performance evaluation and performance-related rewards (Merchant and van der Stede, 2012). Target ratcheting is therefore a widespread practice to determine challenging target levels (Indjejikian et al., 2014b). Target ratcheting derives target values for the next period from performance data that are generated endogenously by the employee's historical output (Sprinkle, 2003; Weitzman, 1980). In general, the use of past performance information to adjust targets is beneficial to supervisors in a multi-period setting, especially since the capability of the subordinate is often not observable (Milgrom and Roberts, 1992). Thus, target ratcheting enables a target setting process that reflects the individual capabilities of employees.

While target ratcheting helps to reflect the individual capabilities of employees, it can also evoke dysfunctional behavior, the ratchet effect in particular. The ratchet effect (or ratcheting) describes the phenomenon of employees strategically withholding effort because they anticipate future upward revisions of their targets after successful target attainment (Milgrom and Roberts, 1992). Ratcheting is economically reasonable for employees when their bonus depends on target attainment and they are thus facing a trade-off between current rewards and future losses due to more challenging targets (Weitzman, 1980). Further, even if the employees' bonuses are not tied to target achievement, the negative psychological outcomes of failing future targets could lead to the ratchet effect. Prior research empirically supports this prediction (e.g., Chow et al., 1991; Cooper et al., 1999). Similarly, Bouwens and Kroos (2011) show that managers significantly restrict their output in the last quarter when target ratcheting is implemented.

The ratchet effect yields at least two negative consequences for firms. First, in the current period, employees do not perform to their maximum extent, which leads to lower firm performance compared to a situation without the ratchet effect. Second, the ratchet effect leads to plans for future periods that do not reflect the true capabilities of the employees and thus less challenging targets, because non-maximum performance is used to target ratcheting. Therefore, it is important for firms to understand the factors that enhance or mitigate the ratchet effect.

We build on prior research that documents the ratchet effect (e.g., Bouwens and Kroos, 2011; Cooper et al., 1999) and investigate factors that can influence the magnitude of the ratchet effect in both directions. On the one hand, we focus on risk aversion, intra-organizational competition and perceived job insecurity as factors that potentially amplify the ratchet effect. On the other hand, we examine the level of employee participation in the target setting process, career ambitions, and self-efficacy as potentially undermining factors.

We analyze the ratchet effect and its influencing factors in a survey of banks in Western Europe. The banking industry is particularly suitable for examining the ratchet effect for two reasons. First, banks frequently focus on quantifiable targets to measure employee performance. Second, consumer banking necessarily requires large sales departments, leading to a large statistical population. In total, our analysis is based on 403 valid responses. Due to lack of a measure for the ratchet effect, we develop a scale that captures the effect. The measurement of our independent variables is based on different scales that have been applied in prior research. We conducted our survey in December, which is typically the last month in a firm's fiscal year. This period of the year is particularly suited for our study, because employees should then be able to assess their performance regarding target achievement and, if necessary, initiate measures such as strategic ratcheting behavior.

We find statistical support that risk aversion is positively associated with the ratchet effect, so that risk-averse employees exhibit a higher tendency for the ratchet effect. Moreover, intra-organizational competition is also positively associated with the ratchet effect. In addition, we find support for a positive association between perceived job insecurity and the ratchet effect. In contrast, we find that target participation—i.e., the possibility that the employee can give feedback or has an even stronger influence on the target setting process—is negatively associated with the ratchet effect. Further, employees with strong career ambitions are less prone to ratcheting, indicating that more career-orientated employees are more willing to perform well than to strategically influence future targets. Our results are robust to a number of alternative model specifications.

Our study makes several contributions to both theory and practice. First, we introduce a valid scale to capture behavior that describes the ratchet effect in a comprehensive manner. With prior studies concentrating on the performance effects of target ratcheting, our reliable measurement scale opens up new directions for research within the field of target ratcheting. Second, since prior research also focuses mainly on the existence of the ratchet effect by observing the effect's potential determinants, our findings provide a deeper understanding of the ratchet effect. Our results suggest that the ratchet effect differs systematically with certain factors—namely, risk aversion, perceived job insecurity and intra-organizational competition (positively associated with the ratchet effect) and target participation and career ambitions (negatively associated with the ratchet effect). Consequently, firms should consider these associations in their target setting processes. Most importantly, firms should not solely rely on target ratcheting but also consider employee input when setting targets. Additionally, firms should find ways to mitigate employees' situation-specific risk aversion. Target participation could also be helpful to reduce risk concerns.

The remainder of this paper proceeds as follows. The next section gives the background on target ratcheting and the ratchet effect. Section III presents the hypothesis developed, while Section IV describes the study design. Section V presents the survey results and Section VI concludes the paper.

2 Background and literature review

2.1 Target ratcheting and the ratchet effect

Generally, targets enhance employees' commitment and motivate them to direct effort in a desired direction. More difficult targets thereby lead to greater performance (Locke, 1996). Frequently, performance standards are based on individuals' prior performance (Ittner and Larcker, 2001; Leone and Rock, 2002). For example, Murphy (2001) examines 177 enterprise incentive plans, of which about 30% rely on the prior year's performance. Using the last available performance record is especially favorable because past performance data are usually accessible without additional expense. The use of past performance for determining future targets is referred to as target ratcheting or the ratchet principle (Weitzman, 1980). In the target setting process, the subsequent target is revised upward (downward) due to high (poor) performance in the past (Bouwens and Kroos, 2011). Accordingly, Leone and Rock (2002) provide evidence for target ratcheting such that the overfulfillment of prior targets is associated with raising future performance standards. However, the literature provides inconsistent evidence on the revision of targets. Some studies demonstrate asymmetry in target revisions, depending on prior target achievement, suggesting that targets are increased to a greater extent than decreased (Aranda et al., 2014; Bouwens and Kroos, 2011; Leone and Rock, 2002). However, according to Aranda et al. (2014), the extent of ratcheting targets is not symmetrically or asymmetrically manifested in practice. Rather, it depends on the superior's beliefs about the nature of the deviations. Thus, target ratcheting does not necessarily imply automatic target revisions.

However, target ratcheting is often associated with penalizing effort, making it harder to attain future incentives, which could evoke strategic behavior (Milgrom and Roberts, 1992). More precisely, the ratchet effect (or ratcheting) describes the behavior of employees who strategically withhold their effort when their current good performance translates into more challenging future targets (Indjejikan et al., 2014b). Thus, while targets generally motivate effort, target ratcheting can restrict effort and performance due to the ratchet effect. The ratchet effect thereby reflects a multi-period principal–agent relationship in which the employee (agent) exploits the information asymmetry between himself or herself and the employee's superior (principal; Weitzman, 1980), since the superior can only observe the results of the employee's effort. However, the superior cannot asses the employee's capabilities or whether the employee is providing maximum effort. The employee therefore has discretion over his or her effort and can use this discretion to strategically influence the target setting process.

There are both monetary and non-monetary reasons for the ratchet effect. First, if a monetary bonus is tied to at least achieving the target, employees face a trade-off between today's rewards for high current performance and possible future losses due to more challenging or even unachievable targets. Second, challenging targets have a negative influence on individuals' satisfaction, such that individuals prefer easily attainable targets over challenging ones (Locke, 1996). Thus, employees need to vary their effort levels to avoid targets that are too high and negative feelings due to failure to achieve targets. Taken together, employees have both monetary and non-monetary incentives to intentionally underperform if the perceived likelihood of achieving future targets is decreasing (Indjejikian et al., 2014b; Roland and Szafarz, 1990).

2.2   Empirical studies on the ratchet effect

The ratchet effect has been much discussed in planned economies and regulatory contexts (e.g., Baron and Besanko, 1984; Freixas et al., 1985; Laffont and Tirole, 1988) and is one of the

first problems noted by advanced incentive theory (Berliner, 1952). For example, Mathewson (1931) studies the output of piece-rate workers and observes that they were limiting their output quantities, fearing negative revisions of their payment or rising output expectations. Moreover, different experimental studies provide evidence of the ratchet effect (Charness et al., 2011; Chaundhuri, 1998; Chow et al., 1991; Cooper et al., 1999). These studies manipulate the participants' incentives to restrict their current output because of subsequent upward target adjustments. In line with theory, the studies show that participants anticipate future adjustments of their targets and therefore limit their current output to resolve this conflict. In addition, several archival studies support the prediction of the ratchet effect. Bouwens and Kroos (2011) analyze sales targets and find that managers who performed particularly well in the first quarter significantly restrict their performance in the last quarter. Leone and Rock (2002) use the data of a large multinational firm and find that division managers increasingly tend to create income-decreasing accruals to balance or conceal income increases when target ratcheting is used. In addition, the authors observe that, if the budget is exceeded by $1, the target budget is increased, on average, by $0.9, whereas failing the budget by $1 results in an average decrease of $0.40 in the subsequent budget. However, evidence of such asymmetric target ratcheting is inconsistent. While Aranda et al. (2014), Bouwens and Kroos (2011), and Leone and Rock (2002) find evidence of asymmetric target adjustment, Anderson et al. (2010) and Indjejikian et al. (2014a) find no support.

While the existence of the ratchet effect is comprehensively shown in prior research, determinants of the ratchet effect have been discussed only occasionally. Ahn et al. (2010) analyze data from the annual reports of Korean public firms and find that, when subordinates are included in the target setting process, ratcheting behavior is impacted by the subordinates' level of influence. In an experimental study, Charness et al. (2011) analyze the influence of market competition on the ratchet effect and find that competition largely reduces it. Frank and Obloj (2014) analyze

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behavior of managers of a retail bank in Poland and find that firm-specific human capital translates into opportunistic behavior when target ratcheting is in use. Our study contributes to prior research by investigating additional determinants of the ratchet effect. Further, we deliberately use a survey design because it allows us to use a proxy that considers the strategic behavior in the target setting process from the respondent's perspective.

3   Hypothesis development

To derive our hypotheses, we consider potential determinants that may positively or negatively contribute to the ratchet effect. On the one hand, we investigate enhancing factors, such as risk aversion, intra-organizational competition, and perceived job insecurity. On the other hand, we examine undermining factors, particularly target participation, career ambitions, and self-efficacy. Both perspectives are important for firms when considering the ratchet effect. First, firms can evaluate the impact of introducing target ratcheting more sufficiently and potentially revise organizational structures to reduce opportunistic employee behavior. Second, firms can better understand how behavioral triggers contribute to the ratcheting effect.

As noted above, we define the ratchet effect as an employee's choice of effort level that is below the employee's capabilities in order to strategically influence future targets. Due to the above-described monetary and non-monetary incentives for the ratchet effect, we assume that employees have a stable drive for ratcheting. Indjejikian et al. (2014b) suggest that the ratchet effect arises particularly when the likelihood of target achievement is decreasing for a given level of effort due to upward target revisions. Hence, we derive that the ratchet effect could be even intensified by factors that increase the fear of not being able to reach future targets or aggravate the negative consequences. However, other factors, which have been generally shown to have a positive influence on effort and performance, could suppress the occurrence of ratchet effect. Therefore, we investigate risk aversion (Young, 1985), intra-organizational competition (Kanemoto and

MacLeod, 1992), and perceived job insecurity (Staufenbiel and König, 2010) as relevant ratchet effect-enhancing factors and target participation (Ahn et al., 2010), employee's career ambitions (Leegomonchai and Vukina, 2005) and self-efficacy (Bandura and Cervone, 1983) as potential attenuating determinants.

3.1   Risk aversion

Generally, risk-averse individuals exhibit low motivation to exert effort when faced with uncertain incentives (Milgrom and Roberts, 1992; Prendergast, 1999). Cadsby et al. (2009) examine the effectiveness of performance-based incentives regarding individuals' performance. Thereby, the authors take risk tolerance into account with respect to a given task. They find the degree of an employee's risk aversion to be negatively related to the effectiveness of a performance-based incentive system. This result implies that the prospective incentive of receiving higher rewards through greater performance is inhibited by risk-averse individuals. Therefore, incentives based on variable outcomes tend to be less effective for risk-averse employees. Instead, performance-based incentives can increase the stress levels of risk-averse employees or lead them to assume that the probability of receiving a future reward is unrealistic. Following expectancy theory (Vroom, 1964), risk-averse employees thus exert low effort levels, which, in turn, lead to less challenging future targets. Employees thereby reduce the risk of failing future targets. Closely related are the findings of Young (1985), who observes in an experimental study that risk-averse employees increasingly tend to build budgetary slack[1] to reduce uncertainty. Budgetary slack is similar to the ratchet effect in that both mechanisms strategically influence the target level to a certain extent. Thus, we assume that an individual's propensity to reduce uncertain outcomes implicates similar behavior for budgetary slack and ratcheting. Consequently, we expect more risk-

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[1]   Budgetary slack describes hidden reserves that are created by intentionally overstating expected costs or understating expected revenues (Schiff and Lewin, 1970; Young, 1985).

averse employees to show a higher propensity for ratcheting while trying to reduce the perceived risk of future target achievement. We formally predict the following hypothesis.

H1:   Risk aversion is positively associated with the extent of the ratchet effect.

3.2   Intra-organizational competition

Individuals have a basic need to maintain a stable and accurate self-view (Tesser, 1988). Accordingly, social comparison theory postulates that individuals desire objective evaluations and feedback about their characteristics and abilities (Festinger, 1954). In absence of objective standards, individuals tend to compare themselves with peers. However, individuals also tend to compare themselves with others—even if objective evaluations are present (Klein, 1997). Competitively oriented work climates, e.g., in banking and retailing (Evans et al., 1999; Bettencourt and Brown, 2003), increase the importance of such comparisons and increase the pressure to achieve the respective target (Festinger, 1954). In general, a target ratcheting mechanism provides information about target achievement and serves as an objective standard, which employees use as their primary source for self-evaluations. However, in a competitive work climate, employees perceive a high likelihood of sanctions if their performance is below target (Goffman, 1956; Kahn et al., 1964). This is because employees not only use the information of achieving or missing the target for self-evaluations. Instead, the status of target achievement is also likely to become a standard for peer comparison. Hereafter, the theory of social loss aversion suggests that individuals' marginal disutility for being perceived as a low performer relative to their peers is higher than their utility from being perceived as a high performer (Camerer, 1998; Fehr and Schmidt, 1999; Lim, 2010). Consequently, employees will try to maintain a positive self-image by avoiding the perceived negative consequences of missing target expectations. Thereby, ratcheting implies an adequate strategic behavior to ensure this drive. Strategically withholding

effort will lead to a lower magnitude of future target adjustments and, thus, implies a higher likelihood to achieve future targets and to avoid unpleasant feelings. Hence, we predict that a higher rate of intra-organizational competition drives employees to exhibit more ratcheting behavior.

H2: *Intra-organizational competition is positively associated with the extent of the ratchet effect.*

3.3 Perceived job insecurity

Because perceived job insecurity is a subjective phenomenon (Greenhalgh and Rosenblatt, 1984; Hartley et al., 1991; De Witte, 1999; Sverke and Hellgren, 2002), it does not necessarily mean that a specific job is at risk. According to Hartley et al. (1991), perceived job insecurity particularly occurs when individuals' perceived level of security is below their level of preferred security. Hence perceived job insecurity may vary between employees in the same situation (Sverke et al., 2002). In general, research on the relationship between job insecurity and work performance delivers inconsistent results. On the one hand, some findings provide evidence of a negative effect of job insecurity on performance (Armstrong-Stassen, 1993; Cheng and Chan, 2008; Roskies and Louis-Guerin, 1990). On the other hand, extant research provides empirical evidence of a positive relationship between job insecurity and effort (e.g., Brandes et al., 2008; Grunberg et al., 2000). Ashford et al. (1989) and Sverke et al. (2002) find no significant effect of job insecurity on performance. The inconsistent results can appear due to a different context (Sverke et al., 2002). However, in our setting, employees' exhibited performance does not reflect the maximum performance but highly depends on the target ratcheting mechanism. When combining target ratcheting and perceived job insecurity, it appears plausible that employees are afraid of steadily missing given targets, which has a negative signal value and could propel layoff decisions. Therefore, employees who perceive that their job is at risk will strive for target

attainment, especially when bottom performers are likely to lose their jobs. In line with our hypothesis regarding competition, employees are likely to shift their focus from exerting maximum effort to simple target achievement. To ensure that they reach their target not only in the current period but also in coming periods, employees need to strategically choose their effort levels and therefore increase the probability of keeping their jobs. Besides, steadily attaining targets becomes particular beneficial regarding subjective performance evaluations by the superior. As prior research demonstrates, performance measures that are attached to targets are likely to improve the rating of a subjective evaluation (Heneman, 1986; Heneman et al., 1987). Thus, a favorable count of former target attainments could have a positive bias on the superior's evaluation, resulting in a lower layoff risk. Therefore, we expect that employees with a high level of perceived job insecurity are more likely to exhibit ratcheting behavior.

H3: *Perceived job insecurity is positively associated with the extent of the ratchet effect.*

3.4 Employee participation in target setting

When it comes to target adjustments based on prior performance, the superior can either apply an automatic revision, specify a revised top–down target, or let the employee participate in the target adjustment process.[2] The latter can vary between stringent bottom–up proposals or simple feedback mechanisms (Chacko et al., 1979). These mechanisms also exist in participative budgeting, which can be considered a special form of participative target setting. Prior research shows that participative budgeting positively influences effort and performance (e.g., Libby, 1999; Nouri and Parker, 1998). Participation is expected to affect employee motivation and commitment to the budget, which again leads to an increase in performance (Locke and Schweiger, 1979,

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[2] As outlined before, target ratcheting is not necessarily an automatic mechanism but also depends on the superior's beliefs about the nature of target deviations. Thus, target ratcheting and target participation are not mutually exclusive.

Shields and Shields, 1998). These mechanisms should also generally apply to target setting. Moreover, under target ratcheting, participation gives employees the opportunity to intervene against an inappropriate target adjustment based on current performance that is subject to one-time effects or extraordinary items. Thus, employees are less likely to fear the superior's evaluation process and inappropriate target adjustments. Consequently, employee participation in the target setting process reduces the necessity to withhold effort to avoid rising future targets. Ahn et al. (2010) provide empirical evidence for a negative relationship between the subordinate's level of influence in case of participative target setting and the ratchet effect by analyzing the data of 14 Korean public enterprises over 17 years. Therefore, we predict that an employee's participation in target setting is negatively associated with the extent of the ratchet effect, which is reflected in the following hypothesis.

> *H4:*   *Employee participation in the target setting process is negatively associated with the extent of the ratchet effect.*

3.5   Career ambitions

Career ambitions and target ratcheting can have opposing influences on employee behavior (Leegomonchai and Vukina, 2005). Generally, target ratcheting leads to the ratchet effect and therefore lower performance levels. On the contrary, we expect that employees with career ambitions generally exhibit high levels of effort to demonstrate their performance potential, since the employee's output is often considered an indicator of the employee's ability. Consistent with this assumption, Yukl and Latham (1978) show more generally that employees who consider target attainment as a suitable means to achieve a higher pursued purpose display higher performance. Promotions within a firm could constitute such a higher pursued purpose. Hence, employees who aim to receive a promotion within their firm try to impress their superiors with outstanding performance and target attainment or overfulfillment. Thus, ratcheting behavior such as matching

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or falling short of the target counteracts the aim of demonstrating high potential. Strategically withholding effort is therefore inappropriate for employees with high career ambitions. Consequently, we expect career ambitions to be negatively associated with the extent of the ratchet effect, as formally predicted in the following hypothesis.

> *H5:* *Career ambitions are negatively associated with the extent of the ratchet effect.*

3.6 Self-efficacy

Self-efficacy is defined as the confidence of individuals in their own abilities to perform a certain task (Bandura, 1982). Consequently, employees with high self-efficacy are likely to believe that they are more effective at performing tasks and estimate the probability of reaching a certain goal higher than employees with low self-efficacy do. Therefore, people with high self-efficacy earlier accept difficult and challenging targets and are more likely to constructively deal with setbacks (Locke, 1996). Consequently, Wood and Bandura (1989) understand self-efficacy as a relevant indicator for an individual's motivation and performance attainments. Bandura and Cervone (1983) observe that target systems are particularly motivating and contribute to performance when individuals exhibit high self-efficacy. Jacobs et al. (1984) confirm a positive relationship between self-efficacy and perseverance and persistence in problem solving. Regarding target ratcheting, individuals with high self-efficacy are less likely to be discouraged by increasing future targets than individuals with low self-efficacy are. Therefore, employees with high self-efficacy should strategically influence their effort levels to a lesser extent, because they are less concerned with future target attainment. Taken together, we expect self-efficacy to be negatively associated with the extent of the ratchet effect, as stated in the following hypothesis.

> H6: *Self-efficacy is negatively associated with the extent of the ratchet effect.*

4   Method

4.1   Study design and sample

To collect data for our empirical analyses, we conducted a survey among the bank employees of retail banks located in Western Europe in December 2015. We refrained from restricting the areas of responsibility to increase the sample population, since we do not expect that hierarchy levels interact with the factors we investigate with regard to the ratchet effect. The banking sector is particularly appropriate due to two reasons. First, the banking industry frequently focuses on financial or at least quantitative targets to measure employee performance. These targets are easily accessible and therefore very suitable for target ratcheting. Thus, we expect a sufficient extent of target setting in our sample. Second, consumer banking necessarily requires large sales departments, which constitute a particularly suitable environment to measure the ratchet effect (Bouwens and Kroos, 2011). In addition, following Bouwens and Kroos (2011), we intentionally choose an inquiry period shortly before the end of the calendar year because, at this time, employees increasingly tend to show a ratchet effect.[3] This is because, by the end of the fiscal year, employees gain increasing security about their performance and are able to assess their personal standing more accurately.

Since our scale to proxy the ratchet effect is new, we first performed a pretest on a smaller scale with 20 valid observations. Consistent with Anderson and Gerbing (1991) and Boyd et al. (1989), a sample size of 20 is deemed sufficient to assess the validity of our instrument. After minor adjustments to our questionnaire, we mailed our questionnaire to 1,173 customer service addresses of banks engaged in consumer banking. In additional 242 cases, we used the available contact information from the management boards. Thus, we directly contacted a total of 1,415 banks. In

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3   The fiscal year deviates from calendar year in only five records. The relevant sample for subsequent investigation shows only four deviations of the fiscal year from the calendar year.

addition, potential subjects were recruited by spreading our survey among XING groups[4] within defined target groups (e.g., online banking clubs). The questionnaire included a cover letter requesting participation and that the questionnaire be forwarded internally.

In total, 527 surveys were returned, of which 403 were valid, with complete answers to all the questions. However, the basic prerequisite for our analysis is application of target ratcheting within the institution. Table 1 depicts a breakdown of the sample with regard to the target setting process, showing that not all cases fulfill this prerequisite: 40 (9.94%) of the records have no agreed-upon targets, 34 (8.44%) have no target adjustments in general, and 137 (34.00%) have no target adjustments based on prior performance. Thus, our investigation of the ratchet effect under target ratcheting is based on a final sample of 192 responses[5], which constitutes 47.64% of all valid answers, supporting the high frequency of target ratcheting in praxis. Due to confidentiality concerns and the limited scope of the questionnaire, we are not able to draw conclusions on specific mechanisms how the surveyed banks conduct target ratcheting in detail over time. In addition, it is possible that some respondents do not precisely know the adjustment process (e.g., Frank and Obloj, 2014).

Table 1
Sample selection

No agreed-upon targets	No target adjustments	No performance-dependent target adjustments	Target ratcheting	Total
40	34	137	192	403
(9.93%)	**(8.44%)**	**(34.00%)**	**(47.64%)**	**(100%)**

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[4]   XING is a social network similar to LinkedIn that is widespread throughout Western Europe and whose members primarily manage their professional contacts with others and find new contacts. XING and LinkedIn serve the same target group.

[5]   Due to anonymity concerns, we did not ask for the respective bank's branch of each participant. By collecting data on the bank type, the number of employees and the total balance sheet we can conclude that at least 52 different bank branches are subject of the analysis.

Table 2 depicts the characteristics of our sample. The respondents' average age was 38.2 years. Only 24.48% of our respondents were female, mainly because of a substantial amount of upper and middle management respondents (35.42%) and the fact that the banking industry has been dominated by men since a long time. When considering only employees without management responsibilities ($n = 94$), the proportion of female respondents increases to 40.43%. Overall, more than two-thirds (68.23%) of the respondents had five or more years of experience with their current employer, while almost half (45.31%) reported 10 or more years of experience. The majority of our respondents (78.13%) operate in the sales department. To assess possible non-response bias, we perform a two-sample t-test to test for differences between the first and last thirds of the respondents. We find only weakly significant indications for the variable *PROGR* ($p = 0.071$), which assesses the progress of target attainment by asking whether targets have already been largely achieved. This result is comprehensive, since respondents in late December are more likely to have attained their set targets than early respondents are at the beginning of December. Beyond that, we find no significant differences with regard to the other variables. Accordingly, we infer that non-response bias does not influence the analyses of our hypotheses. Overall, we conclude that our sample is suitable for analyzing our hypotheses.

Table 2
Sample characteristics (n = 192)

Description	Percent of sample
Gender	
Male	75.52
Female	24.48
Hierarchy level	
Upper management	3.65
Middle management	31.77
Lower management	15.63
Employees without management responsibilities	46.88
Apprentices	0.52
Other	1.56

Table 2(continued)

Subdivision	
Sales	78.13
Back office	7.81
Administrative (e.g., internal revision, accounting/controlling, marketing)	9.90
Board/managing director	1.04
Other	3.13
Level of education	
Secondary school certificate	4.69
Higher education entrance qualification	3.13
Completed apprenticeship	11.98
Certified management expert/banking specialist/comparable	44.79
University degree	34.38
PhD	1.04
Number of employees	
In the category of 30 or less	36.98
Between 31 and 50	9.90
Between 51 and 150	15.10
Between 151 and 300	11.46
Between 301 and 500	9.38
More than 500	17.19
Balance sheet total	
Less than 50 million	3.65
Between 50 and 100 million	4.69
Between 100 and 500 million	19.27
Between 500 million and 1 billion	14.06
Between 1 to 5 billion	35.42
More than 5 billion	22.92
Tenure	
Fewer than 1 year	6.77
Between 1 and 5 years	25.00
Between 5 and 10 years	22.92
More than 10 years	45.31
Retention	
Fewer than 1 year	8.85
Between 1 and 5 years	31.25
Between 5 and 10 years	18.75
More than 10 years	41.15

Note: The percentages may not add up to 100% due to rounding errors.

4.2 Variable measurement

Because we focus on constructs that are unobservable in themselves, we used multiple items

to measure each attribute and most questions were scored on seven-point Likert response scales

anchored at the endpoints of one (strongly disagree) and seven (strongly agree), unless stated otherwise. In general, the use of multiple items for measuring theoretical constructs is considered more robust (Gorsuch, 1997; Nunnally, 1978; Spector, 1992). Some items were negatively phrased to minimize response bias and need to be reverse coded. Whenever possible, scales were developed by adopting items from the prior literature to ensure construct validity. If necessary, items were revised to address the occupational domain. In addition, items were generated based on the conceptual definition of each construct and the reviews of previous literature.

Ratchet effect. Due to a lack of items for measuring our dependent variable, the ratchet effect, we developed new scales for this study based on definitions of the ratchet effect adjusted by the findings of the pretest. The items thus focus on one main aspect of the ratchet effect: not exceeding targets, although the employee would be able to. The items consist of the following: (1) I try not to exceed my targets for fear of future rising targets; (2) I try to exceed my targets to the maximum level possible (R); (3) The statement 'Meeting but not beating the goal' sums up my motto; (4) I try to keep my future targets attainable by reducing my current performance; (5) For strategic reasons, it does not seem advisable to exceed my targets.

Employee participation in target setting (TARG_PART). We measure employee participation during the target setting process by using five items, derived from the work of Ogbonna and Harris (2000), Onsi (1973), and Steers (1976).[6]

Intra-organizational competition (COMP). To assess competition within the organization, we adapt four items from the peer competition scale of Steers (1976).

Perceived job insecurity (INSECU). To measure employees' perceived job insecurity, we use a shortened version of the job insecurity scale developed by De Witte (2000). Van der Elst et al. (2014) confirm the validity and reliability of the scale.

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[6]   The questions for the independent variables are stated in Table 3.

Career ambitions (CAREER). To measure individuals' career ambitions, we deploy a pool of items based on those of Jain and Jain (2013) and two items by Greenhaus (1971).

Risk aversion (RISK_AV). The risk aversion scale in this study consists of four items, which were adapted from three different scales. We adopted items from Donthu and Gilland (1996), Mandrik and Bao (2005) and one item from Burton et al. (1998). Unlike the items in most studies, these items concentrate on measuring a general risk propensity instead of a preferably financially characterized risk propensity.

Self-efficacy (SELF_EFF). The self-efficacy scale consists of six items that were taken from a pool of items based on the generalized self-efficacy scale of Schwarzer and Jerusalem (1995) and the Personal Efficacy Beliefs Scale developed by Riggs et al. (1994).

Besides the dependent and independent variables, the questionnaire collects data on gender; age; education; tenure; position within the organization; field of application within the institute; remaining number of years within the bank until retirement or change of institution; total assets and number of employees, to indicate the size of the organization; and the type of bank (e.g., savings, cooperative, or private), which we partly incorporate as control variables as outlined in the following.

4.3 Control variables

In addition to our main model, we consider a second model with four control variables that could also explain our findings. First, we test if the respective participants are involved in their subordinates' target setting process (*SUPERIOR*). Thereby, the knowledge of supervising employees about the target setting process and the respective target adjustments may impact their own attitude towards strategic ratcheting behavior. The variable *SUPERIOR* was measured by asking respondents whether they were involved in subordinates' target setting processes (no = 0, yes = 1). Further, Frank and Obloj (2014) find that employees' affiliation to a specific firm

facilitates "gaming" behavior such that employees manipulate incentive systems to the disadvantage of the incentivizing institution (Oyer, 1998; Prendergast, 1999). However, it takes time to develop this knowledge of organizational processes. Thus, we control whether the results could be biased by the answers of participants with a short tenure (*TENURE*) or a short time before leaving the bank or retiring (*LEAVE*). Despite *LEAVE* could imply the time passed to raise human capital, we also consider it because employees, who plan to leave the firm anytime soon, have lower future benefits when they understate their current performance. The scales for *TENURE* and *LEAVE* ask the respondents to indicate the time spent within the bank and the time until they expect to leave the bank, respectively: within less than one year, within one to five years, within five to 10 years, and within more than 10 years. As in Merchant's (1990) study, the category of up to one year was used as an indicator of short term, whereas the other three categories indicate long term. With respect to the inquiry date in December, the actual progress in achieving the current target could also have an influence on the participants' answers (*PROGR*). Employees who are behind their personal target attainment schedule should be less likely to exhibit ratcheting behavior. The respondents were asked if they had largely reached their current targets (no = 0, yes = 1).

5 Results

5.1 Descriptive statistics and measurement model

To ensure reliable and valid measures of constructs, we perform a factor analysis to test how well the single indicators represent the constructs. Individual items whose reliability (loading of the measures on their respective constructs) did not meet the required threshold (Hulland, 1999) were eliminated. However, diverging opinions exist as to the placement of the threshold for factor loadings. While some researchers regard factor loadings above 0.40 as reliable (Hulland, 1999;

Stevens, 1992), MacCallum et al. (1999, 2001) recommend communalities over 0.60.[7] We decided

to use 0.50 as the threshold loading, deleting four out of 40 items.[8] All but three of the remaining

items show loadings that equal 0.7 or even higher and therefore exhibit satisfactory individual item

reliabilities. Further, Cronbach's alpha was used to assess internal consistency. The Cronbach alpha

values are between 0.74 and 0.90, indicating sufficient construct validity.

In addition to assessing the adequacy of the measurement model, we monitor for convergent

and discriminant validity. To assess convergent validity, we compute the composite reliabilities

(CR) and the average variance extracted (AVE). All constructs exceed a CR of 0.7. Moreover, all

AVEs have values above 0.5, indicating adequate convergent validity (Chin, 1998). To ensure

discriminant validity, the Fornell-Larcker (1981) criterion is used, which requires the AVE to be

higher than the squared correlation between any two constructs (Hulland, 1999). All the constructs

meet this requisite; discriminant validity can therefore be assumed. Table 3 lists all the single items

used in the analysis, descriptive statistics, and reliability measures. Overall, the results demonstrate

the measurement model's satisfactory construct validity. Moreover, the descriptive statistics in

Table 3 reveal substantial variation in the tendency toward ratcheting behavior across respondents.

This result demonstrates that respondents exhibit a ratchet effect to various degrees, which is

essential for the following analysis.

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[7]   Raising the threshold to 0.60 does not significantly change our forthcoming results.
[8]   Moreover, we exclude an additional item because it is relevant only for respondents who receive bonus payments based on their target achievement. Thus, our sample size would decrease further by 42 responses if we included this item. Consequently, our final factor variables consist of 35 items (see Table 3).

Table 3
Descriptive statistics and measurement model estimates

Latent constructs and survey items 1 = strongly disagree, 7 = strongly agree (R) = reverse coded		Factor loading	Mean	SD
RATCHET EFFECT (α = 0.86, CR = 0.90, AVE = 0.65)				
re1	I try **not** to exceed my targets for fear of future rising targets.	0.8613	2.69	1.90
re2	I try to exceed my targets to the maximum level possible. (R)	0.6947	4.39	2.13
re3	The statement 'Meeting but not beating the goal' sums up my motto.	0.7591	3.02	1.73
re4	I try to keep my future targets attainable by reducing my current performance.	0.8370	2.42	1.70
re5	For strategic reasons, it does **not** seem advisable to exceed my targets.	0.8524	3.17	2.10
RISK AVERSION (α = 0.74, CR = 0.83, AVE = 0.52)				
risk_av1	I avoid situations that have uncertain outcomes.	0.7411	3.58	1.63
risk_av2	I do not feel comfortable about taking risks.	0.8088	3.10	1.58
risk_av3	I prefer situations that have foreseeable outcomes.	0.6052	4.39	1.63
risk_av4	I feel comfortable improvising in new situations. (R)	0.7023	3.39	1.55
INTRA-ORGANIZATIONAL COMPETITION (α = 0.78, CR = 0.86, AVE = 0.60)				
comp1	There is a very competitive atmosphere among my peers and I.	0.6774	5.09	1.73
comp2	My coworkers and I try to outperform one another on our assigned work goals.	0.7591	3.51	1.80
comp3	I feel that my work is being compared with that of my colleagues.	0.7966	4.90	1.81
comp4	The competitive pressure inside the company compels me to work harder.	0.8612	4.32	1.72
PERCEIVED JOB INSECURITY (α = 0.90, CR = 0.93, AVE = 0.77)				
insecu1	I feel insecure about the future of my job.	0.8501	3.61	1.92
insecu2	I think I might lose my job in the near future.	0.9163	2.34	1.58
insecu3	I am sure I can keep my job. (R)	0.8624	3.09	1.78
insecu4	Chances are I will soon lose my job	0.8767	2.40	1.58

Note: α = Cronbach's Alpha; CR = composite reliability; AVE = average variance extracted; SD = standard deviation.

Table 3 *(continued)*

Latent constructs and survey items 1 = strongly disagree, 7 = strongly agree (R) = reverse coded	Factor loading	Mean	SD
TARGET PARTICIPATION (α = 0.87, CR = 0.91, AVE = 0.68)			
targ_part1 I have **no** input on my targets. (R)	0.6908	5.06	2.02
targ_part2 I am actively involved in setting my targets.	0.9007	3.53	2.11
targ_part3 I have opportunities to challenge targets that are too ambitious.	0.8290	3.77	1.96
targ_part4 I am allowed a high degree of influence in the determination of my work objectives.	0.8296	2.76	1.79
targ_part5 My supervisor usually asks for my opinion when determining my work objectives.	0.8438	4.06	2.10
CAREER AMBITIONS (α = 0.90, CR = 0.92, AVE = 0.60)			
career1 I am highly ambitious.	0.7924	5.85	1.20
career2 I try to convince those holding power over my job (e.g., supervisors) of my abilities.	0.7550	5.70	1.34
career3 I would like to improve myself in the long term.	0.7963	5.92	1.37
career4 To me, my career is an important part of my life.	0.8760	5.23	1.63
career5 My good performance today will yield professional or financial benefits in the future.	0.8417	5.56	1.50
career6 I like to demonstrate my capabilities in the workplace.	0.8521	5.64	1.34
career7 I try to put in more efforts than my colleagues.	0.6999	5.26	1.57
career8 I intend to pursue the job of my choice even if it cuts deeply into the time I have for my family.	0.5517	3.51	1.68
SELF-EFFICACY (α = 0.88, CR = 0.91, AVE = 0.67)			
Self_eff1 I have confidence in my ability to do my job.	0.8036	6.24	0.88
Self_eff2 When I am confronted with a problem, I can usually find several solutions.	0.7268	5.66	1.00
Self_eff3 I am very proud of my job skills and abilities.	0.8297	5.79	1.13
Self_eff4 I have all the skills needed to perform my job very well.	0.8680	5.77	1.07
Self_eff5 Thanks to my resourcefulness, I know how to handle unforeseen situations.	0.8626	5.71	1.07

Note: α = Cronbach's Alpha; CR = composite reliability; AVE = average variance extracted; SD = standard deviation.

Table 4 presents the Spearman correlation coefficients among the independent factor variables. Although six correlations are significant, they are still well below 0.5, indicating only weak associations. Hence, the correlation matrix suggests that multicollinearity is unlikely to affect our inferences.

Table 4

Correlation matrix

	RISK_AV	COMP	INSECU	TARG_PART	CAREER	SELF_EFF
RISK_AV	1					
COMP	-0.0368	1				
INSECU	0.0969	0.3928**	1			
TARG_PART	-0.0353	-0.3052**	-0.0979	1		
CAREER	-0.1680*	0.1089	-0.1635*	0.1286	1	
SELF_EFF	-0.2091**	0.1246	-0.0988	0.0533	0.3499**	1

Note: The table presents the Spearman correlation coefficients.
Multiple items were used to measure risk aversion (*RISK_AV*), intra-organizational competition (*COMP*), perceived job insecurity (*INSECU*), target participation (*TARG_PART*), career ambitions (*CAREER*), self-efficacy (*SELF_EFF*), and ratchet effect (*RATCHET EFFECT*). Please refer to Table 3 for the respective items.
* $p \leq 0.05$; ** $p \leq 0.01$; $n = 192$.

5.2   Hypothesis tests

We perform a linear regression with robust standard errors (Froot, 1989) to test our hypotheses. The results for the regression analyses are presented in Table 5. Model 1 presents the results for the main effects only, while model 2 extends our model by adding the control variables. In sum, the tested set of six variables contributes to a satisfying R^2 of 27.29%. Adding the control variables does not remarkably increase the explained variance (29.62%).

Table 5

Expected relationships and the results of regression analysis (n = 192)

Hypothesis (predicted sign)	Independent variables	Model 1: Main effects	Model 2: Control variables included	Support	Cohen's f²
H1 (+)	RISK_AV	**0.183***** (0.004)	**0.202***** (0.001)	Yes	0.051
H2 (+)	COMP	0.117 (0.112)	**0.138*** (0.069)	Yes	0.018
H3 (+)	INSECU	**0.164*** (0.065)	**0.155*** (0.074)	Yes	0.025
H4 (−)	TARG_PART	**-0.238***** (0.001)	**-0.214***** (0.006)	Yes	0.048
H5 (−)	CAREER	**-0.283***** (0.001)	**-0.262***** (0.002)	Yes	0.073
H6 (−)	SELF_EFF	0.094 (0.214)	0.106 (0.178)		
	SUPERIOR		-0.183 (0.206)		
	TENURE		-0.511 (0.100)		
	LEAVE		0.042 (0.866)		
	PROGR		0.093 (0.541)		
R²		**0.2729**	**0.2962**		
Adjusted R²		**0.2493**	**0.2573**		
F-Value		**12.67*****	**8.54*****		

Note: The table presents the results of the regressions with the dependent variable Ratchet Effect. Multiple items were used to measure risk aversion (*RISK_AV*), intra-organizational competition (*COMP*), perceived job insecurity (*INSECU*), target participation (*TARG_PART*), career ambitions (*CAREER*), self-efficacy (*SELF_EFF*), and ratchet effect (*RATCHET EFFECT*). Refer to Table 3 for the respective items. As control variables, SUPERIOR is coded 1 if the respondent is involved in subordinates' target setting process, *TENURE* and *LEAVE* are coded 0 to indicate short term and 1 to indicate long term, and *PROGR* is coded 1 if the respondent claimed to have largely reached the current target. The values presented for models 1 and 2 indicate the regression coefficients, while the *p*-values are in parentheses. Cohen's *f²* indicates the effect sizes, where the values of 0.02, 0.15, and 0.35 indicate small, medium, and large effect sizes, respectively.
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Hypothesis H1 posits a positive association between risk aversion and the ratchet effect. The positive coefficient of *RISK_AV* is significant in both models ($p < 0.01$), indicating that more risk-averse employees show a higher proneness to the ratchet effect. Hypothesis H2 proposes a

positive association of intra-organizational competition between employees and the ratchet effect. The results in model 1 fail to support H2 ($p = 0.11$). However, adding the control variables can contribute to explain the positive association, which is supported by model 2 ($p = 0.07$). H3 states that perceived job insecurity will positively affect the ratchet effect. Regression analysis of model 1 and 2 supports this prediction on a weak basis ($p < 0.07$). H4 predicts a negative relationship between employee participation within the target setting process and the extent of the ratchet effect. The results presented in Table 5 support this hypothesis ($p < 0.01$). Further, H5 posits that a focused career orientation is negatively associated with the ratchet effect. The statistical analysis indicates that career ambitions are sufficient to reduce the ratchet effect significantly ($p < 0.01$). Finally, H6 predicts a negative association between self-efficacy and the extent of the ratchet effect. Against our expectations, self-efficacy does not show any significant signs ($p = 0.214$), thus failing to support H6.

In sum, we find strong significant support for the prediction that employees' risk aversion is positively associated with the magnitude of the ratchet effect. Besides, target participation and career ambitions significantly alleviate the ratchet effect. Adding control variables helps to validate our hypotheses. Overall, we find statistical support for every prediction except H6 (self-efficacy).

Figure 1

Regression model 2 (n =192)
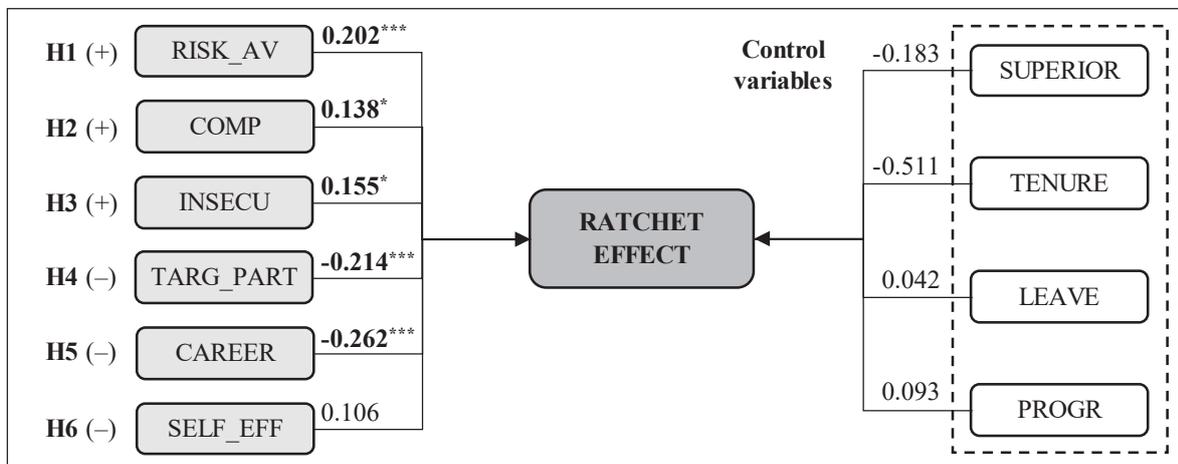
5.3 Additional analysis

To further validate our findings, we rerun the regression analysis by dropping the questionnaires of participants who declared they did not currently receive bonus payments. Thereby, we ensure that only respondents receiving performance-based bonuses are now included, since it appears plausible that these participants have greater involvement. This approach shrinks the sample size by a further 42 observations to $n = 150$. Table 6 shows the results.

Table 6

Additional analysis (n = 150)

Hypothesis (predicted sign)	Independent variables	Model 1: Main effects	Model 2: Control variables included	Support	Cohen's f²
H1 (+)	RISK_AV	**0.173**** (0.015)	**0.162**** (0.019)	Yes	0.035
H2 (+)	COMP	**0.147*** (0.082)	**0.159*** (0.074)	Yes	0.025
H3 (+)	INSECU	0.136 (0.152)	0.132 (0.171)		
H4 (−)	TARG_PART	**-0.211**** (0.011)	**-0.200**** (0.024)	Yes	0.043
H5 (−)	CAREER	**-0.354***** (0.001)	**-0.319***** (0.001)	Yes	0.103
H6 (−)	SELF_EFF	0.135 (0.123)	**0.137*** (0.090)		0.022
	SUPERIOR		**-0.310*** (0.053)		0.074
	TENURE		0.168 (0.275)		
	LEAVE		0.022 (0.936)		
	PROGR		0.157 (0.367)		
R²		**0.2930**	**0.3183**		
Adjusted R²		**0.2634**	**0.2693**		
F-Value:		**10.96*****	**8.22*****		

Note: See Table 5 for the variable definitions and table descriptions.
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

The results are robust regarding H1, H2, H4, and H5. For H3, the sign of the coefficient (+) is in line with H3 but becomes insignificant. This result could be based on less power due to a smaller sample size. We still reject H6, since the sign is opposite to our presumed hypothesis, even if the coefficient becomes slightly significant. A possible explanation for a positive association between self-efficacy and the ratchet effect is that employees with high self-efficacy are less afraid of negative consequences due to missing future targets than respondents with low self-efficacy are. A two-sample t-test shows that the means for the bonus and non-bonus groups are not significantly different with regard to the ratchet effect ($p = 0.392$). Overall, this supplementary analysis confirms the stable appeal of our chosen determinants that direct the ratchet effect.

Furthermore, the ratchet effect is observable only when the institution implemented tar-get ratcheting. As we cannot ensure that banks with target ratcheting do not systematically differ from banks without target ratcheting, the results might be biased by self-selection. We address a potential sample selection bias by employing an additional two-stage sample selection model (Heckman, 1979). The relevant sample size for the Heckman model is $n = 363$ as we now observe all respondents with agreed-upon targets. In the first stage, we estimate a probit regression to model the probability of target ratcheting. While target ratcheting (*TARG_RAT*) is used as the dependent binary variable we include *COMP*, *TARG_PART*, firm size (*ASSETS*) and the operating area of employees (*DEPT*) as independent variables to conduct the first stage regression and to receive the inverse Mills ratio (*IMR*). We find that *COMP*, *TARG_PART* and *DEPT* significantly explain the use of target ratcheting (all p-values < 0.05). In the second stage, we rerun our regression model adding the IMR as an additional explanatory variable. Table 7 illustrates the results. IMR is insignificant ($p = 0.60$), indicating that self-selection is unlikely to occur. Therefore, we conclude that our results are robust to this alternative specification.

Table 7

Heckman two-stage approach

	First stage	Second stage
Dependent Variable	TARG_RAT	RATCHET_EFFECT
RISK_AV		**0.204**[***]
		(0.001)
COMP	**0.256***	**0.177***
	(0.000)	(0.093)
INSECU		**0.149****
		(0.037)
TARG_PART	**0.154****	**-0.205**[**]
	(0.034)	(0.021)
CAREER		**-0.247**[***]
		(0.000)
SELF_EFF		0.113
		(0.120)
SUPERIOR		**-0.186**
		(0.163)
TENURE		**-0.522****
		(0.035)
LEAVE		0.049
		(0.829)
PROGR		0.090
		(0.565)
ASSETS	-0.080	
	(0.149)	
DEPT	-0.132**	
	(0.039)	
IMR		0.271
		(0.602)
Pseudo R²	**0.0435**	
Adjusted R²		**0.2533**
F-Value		**7.962**[***]
n	363	363

Note: The table presents the results from the Heckman's two-stage sample selection model. The dependent variable target ratcheting is coded 1 if target ratcheting is used. *ASSETS* represents the total assets of the institution, and *DEPT* represents the employees' division within the institution. Refer to Table 3 for the respective categories. All other variables are defined in Table 5. *IMR* represents the inverse Mills ratio from the first stage.
[*] $p < 0.1$; [**] $p < 0.05$; [***] $p < 0.01$

First stage:

$$\Pr(\text{TARG\_RAT}_i=1) = \alpha_0 + \alpha_1\,\text{TARG\_PART}_i + \alpha_2\,\text{COMP}_i + \alpha_3\,\text{ASSETS}_i + \alpha_4\,\text{DEPT}_i + \varepsilon_i.$$

Second stage:

$$\text{RATCHET\_EFFECT}_i = \alpha_0 + \alpha_1\,\text{RISK\_AV}_i + \alpha_2\,\text{COMP}_i + \alpha_3\,\text{INSECU}_i + \alpha_4\text{TARG\_PART}_i + \alpha_5\,\text{CAREER}_i$$
$$+ \alpha_6\,\text{SELF\_EFF}_i + \alpha_7\,\text{SUPERIOR}_i + \alpha_8\,\text{TENURE}_i + \alpha_9\,\text{LEAVE}_i + \alpha_{10}\,\text{PROGR}_i$$
$$+ a_{11}\,\text{ASSETS} + \alpha_{12}\,\text{DEPT}_i + \alpha_{13}\,\text{IMR}_i + \varepsilon_i.$$

6   Conclusion

In line with prior research, our study addresses the relevance of target ratcheting and its consequences. A considerable amount, almost 50% of our respondents state that their firm uses current individual performance as an adjustment basis for future employee targets (i.e., target ratcheting). On the one hand, target ratcheting is beneficial in several ways. First, it is a cost-effective option for target setting because the required past performance data is already available and negotiations about target revisions become obsolete. Second, target ratcheting helps to provide challenging targets in order to motivate employees to increase their personal performance. On the other hand, target ratcheting can induce strategic behavior such that employees withhold their true performance levels, i.e., the ratchet effect. Thus, it is possible to direct future upward revisions when employees slightly beat or even match the current target level. Whereas previous literature on the ratchet effect has primarily focused on the existence of the ratchet effect (e.g., Bouwens and Kroos, 2011; Cooper et al., 1999), this study examines determinants of an employee's proneness to the ratchet effect. Following Indjejikian et al. (2014b), we investigate underlying determinants that are linked to negative concerns of not being able to reach future targets. Besides, we consider determinants that are related to level of exerted effort.

We conduct a survey using a unique dataset of 403 valid responses. By examining determinants related to the ratchet effect, we predict and find that employees with higher risk aversion are more likely to exhibit ratcheting behavior. Further, we posit that high intra-organizational competition fosters the ratchet effect because employees will try to maintain a positive self-image by avoiding the negative consequences of missing target expectations. Similarly, higher perceived job insecurity enhances an employee's tendency for ratcheting because it shifts employees' focus on steadily attaining targets to signal an impeccable work performance when it comes to layoff decisions. In contrast, we predict and find that an employee's opportunity

to participate within the target setting process constitutes an instrument to constrain the ratchet effect because employees have the opportunity to give feedback when target adjustments become unattainable. Finally, we find that career ambitions help to alleviate the ratchet effect because employees with high career ambitions tend to signal their best performance regardless of their given target and, thus, have no incentive to restrict their effort.

With these findings, our study contributes to literature and practice in several ways. From a theoretical point of view, we develop a valid and reliable scale to measure the ratchet effect. While our scale proved to be successful, this opens up new directions for future research within the field of target ratcheting. Next, we identify important determinants that have the potential to substantially influence the magnitude of the ratchet effect. These findings offer suggestions for handling the ratchet effect by letting the employee participate in the target setting process. Moreover, the risk-aversion of employees needs to be considered when target ratcheting is implemented. Further, firms can influence the level of competition within a firm and take actions to alleviate employees' perceived job insecurity. In addition, firms could offer better career development options to increase employees' career ambitions.

Since our survey is subject to a number of limitations, new perspectives for future research are open. While we focus on the banking industry, it could be worth examining and comparing the magnitude of the ratchet effect in other sectors, such as the manufacturing industry. Missing consumer contacts could facilitate the predictability of work outcomes, such that the ratchet effect has less weight. Furthermore, some variables (e.g., self-efficacy scale) prove relative low variance in our sample, which is likely because we focus on one specific industry. A study across different industries could provide additional insights due to a more heterogeneous workforce. In addition, voluntarily attending a survey can influence responses in a way that the assessment of the ratchet effect is too conservative, in the sense of a self-selection bias. Further, several measures ask for the

respondents' perception. Consequently, we cannot rule out a bias through socially desirable response patterns. Due to the nature of surveys, other research approaches, e.g., field experiments could help overcome this potential bias. Besides, we study specific traits of personality such as risk aversion, perceived job insecurity, career orientation, and self-efficacy. However, humans' personality exhibits a significantly higher diversity than we assume to have a potential influence on the ratchet effect. Subsequent research could therefore investigate the association of further characteristics (e.g., NEO personality inventory, Costa and McCrae, 1992). Finally, our hypotheses are partly inspired by budget-based research. Consequently, future research could further transfer budgetary knowledge to target ratcheting, e.g., by examining group-based targets versus single appointments (Fisher et al. 2002).

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Appendix: Survey questions

Dear sir or madam,

We thank you for taking part in our study on *target setting* within the scope of our research project. The study serves research purposes exclusively. Data will be collected anonymously and treated confidentially. It will take approximately 15 minutes to complete. It is important that you answer all questions even if you are not sure about the exact answer. An approximate indication is more precious than an incomplete questionnaire. At some points in the questionnaire there are several similar questions for methodological reasons. There are no right or wrong answers. The survey results will be provided, if of interest. To thank you for your support you can participate in a lottery of three wine vouchers worth 50 euros each.

To what extent do you agree with the following statements? *(Yes or No)*

1. In my job there are agreed-upon targets.
2. It also counts to my responsibilities to define targets for third parties.
3. In addition to my basic salary I receive performance-related bonus payments.

Target adjustments

To what extent do you agree with the following statements? *(Yes or No)*

1. My targets can be adjusted in the next period.
2. My performance in this period affects my targets in the next period.

Please read each statement carefully and place a check on displayed seven-point Likert response scales anchored at the endpoints of one (strongly disagree) and seven (strongly agree), unless stated otherwise.

To what extent do you agree with the following statements?

1. Exceeding my current targets translates into higher targets in the future.
2. Failing to meet my current targets translates into lower targets in the future.
3. In case of a positive target deviation targets will be raised more than targets will be lowered in case of a negative deviation from current target.

Ratchet Effect

To what extent do you agree with the following statements?

1. I try **not** to exceed my targets for fear of future rising targets.
2. I try to exceed my targets to the maximum level possible. (R)
3. The statement 'Meeting but not beating the goal' sums up my motto.
4. I try to keep my future targets attainable by reducing my current performance.
5. In order to ensure future bonus payments, I try to keep my targets on an achievable level.
6. For strategic reasons, it does **not** seem advisable to exceed my targets.

Does the fiscal year correspond to the calendar year? *(Yes or No)*

If fiscal year differs from calendar year, choose the beginning of financial year 2016. _____

Have you already achieved your targets for financial year 2015 widely? *(Yes or No)*

To what extent do you agree with the following statements?

1. I already work on target attainment for the next financial year.
2. When the opportunity arises I already put orders to next financial year in order to ensure target attainment even in next year.
3. I entirely focus on the achievement of my targets for current financial year. (R)

Perceived probability of reaching target in period t + 1

To what extent do you agree with the following statements?

1. I consider my current targets as very demanding. (R)
2. I find my current targets very hard to accomplish. (R)
3. I think it is impossible to reach my targets for upcoming fiscal year. (R)
4. It is very likely that I actualize my targets in upcoming fiscal year.
5. I fear increasing targets because I am already working at my limit. (R)
6. I do not fear increasing targets as I still have enough capacity.

Actual workload

To what extent do you agree with the following statements?

1. During work I barely can take breaks.
2. I have a lot of time for other things during work. (R)
3. Often I have nothing to do. (R)
4. I am often forced to work extra hours because I have too many tasks.

Target Participation

To what extent do you agree with the following statements?

1. I have no input on my targets. (R)
2. I am actively involved in setting my targets.
3. I have opportunities to challenge targets that are too ambitious.
4. I am allowed a high degree of influence in the determination of my work objectives.
5. My supervisor usually asks for my opinion when determining my work objectives.

Internal Competition

To what extent do you agree with the following statements?

1. There is a very competitive atmosphere among my peers and I.
2. My coworkers and I try to outperform one another on our assigned work goals
3. I feel that my work is being compared with that of my colleagues.
4. The competitive pressure inside the company compels me to work harder.

Perceived Job Insecurity

To what extent do you agree with the following statements?

1. I feel insecure about the future of my job.
2. I fear that I might lose my job in the near future.
3. I am sure I can keep my job. (R)
4. Chances are I will soon lose my job
5. In times of strong layoffs, I would increase my job effort to keep my job.

Career Ambitions

To what extent do you agree with the following statements?

1. I am highly ambitious.
2. I try to convince those holding power over my job (e.g., supervisors) of my abilities.
3. I would like to improve myself in the long term.
4. To me, my career is an important part of my life.
5. Today's good performance results in professional or financial benefits in future.
6. My good performance today will yield professional or financial benefits in the future.
7. I like to demonstrate my capabilities in the workplace.
8. I try to put in more efforts than my colleagues.
9. I intend to pursue the job of my choice even if it cuts deeply into the time I have for my family.

Organizational Commitment

To what extent do you agree with the following statements?

1. I am willing to put in a great deal of effort beyond that normally expected in order to help this organization be successful.
2. I am proud to tell others that I am part of this organization.
3. My values and the organization's values are very similar.
4. I feel as if this organization's problems are my own.
5. I would **not** recommend a close friend to join our organization. (R)
6. Even if the firm were not doing well financially, I would be reluctant to change to another employer.

Risk Aversion

To what extent do you agree with the following statements?

1. I avoid situations that have uncertain outcomes.
2. I do not feel comfortable about taking risks.
3. I prefer situations that have foreseeable outcomes.
4. I feel comfortable improvising in new situations. (R)
5. I want to protect myself against possible future risks.
6. I would rather be safe than sorry.

Self-Efficacy

To what extent do you agree with the following statements?

1. I have confidence in my ability to do my job.
2. When I am confronted with a problem, I can usually find several solutions.
3. I am very proud of my job skills and abilities.
4. I have all the skills needed to perform my job very well.
5. Thanks to my resourcefulness, I know how to handle unforeseen situations.
6. When facing difficulties, I tend to give up easily. (R)

Personal information:

Gender

☐ female   ☐ male

Please enter your age: _____

What is your highest degree?

☐ No degree

☐ Secondary school certificate

☐ Higher education entrance qualification

☐ Completed apprenticeship

☐ Certified management expert/banking specialist/comparable

☐ University degree

☐ PhD

What position do you have in your current company?

☐ Upper management (managing director/board,…)

☐ Middle management (division manager, head of department,…)

☐ Lower management (team manager, project manager,...)

☐ Employees without management responsibilities

☐ Apprentices

☐ intern/working student

☐ Other

In which department do you currently work?

☐ sales

☐ back office (e.g., credit department, payment transaction)

☐ holding department (e.g., internal revision, accounting/controlling, marketing)

☐ board/managing director

☐ Apprentices

☐ Other

How long have you already worked for the institution? (tenure)

☐ Fewer than 1 year   ☐ Between 1 and 5 years   ☐ Between 5 and 10 years

☐ More than 10 years

Based on current expectations, I expect to leave the company in…

☐ Fewer than 1 year   ☐ Between 1 and 5 years   ☐ Between 5 and 10 years

☐ More than 10 years

How many employees does your bank branch have?

☐ In the category of 30 or less   ☐ Between 31 and 50   ☐ Between 51 and 150

☐ Between 151 and 300   ☐ Between 301 and 500   ☐ More than 500

What was the balance sheet total of your credit institution past financial year (2014) (in million Euro)?

☐ Less than 50 million   ☐ Between 50 and 100 million   ☐ Between 100 and 500 million

☐ Between 500 million and 1 billion   ☐ Between 1 to 5 billion

☐ More than 5 billion

What type of credit institution is it?

☐ Cooperative bank

☐ Savings bank

☐ Other, namely: _____

☐ I would like to take part in the lottery.

☐ I would like to get the survey results mailed.

To participate in the lottery and get the survey results, please enter your e-mail address: _____

(This information is optional, but is required for participation in the lottery or mailing the results)

Thank you for your participation!

Part V

The Effect of Relative Performance Information on Excessive Risk-Taking

ABSTRACT

Prior research has mainly investigated how relative performance information (RPI) affects performance via employee effort. We extend the prior research by considering that performance is often a joint function of effort and risk decisions. Specifically, we examine the effect of the absence or presence of RPI on excessive risk-taking because excessive risk-taking is particularly important in situations where agents compete against each other. We predict that the presence of RPI reduces excessive risk-taking because employees are social loss averse and weigh the disutility of being perceived as a low performer higher than the utility of being perceived as a high performer. We conduct a laboratory experiment and find, as predicted, that RPI decreases excessive risk-taking. In addition, we find that this effect is mainly driven by the behavior of bottom performers, supporting our theory that employees are particularly concerned with being perceived as low performers. Our results help firms to better understand the benefits and costs of RPI use.

Keywords: relative performance information, decision-making, risk-taking, framing, social loss

JEL: C91, D80, M41

1   Introduction

This study investigates the effect of relative performance information (RPI) on decision-making quality. More precisely, we study how the presence of RPI affects employees' excessive risk-taking when compensation is not tied to RPI. Further, we examine how the provision of RPI affects excessive risk-taking over time.

RPI indicates an employee's performance relative to her peers (Frederickson, 1992). In practice, many firms provide RPI to their employees even when RPI is *not* tied to compensation (Anderson et al., 1983; Nordstrom et al., 1991; Blackwell et al., 1994; Hazels and Sasse, 2008; Tafkov, 2013). Employees can also often infer their ranking informally in situations of high proximity, for example, by observing other employees' behavior and performance (Hannan et al., 2013). While a growing body of research examines how the provision of RPI affects effort and thus performance (e.g., Hannan et al., 2008, 2013; Tafkov, 2013, Kramer et al., 2016), little is known regarding how RPI affects the risk-taking decisions of employees. However, examining how RPI affects employee risk-taking is important because in many real-world settings, performance is a function of *both* effort and risk-taking decisions (Awasthi and Pratt, 1990; Sprinkle et al., 2008), and—since employees are ranked based on their performance—employees influence their ranking position not only by their level of effort but also by their risk-taking decisions.

From the firm's perspective, March and Shapira (1987) emphasize that risk-taking decisions are an important factor for firm success. While appropriate risk-taking decisions support the value-maximizing objectives of a firm's owners, employee risk-taking can also lie below or exceed the level that the owners may desire. While employees' risk-taking decisions affect the expected mean and the spread of their outcome distribution in both situations, our study addresses the case where employees select a greater spread that comes with a lower expected mean. We refer to such risk-taking decisions as excessive risk-taking. We focus on excessive risk-taking because

it is important for a number of reasons. First, it is not in the best interest of a firm's owners because it contradicts the value-maximizing objective (Hvide, 2002; Brink et al., 2017). For example, banks sometimes take excessively risky positions that, on average, decrease performance (Dong et al., 2010). Further, many entrepreneurs fail within a few years because their entry decisions are too risky and are rooted in over-optimism (e.g., Dunne et al., 1988). Second, excessive risk-taking can be harmful even from society's perspective. For example, the 2007-09 global financial crisis is said to be the result of excessive risk-taking in the financial sector, and financial regulators have attempted to counter the potential factors that led to the financial crisis (Dewatripont and Freixas, 2012; Acharya et al., 2016; Brink et al., 2017). Third, the potential for excessive risk-taking is inherent in many tasks. For example, managers of investment centers have the authority to select projects that vary in their expected value and variance (Sprinkle et al., 2008). Further, salespersons decide which customers to approach and consider that the propensity to close a deal and the potential deal value varies among customers. Finally, the hazard of excessive risk-taking refers not only to the small proportion of risk-loving individuals (e.g., von Gaudecker et al., 2011) but also applies to risk-averse individuals because contextual factors can change an individual's risk perception and risk-taking (Weber and Ancker, 2011).

A growing body of research has begun to focus on the factors that contribute to the buildup of excessive risk, and incentive systems have generally been identified as a driver of excessive risk-taking (Kempf and Ruenzi, 2008; Dong et al., 2010). In particular, tournament[1] incentive schemes—specific RPI-based contracts where compensation *is* tied to ranking information—have been suspected as a proximate cause of excessive risk-taking (Diamond and Rajan, 2009). Research on tournaments supports this notion and shows that tournament incentives indeed increase

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[1] Hannan et al. (2008, 894) define a tournament incentive scheme as a "compensation scheme where employees or managers are ranked on an ordinal scale based on their output and compensated according to their rank."

excessive risk-taking (Hvide, 2002; Bothner et al., 2007; Kini and Williams, 2012; Eriksen and Kvaløy, 2014). Because RPI invokes competition similar to tournaments and more competitive tournaments are associated with higher levels of excessive risk-taking (Eriksen and Kvaløy, 2017), it is important to investigate whether RPI that does *not* affect compensation also invokes excessive risk-taking.

To derive our hypotheses, we rely on "social loss aversion" (Camerer, 1998: 61) to predict that in contrast to tournaments, RPI mitigates excessive risk-taking. Social loss aversion suggests that an individual's marginal disutility for being perceived as a low performer relative to her peers is higher than her utility from being perceived as a high performer (Fehr and Schmidt, 1999; Lim, 2010). RPI illustrates whether an employee is a low or high performer and thus offers employees the opportunity to engage in social comparison (Festinger, 1954), which serves as an antecedent of social loss aversion (Camerer, 1998; Loewenstein et al., 1989). Therefore, employees are likely to weigh the costs and benefits of excessive risk-taking differently when RPI is provided than when RPI is absent. Specifically, we argue that employees are particularly concerned about being perceived as low performers relative to their peers when RPI is provided. Therefore, we predict that employees are likely to reduce their levels of excessive risk-taking to avoid the disutility that stems from a social loss because higher levels of excessive risk-taking imply lower levels of expected performance. Overall, our theory suggests that the provision of RPI changes employees' risk perception because the employees are likely to take the potential social loss into account, which is greater for higher levels of excessive risk-taking.

Further, we predict that the provision of RPI and time interact in affecting excessive risk-taking. While all employees are likely to reduce excessive risk-taking over time due to trial-and-error learning (Ashby, 1970), we expect that excessive risk-taking decreases more over time when RPI is provided because social loss aversion can increase over time (for loss aversion, see

Strahilevitz and Loewenstein, 1998). Further, we argue that permanent irrational decisions and hence a steadily poor social standing increase social pressure, potentially leading to social exclusion (Duclos et al., 2013).

To test our predictions, we conduct a 2×3 mixed-design laboratory experiment. We manipulate RPI between-subjects at two levels: *RPI* and *no RPI*. Each experimental session consists of three rounds. Thus, time is manipulated within-subjects at three levels. Participants conduct two subsequent tasks, and we compute the combined performance on both tasks. We use the combined performance to determine the ranking because it allows us to investigate a situation where performance is a function of *both* effort and risk-taking decisions, a setting that is commonly observed in the real world (Awasthi and Pratt, 1990).[2] Hence, participants first had to solve multiplication problems, which constitutes a real-effort task suggested by Tafkov (2013) and is appropriate for inducing social comparison. Our second task is based on Gneezy and Potters (1997). Participants were asked to decide how much of an endowment to invest in a risky lottery. The risky lottery had a 1/3 probability to win 2.5 times the invested amount and a 2/3 probability to lose the invested amount. Greater stakes in the risky lottery increase the outcome distribution while the expected mean of this risky lottery (which is always lower than the risk-free alternative) declines. Because the economically optimal strategy is thus to take no risk, the stake allocated to the risky alternative is our measure for excessive risk-taking.

In line with our predictions, we find excessive risk-taking to be greater when RPI is absent compared to RPI-present conditions. Hence, the presence of RPI promotes *non*-excessive risk-taking even though financial incentives are not tied to the ranking. Moreover, we find an additive

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[2] Alternatively, we could have investigated a situation where the ranking is based only on risk-taking decisions. However, such a situation could first lead to gambling. Second, because our hypothesis development builds on social loss aversion, it is important that social comparison is likely to evolve and that the ranking information is perceived as informative about individual ability. Therefore, we used a ranking based on combined performance.

association between RPI and time on excessive risk-taking. More precisely, employees reduce excessive risk-taking over time independent of whether RPI is provided. Finally, we further investigate our data by conducting one additional experimental condition and using items from the pre- and post-experimental questionnaire. Thereby, we provide evidence for our theory that the provision of RPI changes employees' risk perception and that they are particularly concerned about being perceived as low performers.

Our study contributes to accounting theory and practice in several ways. From a theory perspective, we add to extant research that studies the effects of RPI. Previous research has examined how RPI affects behavior, for instance, effort and performance (e.g., Hannan et al., 2008, 2013; Azmat and Iriberri, 2010; Murthy and Schafer, 2011; Tafkov, 2013; Kramer et al., 2016), honesty (Brown et al., 2014), perceived organizational support (Mahlendorf et al., 2014), and sabotage (Charness et al., 2014). However, we investigate how RPI affects decision-making, specifically excessive risk-taking. This approach is in line with Sprinkle (2003, 299), who argues that it is important that an "accounting performance measurement and reward system not only needs to motivate high levels of effort from employees, but also needs to encourage the appropriate level of risk taking".

Further, we contribute to the literature on the effects of tournaments on excessive risk-taking (Hvide, 2002; Bothner et al., 2007; Kini and Williams, 2012; Eriksen and Kvaløy, 2014; Eriksen and Kvaløy, 2017). While research on tournaments finds that these incentive systems increase excessive risk-taking, our study illustrates that RPI that is *not* tied to compensation promotes *non*-excessive risk-taking. Hence, our results suggest that excessive risk-taking in tournaments is not driven by RPI but by combining RPI with rewards based on RPI.

From a practical perspective, our findings reveal important information for the implementation of RPI. Most importantly, we show that the provision of RPI promotes non-

excessive risk-taking when it is not linked to compensation, which is important for management accountants when assessing the benefits and costs of RPI. This finding is particularly important for firms that are seriously concerned about excessive risk, for example in the financial industry, because they can rip the benefits of RPI (increased effort) while reducing the excessive risk-taking cost at the same time. We also inform management accountants that the provision of RPI reduces excessive risk-taking most effectively if not only the top ranks but also the bottom ranks are disclosed because employees are particularly concerned about potential social losses. In contrast, using RPI to expose only the high-performing employees, e.g., by disclosing the best employees of the month, will be less effective in promoting non-excessive risk-taking.

This paper proceeds as follows: Section II provides the background and hypotheses. Section III describes our experimental method, while Section IV presents the results. Section V concludes.

2   Background and hypotheses

2.1   Background

Decision-making under risky conditions is one of the most studied topics in managerial accounting (Moreno et al., 2002). Thereby, risk refers to either organizations that experience volatile income flows (organizational risk) or managerial choices associated with uncertain outcomes (managerial risk-taking) (Palmer and Wiseman, 1999). In our study, we concentrate on the latter aspect of managerial risk-taking.

Classic theories within the expected utility framework suggest that decision-makers prefer larger expected value over smaller expected value, given a constant level of risk (Lindley, 1985), while given a constant expected value, individuals are expected to prefer smaller risk over larger risk (Arrow, 1965). Early definitional approaches in decision theory view risk as the variation in the distribution of possible outcomes. For instance, Pratt (1964) and Arrow (1965) determine the variance of a probability distribution of possible gains and losses as risk.

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Agency theory distinguishes risk-taking behavior between principals and agents (Jensen and Meckling, 1976). Thereby, theory implies risk-neutral, i.e., expected-value-maximizing, principals and risk-averse, i.e., variance-minimizing (given a constant expected value), agents (Eisenhardt, 1989). This is because principals can diversify their investments via portfolio selection, while agents are risk-averse due to their firm-specific and undiversified human capital (Amihud and Lev, 1981).

Empirical research supports the assumption that individuals are, on average, risk-averse (e.g., von Gaudecker et al., 2011). However, research also provides consistent evidence that agents may exhibit excessive risk-taking behavior when they accept a lower expected value in favor of a greater spread and a potentially higher outcome. For instance, in investment banking, managers take risk on top of what a principal would rationally desire (Bannier et al., 2013; Clementi et al., 2009). Further, research suggests that overconfident CEOs exhibit excessive risk-taking behavior when they overestimate the returns on their investment projects or underestimate the risks (Malmendier and Tate, 2005). Excessive risk-taking becomes a major problem if poor performance simultaneously coincides with it (Chen et al., 2013).

As Wiseman and Gomez-Mejia (1998) note, a synthesis between agency theory and behavioral decision theory explains risk-taking more comprehensively than either perspective alone. While agency theory indicates that financial incentives can affect the agent's risk-taking behavior, behavioral decision theory proposes that downside risk dominates over upside incentives (Sanders, 2001). The prospect theory of Kahneman and Tversky (1979) marks such a behavioral addition to decision theory. Because their model incorporates a person's situational processing, it is possible to alter the personal reference point by framing the decision problem (Tversky and Kahneman, 1992). In particular, positively framed situations foster excessive risk-taking by highlighting opportunities rather than risks (March and Shapira, 1987). Conversely, negatively

framed situations foster risk-averse decisions because of hypervigilance (Janis and Mann, 1977) or threat-rigidity responses (Staw et al., 1981).

The risk framework of Sitkin and Pablo (1992) and Sitkin and Weingart (1995) integrates the perspectives of individual personality and situational effects to explain risk-taking. They show that *risk propensity* has an influence on *risk perception*, which finally leads to observable *risky decision-making* behavior. Risk propensity, i.e., an individual's tendency to take or avoid risks, is assumed to not be stable but "persistent" (Sutherland, 1989: 452) or "enduring" (Goldenson, 1984: 757) and to be learnable or inheritable (Corsini and Osaki, 1984). Therefore, risk propensity changes only slowly over time due to, e.g., past experiences (Sitkin and Pablo, 1992). In contrast, risk perception, i.e., the cognitive processing of situations, can rapidly change due to situational effects, for example due to the framing of content. Hence, differences in individuals' risky decision-making are not only due to their different willingness to take risks but also to their different cognitive processes of perceiving risk (Weber and Ancker, 2011). According to this framework, increases in perceived risks lead to lowered risks taken in decision-making behavior, while increases in perceived benefits are associated with higher risk-taking (Finucane et al., 2000).

2.2   Hypothesis development

To develop our hypotheses, we argue that the provision of RPI is likely to influence an employee's risk perception, and we rely on social loss aversion to predict how RPI affects an employee's risk perception and thus excessive risk-taking.

While conventional economic theory argues that RPI should not affect employee behavior when compensation is not linked to ranking information, prior research shows that the provision of RPI affects behavior. More precisely, research documents that RPI increases effort and performance (e.g., Hannan et al., 2008, 2013; Tafkov, 2013; Kramer et al., 2016), particularly when employees' social identification with their peers is strong (Mahlendorf et al., 2014). Thereby, prior

research predominantly builds on social comparison theory and argues that the provision of RPI frames a situation differently compared to a situation without RPI.

Social comparison theory posits that individuals have an inherent drive to compare their abilities, and they wish to perform better than their peers because performance speaks to ability (Festinger, 1954). In particular, social comparison describes the state whereby individuals relate information to themselves whenever they receive information about what others have achieved or have failed to achieve (Dunning and Hayes, 1996). Tesser (1988) extends social comparison theory with the self-evaluation maintenance model and integrates emotions into Festinger's approach concerning the affective consequences of the social comparison process. Thereby, performing worse than one's peers threatens an individual's self-image, while performing better than one's peers evokes positive feelings (e.g., pride) that help an individual maintain a positive self-image (Tesser and Smith, 1980; Tesser, 1988; Beach and Tesser, 1995).

In many real-world settings, performance is a function of both effort and risk-taking decisions (Awasthi and Pratt, 1990; Sprinkle et al., 2008) and therefore also of the level of excessive risk-taking. The framework of Sitkin and Pablo (1992) and Sitkin and Weingart (1995) suggests that the level of excessive risk-taking depends on an employee's risk perception.[3] However, the provision of RPI is likely to affect an employee's risk perception because employees have to bear not only the monetary consequences of their risk-taking decisions but also the psychological consequences, since being at the top or bottom end of a ranking leads to feelings such as pride or shame (Lazarus, 1991; Smith, 2000; Kuhnen and Knutson, 2005). On the one hand, a low level of excessive risk-taking suggests that employees have a high chance of achieving a medium performance and thus a midfield ranking position but a low chance that their performance

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[3] An employee's level of excessive risk-taking also depends on risk propensity. Because risk propensity is rather persistent, it is independent of whether RPI is absent or present and is thus unlikely to affect risky decision-making.

will be either high (top rank) or low (bottom rank). On the other hand, a high level of excessive risk-taking implies that employees are more likely to achieve a high performance (top rank), but additionally they are even more likely to achieve a low performance (bottom rank).

To predict how RPI affects an employee's risk perception and consequently her level of excessive risk-taking, it is important to investigate how employees appraise different ranking positions. According to Loewenstein et al. (1989), who demonstrate the applicability of the loss aversion concept (Tversky and Kahneman, 1992) to social utility functions, employees feel worse about being a low performer in their group than they feel good about being a high performer. Therefore, an employee's marginal disutility for being perceived as a low performer is higher than her utility for being perceived as a high performer (Fehr and Schmidt, 1999; Lim, 2010), which is a phenomenon called "social loss aversion" (Camerer, 1998, 61). To formally describe the utility employees derive from their relative performance, we follow the approach of Fehr and Schmidt (1999):

$$U_i = U(p_i) - \alpha_i \frac{1}{n-1} \sum_{j \neq i} max(r_j - r_i, 0) + \beta_i \sum_{j \neq i} max(r_i - r_j, 0)$$

We consider the utility U for agent i, which consists of three parts. First, $U(p_i)$ denotes the monetary utility (payment) of agent i for completing a task. Second, considering a set of n agents, parameter α_i represents the social disutility of receiving a worse rank r_i than the rank r_j of a competing agent. Third, parameter β_i denotes the additional social utility from the status-seeking preferences of agent i to receive a better rank r_i than the rank r_j of a competing agent. We assume $0 < \beta_i < \alpha_i$, which essentially represents social loss aversion because negative deviations from the social reference point, that is the other contestants, have more weight than positive deviations.[4]

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[4] Loewenstein et al. (1989) provide evidence that our central assumption of $\alpha_i > \beta_i$ is valid. Nevertheless, they also illustrate scenarios where $\beta_i < 0$, as it appears reasonable that contestants with a positive relationship (e.g., best friends) or in a certain context (e.g., creative R&D) can even suffer from advantageous inequality ($\beta_i < 0$).

Findings from biological and neurological research further support the validity and applicability of the prediction of social loss aversion. In this regard, primate research can serve as an indicator to describe humans' subconscious competitive behavior (Garcia et al., 2013). In fact, even nonhuman primates are able to distinguish between in-groups and outgroups (Bergman et al., 2003), which constitutes social comparison. Moreover, primate research demonstrates that primates' susceptibility to rankings induces negative emotions (Beehner et al., 2006). From an evolutionary biology perspective, these feelings activate the harm-avoidance system, which unconsciously reacts to potential dangers from the environment (Gray, 1970; Tellegen, 1985). Further, psychology research supports this view by indicating that pleasant and unpleasant feelings as well as their cognitive and behavioral consequences are not perfectly correlated bipolar opposites (e.g., Erber and Erber, 1994; Forgas, 1991; Raghunathan and Pham, 1999).

With regard to the provision of RPI, it is likely to induce asymmetric effects such that, on average, employees have a slight willingness to positively distinguish themselves from others by achieving a top rank but have stronger preferences to avoid receiving a bottom rank. Transferred to excessive risk-taking, we predict that RPI frames the decision problem in such a way that employees take the possibility of a social loss into account in their mental processing phase because employees compare their performance, as performance speaks to ability. Because high levels of excessive risk-taking are associated with a higher likelihood of receiving a bottom rank, it comes with the danger of a social loss, which individuals include in their decision process. As the lower likelihood of reaching a top rank cannot outweigh the disutility of reaching a bottom rank, individuals lower their acceptance for excessive risk-taking when RPI is present compared to situations without RPI. This leads to our first hypothesis.

H1:   Excessive risk-taking will be lower when RPI is provided compared to when it is not.

Although the provision of RPI in firms may take a variety of forms (Nordstrom et al., 1990), it is typically not a single event. Rather, firms often provide RPI regularly and even at consistent time intervals because the delivery of monthly or even weekly feedback can lead to preferable performance levels (Ford, 1980). Therefore, the question arises whether the provision of RPI affects excessive risk-taking differently over time compared to when RPI is not provided.

When RPI is absent, employees can adapt their risk-taking decisions based on trial-and-error learning, which represents an inherent instinct that does not necessarily require deeper analytic methods (Ashby, 1970). More precisely, employees who engage in excessive risk-taking likely receive feedback that their behavior is suboptimal because they are more likely to lose money than to win money. This feedback may change their risk perception, while their risk propensity remains unaffected. Therefore, employees are likely to reduce excessive risk-taking to increase their expected payoff (Kuhnen and Knutson, 2005), independent of whether RPI is provided.

However, when RPI is provided, employees are likely to reduce excessive risk-taking more compared to when RPI is absent because the degree of social loss aversion likely increases over time after employees experience the disutility from a comparable loss in a previous period (for loss aversion, see Strahilevitz and Loewenstein, 1998). Further, while singular suboptimal decisions under risk can happen to anyone, constant irrational decisions and hence a steady poor social standing increase social pressure, potentially leading to social exclusion, which ultimately decreases decision-making quality (Duclos et al., 2013). Because the disutility attached to bottom ranks increases over time, employees are likely to adjust their level of excessive risk-taking according to their higher degree of social loss aversion. Finally, the decision frames from RPI likely need time to internalize. With RPI as a subpart of an organizational incentive system, organizations aim to direct employees' attention and behavior (Snyder and Ickes, 1985; Davis-Blake and Pfeffer, 1989). Thereby, decision makers pass through an adaptation process in which they slowly update

their personal risk perception based on the organization's targeted risk culture (Sitkin and Pablo, 1992). Consequently, employees tend to seek the organization's cultural risk values as an orientation for decisions under risk (Douglas and Wildavsky, 1982).

Overall, our arguments suggest that employees reduce excessive risk-taking over time. However, when RPI is provided, employees are likely to reduce their level of excessive risk-taking more than when RPI is absent. Taken together, we predict an interaction effect between RPI and time on excessive risk-taking, which is reflected in our second hypothesis.

H2: Over time, excessive risk-taking decreases more when RPI is provided compared to when it is not.

H1 and H2 are graphically presented in Figure 1.

FIGURE 1
Predicted effects of RPI on excessive risk-taking
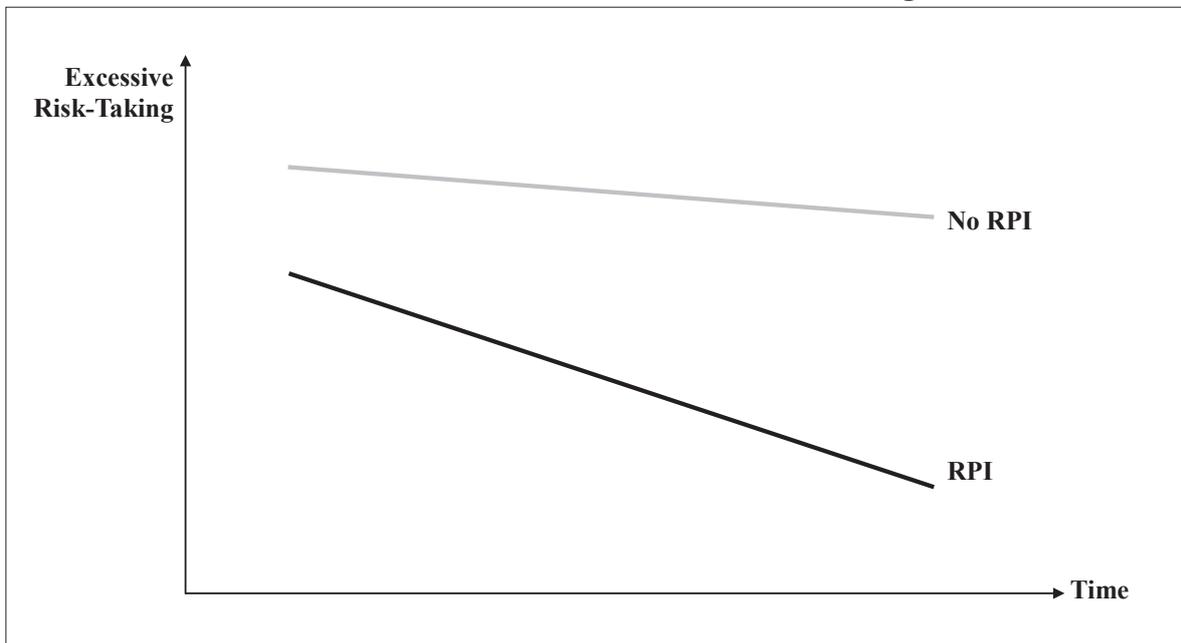
3   Method

3.1   Experimental design and task description

To test our hypotheses, we conduct a 2 × 3 experiment in which we vary two factors. First, we manipulate the provision of RPI between-subjects at two levels: *RPI* and *no RPI*. Second, we conduct three rounds where performance in a prior round does not carry over to the next round. Hence, time is our second within-subject factor that is measured at three levels. We conduct each session with six participants. Each session is conducted in a computer laboratory using z-Tree software (Fischbacher, 2007).

Participants work on two problem-solving tasks, a real-effort math task and an (investment) risk-taking decision. Regarding the math task, participants are given 30 multiplication problems in each round. The multiplication problems are of similar difficulty so that no rational order exists to solve the problems.[5] We prohibited the use of calculators and pens to ensure that participants rely on their mental calculation skills. The task ends automatically after 120 seconds.[6] During that time, a visible clock in the right corner of the screen counts down. We include the math task prior to the risk-taking decision in our experiment for two reasons. First, it prevents participants from pure gambling in the subsequent risk-taking decision because prior research shows that math tasks are suitable to evoke social comparison (e.g., Hannan et al., 2013; Tafkov, 2013), which is an antecedent of social loss aversion. To enhance this effect, we explain to participants that IQ tests frequently use such multiplication problems, which indicate general problem-solving ability. Second, we include the math task because in many real-world settings, performance is a function

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[5]   The first multiplier ranges between six and nine, while the second multiplier exhibits a range between 11 and 36 (e.g., 7 × 17), leading to results between 100 and 400. To keep the tasks challenging, we avoid two-digit multipliers ending in zero or five. In addition, we refrain from using multiple-choice questions to prevent lucky choices.

[6]   We pretested the difficulty and number of problems. Therefore, we expected that on average, participants would solve ten problems correctly within the given timeframe, while solving all problems appeared unlikely.

of both effort and risk-taking decisions (Sprinkle et al., 2008). Therefore, performance depends not only on decision quality but also on effort.

We derive our second task from Gneezy and Potters (1997) to capture our dependent variable of excessive risk-taking. The risk elicitation method of Gneezy and Potters (1997) is widely used to provide support for loss aversion in financial decisions and constitutes an instrument to assess risk preferences (Charness et al., 2013). Specifically, participants receive an endowment of 100 points that they have to allocate to two alternative investments. Participants can allocate the 100 points in one-point increments. Alternative one comes without risk but also with zero return. For example, if a subject decides to allocate 100 points to alternative one, then she will keep the 100 points endowed. Alternative two represents a risky lottery and exhibits a dyadic payoff structure. The risky lottery has a 1/3 probability to win 2.5 times the invested amount and a 2/3 probability to lose the invested amount. Because the expected value of alternative two (expected value $0.8\bar{3}$) is lower than the expected value of the risk-free alternative one (expected value 1), every increment that participants invest in alternative two can be regarded as excessive risk-taking because participants exchange a lower expected value for a greater variance. Therefore, the proportion that participants allocate to alternative two is our proxy for excessive risk-taking.

To derive the combined performance on the two tasks, participants receive ten points for each multiplication problem solved correctly as well as the points from the risk-taking decision. Thereby, we aim to balance the level of importance of both tasks because the expected 100 points from the first task (ten points for ten problems solved correctly, according to the pretest) equal the economically rational strategy of the second task, that is, investing 100 points into alternative one.

3.2 Experimental manipulations

We manipulate the provision of RPI at two levels. Under conditions of *No RPI*, participants receive no ranking information. Instead, they receive a waiting screen before proceeding to the next

round. Under conditions of *RPI*, participants receive ranking information about their individual performance and the ranks of the other five participants in their group (public RPI). The ranking information is illustrated in a table that shows which participant (based on the participant's cubicle number) achieved which rank, sorted by rank in descending order. The ranking information is computed based on the participants' total points on the two performed tasks. We inform the participants that a random number decides their rank order if two or more subjects earn the same number of points.

3.3 Incentive scheme

All participants receive a show-up fee of €5.00. Further, participants earn points from the math task and the risk-taking decision that translate into money. Participants receive €0.01 for each point, implying that compensation depends on the absolute number of points earned but not on relative performance. Hence, it is economically rational to solve as many problems as possible within the given timeframe of 120 seconds. Further, participants earn additional points from the investment and thus have an economic incentive to invest in the alternative with the higher expected return. Simultaneously, we assure that investments in the inferior alternative two represent a suitable measure of excessive risk-taking. The compensation scheme is identical under both conditions.

3.4 Procedures

We conducted six separate sessions for each of the two conditions. In each session, participants were provided with a written set of instructions that informed the participants about the experimental procedure. In particular, we explained the two tasks, the compensation scheme, and the feedback in detail. Then, participants were asked to answer all questions on a pre-experiment quiz correctly to ensure that all participants understood the experiment. After

successfully finishing the quiz, participants introduced themselves by standing up, turning to the other five participants, and saying their participant number, which was mounted on top of each participant's screen. Participants also stated their first name, their term, their exact major, and in which federal state they finished secondary school. The purpose was to increase the relevance of the other participants and, thus, the degree of social comparison. To preserve experimental control, introductions took place in all conditions.

Next, participants were asked to answer twelve questions measuring their risk propensity in social and financial domains that we derived from the "Domain-Specific Risk-Taking (DOSPERT)" scale by Blais and Weber (2006). We used this scale because it allows us to measure not only risk propensity but also risk perception.[7] Further, the DOSPERT scale includes various facets of risk in different domains.[8] Therefore, we could choose twelve questions from the financial and social domain, as they adequately capture our investigated environment of financial decisions with social consequences. While the questions concerning risk propensity had to be answered before the experiment took place, we measure risk perception at the end of each session.

After taking the risk-propensity questionnaire, the participants conducted three rounds of the experimental tasks. In each round, participants started by solving the mathematical problems. Then, participants received individual performance information that showed the number of correct answers and the resulting points. We provided this information to avoid uncertainty regarding performance in the first task. Next, we asked the participants to evaluate their own performance

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[7] The DOSPERT instrument uses identical statements to measure risk propensity and risk perception. However, the DOSPERT scales differ. Risk propensity is measured on the scale "1 – Extremely unlikely … 7 – Extremely likely". In contrast, risk perception is measured on the scale "1 – Not at all risky … 7 – Extremely risky". It is noteworthy that the meaning of both scores diverges. Consequently, a high (low) score for risk propensity (risk perception) signals a high likelihood of risky behavior in domain-specific situations. However, as the items are the same, it is possible to reverse-code the risk perception score to ultimately compare the accordance between risk propensity and risk perception.

[8] Although Blais and Weber (2006) call it a domain-specific risk-taking scale, healthcare studies use its main questionnaire (risk-taking) to measure risk propensity (Harrison, et al., 2005). Another popular questionnaire with an explicit risk-taking scale is Jackson's Personality Inventory (Jackson, 1994). However, its items gather only financial domains and try to operationalize risk-*taking*.

relative to their peers (top third, midfield, bottom third).[9] Subsequently, participants completed the (investment) risk-taking task. To determine whether investments in alternative 2 are lost or multiplied by 2.5, we used a lottery and drew a ball out of a bowl that contained two red balls and one green ball, with the green ball representing the positive outcome.[10] At the end of each round, all participants learned their combined performance. Further, participants in the RPI condition also received the ranking information, while participants in the no RPI condition received a waiting screen.

Finally, following the completion of all three rounds, participants were asked to fill out a post-experimental questionnaire. We include items to measure rank thinking, selected personality traits, and the person's risk perception. We derive the item for rank thinking from Tafkov (2013) to determine whether our manipulation was successful. As described, we capture risk-perception data in the post-experimental questionnaire using the same statements in the DOSPERT instrument but with the scale for risk perception. Placing the risk perception measurement at the end of the experiment allows us to analyze whether our manipulation altered the participants' risk perception compared to their initial risk propensity (Sitkin and Pablo, 1992). In addition, we control for personality-related influences. Thereby, we picked suitable dimensions from the revised NEO personality inventory (Costa and McCrae, 1992; McCrae and John, 1992), particularly anxiety, excitement-seeking, and achievement-striving. Finally, participants received information about their total amount earned during the experiment. On average, participants earned €10.75, including the show-up fee, for approximately 45 minutes of participation. Figure 2 illustrates the experimental procedures.

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[9]   We use this information to analyze whether there is a link between the perceived rank after the first task and the level of excessive risk-taking. For example, perceived low performers may aspire to high-risk strategies.

[10] To prevent dishonest behavior, participants were asked to enter an unknown code that described the drawn state. Hence, participants were not able to enter a positive state when a red ball had been drawn.

FIGURE 2
Experimental procedure
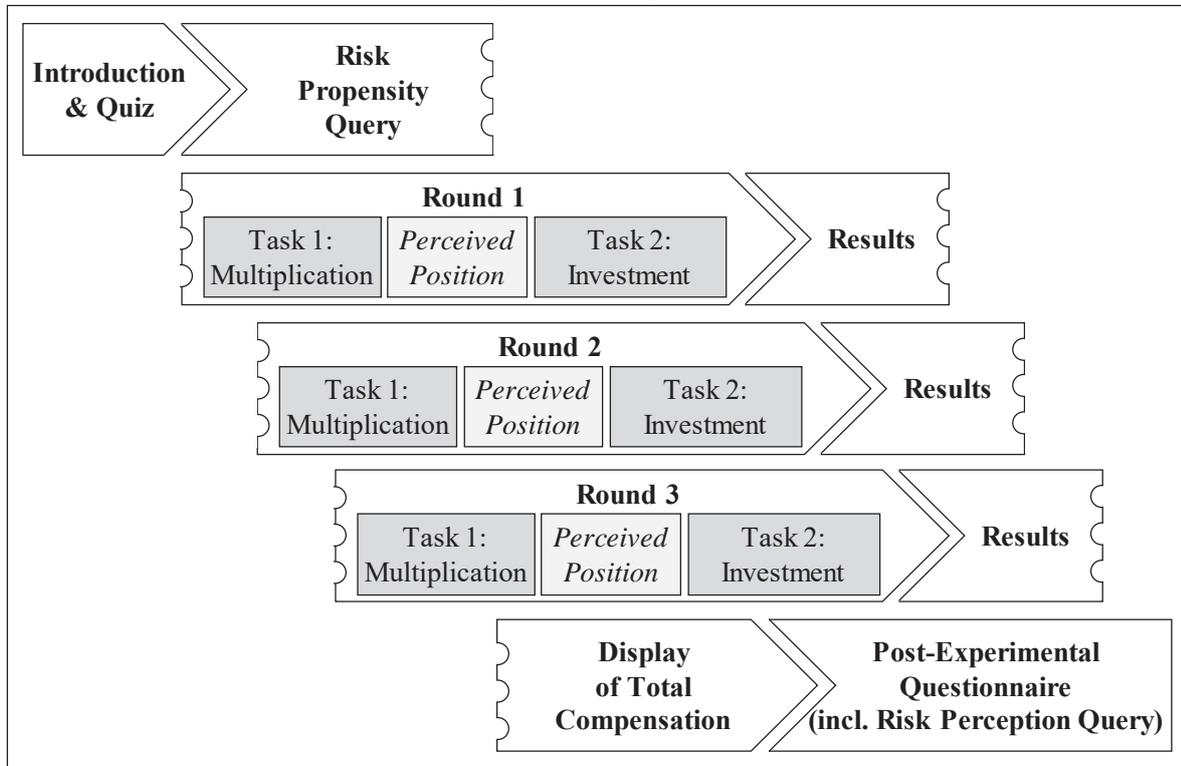
3.5 Participants

Participants were recruited from a Western European university. In total, 72 students participated in 12 sessions, with six participants in each session. With respect to the general nature of our experiment, we recruited undergraduate and graduate business students from all majors, of which 68.1 percent were graduate students. Participants' mean age is 23.8 years; 54.2 percent are male. Because our tasks demand mathematical skills, we collected the number of college-level math classes participants had taken. On average, they had taken 3.0 math classes. We tested for differences regarding age, gender, and mathematical background across conditions. While we do not find significant differences regarding gender and mathematical background across conditions (all p-values > 0.10, two-tailed), we do find significant differences regarding age (RPI: 24.4; no RPI: 23.1 years; $p = 0.02$). Because prior research indicates that age has an influence on

individuals' risk-taking (Wallach and Kogan, 1961; Chaubey, 1974), we consider participants' age in our statistical analyses.

4   Results

4.1   Experimental design validation

According to the risk framework of Sitkin and Pablo (1992) and Sitkin and Weingart (1995), risk propensity is a persistent and important factor in explaining risk-taking. Therefore, we test for differences regarding risk propensity but do not find significant differences across conditions ($p = 0.97$, two-tailed). Because risk preferences may be rooted in personality traits, we included questions for the dimensions of anxiety and excitement-seeking, which can considerably explain risk propensity in our post-experimental questionnaire. We find that both dimensions explain risk propensity (anxiety: $F = 5.43$, $p = 0.02$; excitement-seeking: $F = 14.39$, $p < 0.01$), indicating that we have an appropriate setting to test risk-taking behavior. Further tests show that both traits do not differ significantly across conditions (anxiety: $p = 0.94$, two-tailed; excitement-seeking: $p = 0.83$, two-tailed).[11]

In addition, overconfidence, as one manifestation of excessive risk-taking, is linked to narcissism (Zhu and Chen, 2015; Navis and Ozbek, 2016). Therefore, we included a single-item scale to identify potential narcissists, who may distort the results. A single question about whether the participant agrees to be a narcissist appears to be appropriate for two reasons. First, the concerned individuals tend to reveal themselves as narcissists (Raskin and Terry, 1988). Second, Konrath et al. (2014) demonstrate a significant correlation between the single-item scale and narcissism scales that are more sophisticated (e.g., including several forced-choice items). Notwithstanding, the participants seem to refrain from narcissism, with both conditions being

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[11]   Further, we check for an unbalanced distribution of achievement-oriented individuals to rule out performance distortions. The two-sample t–test reveals similar means ($p = 0.92$, two-tailed).

significantly smaller than the mean ($p < 0.01$, one-tailed). Moreover, there are no significant differences across conditions ($p = 0.76$, two-tailed). Thus, randomization appears to be successful, as we are not able to find significant differences in personality that may interfere with our results.

Finally, we asked participants whether they thought about their performance in comparison to the other participants' performance to elucidate whether they engaged in a social comparison process. The results reveal that answers in the RPI condition are significantly above the midpoint ($p < 0.01$, one-tailed), whereas the condition without RPI is not significantly different from the midpoint ($p = 0.92$, two-tailed). Notably, the answers of participants in the RPI condition differ significantly from those in the no RPI condition ($p = 0.03$, two-tailed). Therefore, we conclude that our RPI manipulation evokes social comparison.

4.2   Descriptive statistics

Table 1 reports the mean and standard deviation of the number of problems solved correctly and the stakes of excessive risk allocation. Recall that the number of problems solved correctly originates from the multiplication tasks, whereas the second task captures our measure for excessive risk-taking, that is, excessive risk allocation. The average number of problems solved correctly neither differs significantly between the RPI and no RPI conditions in round 1 (7.25 vs. 8.31, $p = 0.23$, two-tailed), round 2 (10.06 vs. 10.25, $p = 0.83$, two-tailed), and round 3 (10.36 vs. 10.56, $p = 0.83$, two-tailed) nor in total (27.67 vs. 29.11, $p = 0.58$, two-tailed).[12] This finding is important because our results suggest that participants of both conditions enter the second (decision) task with comparable performance and thus amount of money earned. Further, the results

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[12]   At first sight, these findings are at odds with prior research, suggesting that RPI increases performance (e.g., Tafkov, 2013; Hannan et al., 2013). However, these studies use a time bonus for every second saved, which we consciously do not provide because in these studies, the participants use more time, which leads to increased performance, but they do not solve more questions correctly in a shorter period of time. Because we aimed to create a situation in which the participants enter task 2 with similar preconditions, we provided all participants 120 seconds in each round for the multiplication task and ended the task automatically.

indicate that average performance increases over time. However, only the improvement from round 1 to round 2 is significant for both conditions, with $p < 0.01$ given a paired t-test.

Regarding the results for our main variable of interest, the data suggest that participants invest less in the excessively risky alternative when RPI is provided. This result is in line with hypothesis 1. While participants allocate 117.44 points over the three rounds out of the endowment of $3 \times 100 = 300$ points to the risky investment alternative when RPI is absent, participants in the RPI-present condition invest, on average, only 78.19 points. This difference is statistically significant in round 1 ($t = 1.83$, $p = 0.07$, two-tailed), round 2 ($t = 2.24$, $p = 0.03$, two-tailed), round 3 ($t = 2.85$, $p < 0.01$, two-tailed), and in total ($t = 2.84$, $p < 0.01$, two-tailed).

Regarding the development of excessive risk allocation over the three experimental rounds, Table 1 reveals that in RPI conditions, the amount invested into the excessively risky alternative decreases from round 1 (mean 32.69) to round 2 (mean 24.75) to round 3 (mean 20.75). These differences are statistically significant from round 1 to 2 ($t = -2.17$, $p = 0.04$, two-tailed) and from round 2 to 3 ($t = -1.72$, $p = 0.09$, two-tailed). When RPI is absent, the amount invested into the excessively risky alternative decreases slightly from round 1 (mean 42.61) to round 2 (mean 36.17) but then increases to round 3 (mean 38.67). These differences are either significant (from round 1 to 2: $t = -1.89$, $p = 0.07$, two-tailed) or insignificant (from round 2 to 3: $t = -0.52$, $p = 0.60$, two-tailed).

TABLE 1
Descriptive statistics
(Mean [Standard Deviation])

	RPI manipulation[a]	
	RPI ($n = 36$)	**No RPI** ($n = 36$)
Problems solved correctly[b]		
Round 1[c]	7.25 [3.38]	8.31 [4.01]
Round 2	10.06 [3.07]	10.25 [4.38]
Round 3	10.36 [3.21]	10.56 [4.50]
Total	**27.67** [8.18]	**29.11** [12.24]
Excessive risk allocation[d]		
Round 1[c]	32.69 [24.82]	42.61 [21.02]
Round 2	24.75 [18.52]	36.17 [24.32]
Round 3	20.75 [21.37]	38.67 [31.13]
Total	**78.19** [55.13]	**117.44** [61.89]

[a] *RPI* (relative performance information) is manipulated between-subjects at two levels: *RPI* and *No RPI*. In the *RPI* condition, participants received their individual performance rank and the performance ranks of the other five participants in their respective session at the end of each round. In the *No RPI* condition, participants received no information about their individual performance rank and the performance ranks of the other five participants but were presented a waiting screen.
[b] *Problems solved correctly* equals the number of problems solved correctly in the first task (multiplication problems).
[c] *Round* is a within-subjects factor.
[d] *Excessive risk allocation* is the proportion that participants allocate to the risky alternative 2 in the (investment) risk-taking decision.

4.3 Hypothesis tests

Hypothesis 1 predicts that excessive risk-taking will be lower when RPI is provided compared to when it is not. The descriptive statistics are in line with our prediction. To formally test our hypothesis, we run a repeated measures ANOVA using the RPI manipulation and round as treatment variables, whereas the dependent variable is the amount allocated to the risk lottery.

Panel A of Table 2 presents the results, which support H1 ($F = 32.77$, $p < 0.01$, two-tailed). To consider that age differs significantly across conditions, we also run a repeated measures ANOVA with age as a covariate. Panel B of Table 2 shows the corresponding results. As suggested by prior research (Wallach and Kogan, 1961; Chaubey, 1974), age significantly influences participants' risk taking ($F = 13.30$, $p < 0.01$, two-tailed). However, it does not affect our inferences because the main effect of RPI remains significant ($F = 15.13$, $p < 0.01$, two-tailed). Therefore, we conclude that excessive risk-taking is lower when RPI is provided compared to conditions without RPI.

TABLE 2
Tests of hypothesis H1 and H2 (*RPI vs. No RPI*)

Panel A: Repeated measures ANOVA

Source	df	Mean Square	*F*-Statistic	*p*-Value[e]
RPI[a]	1	9,243.38	32.77	<0.01
Round[b, c]	2	1,385.24	4.91	0.01
RPI × Round[c]	2	325.50	1.15	0.32
Residual	140	282.03		

n = 216
Adjusted R² = 0.542
Huyn-Feldt epsilon = 0.953

Panel B: Repeated measures ANCOVA

Source	df	Mean Square	*F*-Statistic	*p*-Value[e]
RPI[a]	1	4,266.76	15.13	<0.01
Round[b, c]	2	1,385.24	4.91	0.01
RPI × Round[c]	2	325.50	1.15	0.32
Age[d]	1	3,750.00	13.30	<0.01
Residual	140	282.03		

n = 216
Adjusted R² = 0.542
Huyn-Feldt epsilon = 0.968

[a] *RPI* (relative performance information) is manipulated between-subjects at two levels: *RPI* and *No RPI*. In the *RPI* condition, participants received their individual performance rank and the performance ranks of the other five participants in their respective session at the end of each round. In the *No RPI* condition, participants received no information about their individual performance rank and the performance ranks of the other five participants but were presented a waiting screen.
[b] *Round* constitutes a within-subjects variable. We conduct three individual rounds, leaving former results disregarded.
[c] The *p*-values are calculated based on the Huynh-Feldt correction to account for sphericity.
[d] *Age* is a participant's age and is measured in the post-experimental questionnaire.
[e] The *p*-values are two-tailed.

Hypothesis 2 predicts that, over time, the reduction in excessive risk-taking is greater when RPI is provided compared to when it is not. The descriptive statistics, which are graphically presented in Figure 3, are in line with our hypothesis. To formally test hypothesis 2, we use a repeated measures ANOVA and ANCOVA with the amount allocated to the excessively risky alternative in the three rounds as our dependent variable. The results are reported in Table 2. In addition to the RPI main effect, we find a significant round effect ($F = 4.91$, $p = 0.01$, two-tailed), indicating that excessive risk-taking decreases over time.[13] However, the predicted interaction between RPI and time is insignificant ($F = 1.15$, $p = 0.32$, two-tailed). Therefore, we do not find support for H2 and reject the hypothesis that excessive risk-taking decreases more over time when RPI is provided.

FIGURE 3
Effect of RPI on excessive risk allocation (H1 and H2)

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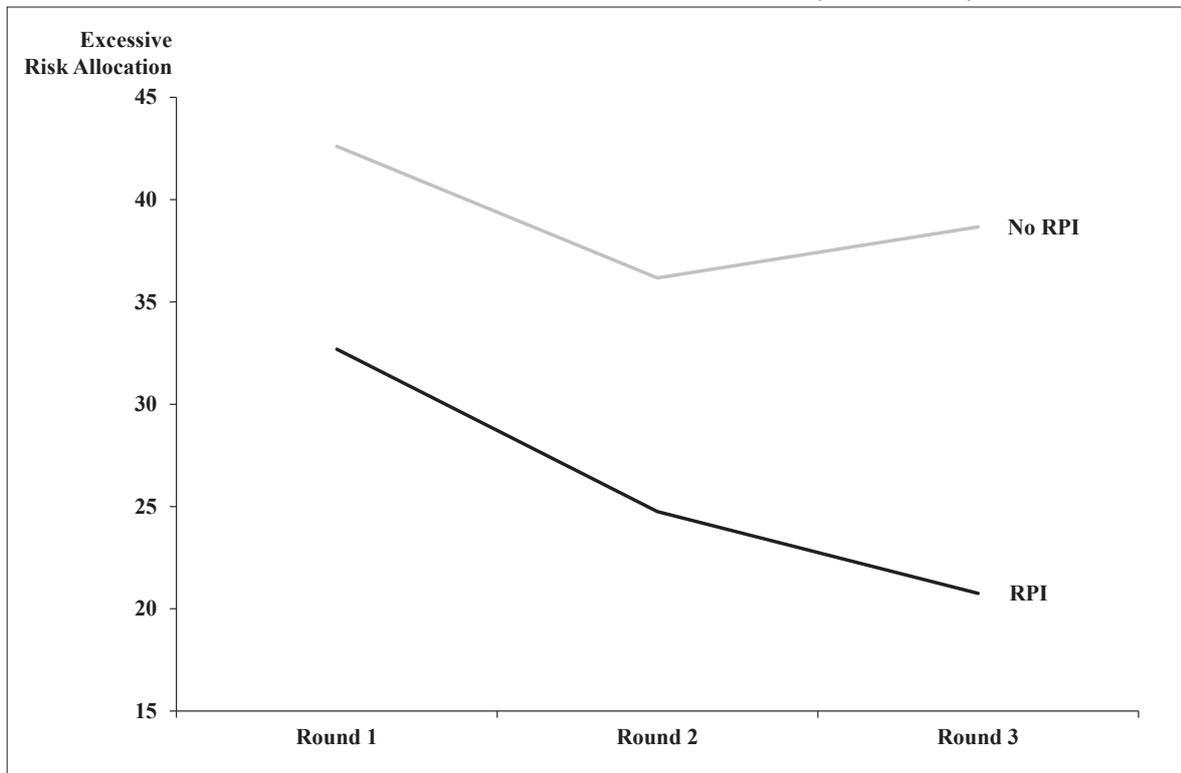
[13] We test for sphericity by computing the Huynh-Feldt epsilon. Thereby, we adjust the p–values that relate to the variable "Round".

4.4   Additional analysis

This subsection provides further insights into the underlying theory driving our results and sheds light on the participants' behavior. Therefore, we use questions from the pre- and post-experimental questionnaire, perform additional analyses on the experimental data and report the results of an additional experimental condition.

First, we argue that RPI frames a situation and that such framing shifts the risk perception away from the actual risk propensity. Therefore, we capture participants' risk propensity *before* the start of the experiment. In contrast, we measure participants' risk perception with questions *after* the three experimental rounds in the post-experimental questionnaire. We use twelve questions from the DOSPERT instrument as outlined above and compute the sum of the participants' answers to these questions.[14] We expect that risk propensity and risk perception differ when RPI is provided, but not when RPI is absent. Panel A of Table 3 shows the corresponding results, which support our expectation. When RPI is provided, participants exhibit a lower risk perception score than their ex ante risk propensity score ($t = 2.85$, $p < 0.01$, two-tailed), indicating a decreased tendency to take risks. In contrast, when RPI is absent, risk perception is not different from risk propensity ($t = 0.03$, $p = 0.97$, two-tailed). We also run an ANCOVA with risk perception as the dependent variable and risk propensity and RPI as independent factors. The results (untabulated) further support our expectation that RPI affects risk perception because both main effects are significant (risk propensity: $F = 9.74$, $p < 0.01$, two-tailed; RPI: $F = 4.89$, $p = 0.03$, two-tailed).

Second, we argue in our hypothesis development that the level of excessive risk-taking will be lower when RPI is provided because employees are particularly concerned about receiving a bottom rank, which is associated with a social loss. To investigate the underlying argument that

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[14]   We reverse-code the risk perception score to enable a paired *t*-test. Therefore, a decrease in the reported score actually means an increased risk perception. With an increased risk perception, an individual is likely to act in a more risk-averse manner.

participants who receive a bottom rank are particularly likely to change their behavior, we compute the level of excessive risk-taking in rounds one and two for top ranks (ranks one to three) and bottom ranks (ranks four to six) separately. We focus on the first two rounds because some participants in the third round gained mixed experience (e.g., bottom rank in round one, top rank in round two). Panel B of Table 3 presents the results. We find that participants who receive a bottom rank in round one reduce their level of excessive risk allocation significantly, from 41.11 points in round one to 27.22 points in round two ($t = 2.14$, $p = 0.05$, two-tailed).[15] In contrast, the level of excessive risk allocation by participants who receive a top rank in round one does not change significantly (24.28 vs. 22.28; $t = 0.67$, $p = 0.51$, two-tailed).[16] These results suggest that participants with lower ranks seek to improve their decision-making and thus their performance by reducing their level of excessive risk-taking. These results are also in line with Neckermann and Yang (2017), who find that low performers who have been left out from recognition increase their performance in the subsequent period.

We further elaborate on the argument that participants are particularly concerned about a social loss. Therefore, we compare the ranking position in round one to the ranking position in round two. We distinguish between the 20 participants with a rank improvement or equal rank on the one hand and the 16 participants with a rank deterioration on the other hand. Thus, the two groups differ regarding whether the participants experienced a social loss. Then, we compare the levels of excessive risk-taking between the two groups and find that the 16 participants whose rank position deteriorated exhibit significantly lower risk-taking in the third round compared to the group without the experience of a social loss (13.06 vs. 26.90; $p = 0.05$, two-tailed).[17] Thus, the

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[15] Due to the small number of observations, we also perform a nonparametric Wilcoxon signed rank test. This test yields similar results ($z = 2.14$, $p = 0.03$, two-tailed).

[16] Due to the small number of observations, we also perform a nonparametric Wilcoxon signed rank test. This test yields similar results ($z = 0.65$, $p = 0.52$, two-tailed).

[17] Due to the small number of observations, we also perform a nonparametric Wilcoxon ranksum test. This test yields similar results ($z = 2.10$, $p = 0.04$, two-tailed).

analysis indicates that participants are not only particularly concerned about being a low performer ex ante but also adjust their decision-making after the experience of a social loss.[18]

Because the different behavior of top ranks and bottom ranks might also result from different chances for trial-and-error learning so that bottom performers adjust their unfavorable strategy to a greater extent, we also conducted one additional experimental condition. The additional experimental condition equals the RPI condition with the exception that we only disclose the first and second ranks (*positive-only RPI*). We expect that not disclosing ranks three to six will attenuate the social loss that participants experience when they are not ranked first or second. If our theory holds, we would expect a higher level of excessive risk-taking under positive-only RPI compared to RPI.

To investigate this conclusion and to be able to compare the results of the additional condition with the results of the main experiment, we conducted the additional experimental sessions at the same time that the 2×3 main experiment took place. We recruited 36 more students (six sessions with six participants in each session) from the same subject pool. We find that participants under the positive-only RPI condition allocate 113.89 points (standard deviation 58.14) over the three rounds to the risky investment alternative.[19] We again run a repeated measures ANCOVA with the RPI manipulation (RPI vs. positive-only RPI) and round as fixed factors where the dependent variable is the amount allocated to the excessively risky alternative in the three rounds. As before, we include participants' age as a covariate. Panel D of Table 3 shows the results, which indicate significant main effects for RPI ($F = 18.20$, $p < 0.01$, two-tailed) and round ($F = 8.47$, $p < 0.01$, two-tailed), while the interaction is insignificant ($F = 0.55$, $p = 0.57$, two-

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[18] Indeed, the difference between status losers and maintainers is not only salient in round three. Participants with a deterioration in status also reduce their level of risk-taking from round two to round three ($p = 0.04$, two-tailed). In contrast, participants without a rank deterioration do not adjust their level of risk-taking ($p = 0.52$, two–tailed).

[19] Participants allocate 45.61 points (standard deviation 20.91) to the risky investment alternative in round one, 33.11 points (standard deviation 24.87) in round two, and 35.17 points (standard deviation 31.24) in round three.

tailed).[20] Most importantly, the main effect on RPI suggests that excessive risk-taking is lower when RPI is provided compared to positive-only RPI. Because the results suggest that also displaying the bottom ranks is important for participants' behavior, they support our argument that participants derive a high disutility from being perceived as a low performer.

Finally, we investigate the argument that RPI leads low performers to excessively risky strategies that maintain little chance of outperforming their peers on combined performance. Therefore, we asked participants to estimate their perceived relative position after the mathematical task but before entering the risk decision task. If a subject perceives her mathematical performance in one specific round to be relatively weak, he or she may exhibit a higher level of risk-taking to compensate for her perceived poor performance. However, this argument first works against finding results because it assumes that perceived low performers experience a greater level of excessive risk-taking when RPI is provided. Second, we find (untabulated) no significant association between perceived low performers and their level of risk-taking in round one ($F = 1.94$, $p = 0.16$, two-tailed), round two ($F = 1.25$, $p = 0.29$, two-tailed) or round three ($F = 0.58$, $p = 0.57$, two-tailed).

TABLE 3
Additional Analyses

Panel A: Responses to Domain-Specific Risk questions (Mean [Standard deviation])

Condition[a]	Risk propensity	Risk perception	t-Statistic	p-Value[c]
RPI (n = 36)	46.58 [6.41]	43.19 [6.18]	2.85	<0.01
No RPI (n = 36)	46.42 [9.63]	46.47 [7.30]	0.03	0.97

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[20] Performing a repeated measures ANOVA without the participants' age as a covariate provides similar results (RPI: $F = 23.40$, $p < 0.01$).

TABLE 3 (continued)

Panel B: Analysis of social loss aversion (*RPI only*) (Mean risk allocation [Standard deviation])

Rank placement	Round 1[b]	Round 2[b]	*t*-Statistic	*p*-Value[c]
Ranks 1–3 (*n* = 18)	24.28 [16.42]	22.28 [15.38]	0.67	0.51
Ranks 4–6 (*n* = 18)	41.11 [29.13]	27.22 [21.37]	2.14	0.05

Panel C: Risk-taking due to status loss (*RPI only*) (Mean risk allocation [Standard deviation])

Rank change from round 1 to 2	Round 3[b]	*t*-Statistic	*p*-Value[c]
Positive or equal (*n* = 20)	26.90 [23.49]	2.01	0.05
Negative (*n* = 16)	13.06 [15.92]		

Panel D: Repeated measures ANCOVA (*RPI vs. Positive-only RPI*)

Source	df	Mean Square	*F*-Statistic	*p*-Value[c]
RPI[a]	1	5,949.01	18.20	<0.01
Round[b, e]	2	2,769.06	8.47	<0.01
RPI × Round[e]	2	179.02	0.55	0.57
Age[d]	1	16.67	0.05	0.82
Residual	140	318.17		

n = 216
Adjusted R² = 0.476
Huyn-Feldt epsilon = 0.951

[a] *RPI* (relative performance information) is manipulated between-subjects at two levels: *RPI* and *No RPI*. In the *RPI* condition, participants received their individual performance rank and the performance ranks of the other five participants in their respective session at the end of each round. In the *No RPI* condition, participants received no information about their individual performance rank and the performance ranks of the other five participants but were presented a waiting screen.
[b] *Round* constitutes a within-subjects variable. We conduct three individual rounds, leaving former results disregarded.
[c] The *p*-values are two-tailed.
[d] *Age* is a participant's age and is measured in the post-experimental questionnaire.
[e] The *p*-values are calculated based on the Huynh-Feldt correction to account for sphericity.

5   Conclusion

This paper reports the results of an experimental study that investigates the effect of RPI on excessive risk-taking. Our results provide evidence that RPI reduces excessive risk-taking. We argue that RPI frames the decision context differently from a situation without RPI. Thereby, RPI evokes social comparison, which in turn serves as an antecedent of social loss aversion (Camerer, 1998; Loewenstein et al., 1989). Social loss aversion refers to the theory that an individual's marginal disutility from being perceived as a low performer relative to her peers is higher than her utility from being perceived as a high performer (Fehr and Schmidt, 1999; Lim, 2010). When RPI is provided, individuals lower their acceptance of risk-taking to reduce the risk of achieving a low performance compared to their peers and thus a low rank, which is associated with a social loss. We provide support for our theory via additional analyses and an additional experiment.

Our study has important implications for accounting theory and practice. First, our study provides evidence of an important benefit of RPI because RPI reduces excessive risk-taking, which is not in the best interest of a firm's owners. In particular, we show that RPI frames a situation such that participants wish to avoid a social loss, which is associated with a relatively poor performance compared to their peers. Therefore, management accountants should be aware that disclosing not only the first ranks but also the last ranks can be beneficial for a firm. In this vein, we add to the literature by examining how RPI affects decision-making. Second, our study shows management accountants that RPI will not only lead to an immediate decrease in excessive risk-taking but also has the potential to reduce excessive risk-taking over time. Finally, our results reveal that it is important to distinguish between RPI where compensation is *not* tied to ranking information and tournament incentive schemes where compensation is tied to ranking information. While prior research shows that tournament incentive schemes increase excessive risk-taking, our study shows that RPI that is *not* tied to compensation reduces excessive risk-taking. Our findings therefore

suggest that management accountants and researchers should carefully distinguish between these ranking systems.

As our study is subject to limitations, it also offers avenues for future research. First, we follow prior tournament research and focus on the effect of RPI on excessive risk-taking, which has gained in importance in recent research. Future studies could investigate whether RPI also mitigates risk-averse behavior. Second, our results show that the type of RPI matters. Because some firms provide more detailed ranking information, future research could thus examine how such information affects risky decision-making. Finally, our study neither particularly appreciates the top ranks nor depreciates the bottom ranks. Because this approach might affect the relative importance of a social loss with regard to the benefits of being perceived as a high performer, future studies might generate evidence on whether our findings are also generalizable to firms that label their ranking information.

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Appendix: Experimental instructions

We thank you for participating in our research project. This is a computer-based experiment that takes approximately 60 minutes to complete. Please read these instructions very **carefully**, as you will be asked some basic comprehension questions before you start the experiment.

Basic rules:

To ensure that the experiment can proceed smoothly, please consider the following 9 rules:

1.   Always follow the instructions of the administrator.

2.   During the experiment, please be quiet and do not talk to the other participants. Do not look at your neighbor's screen. If you have any questions or need assistance, please raise your hand. The administrator will come to help you.

3.   Mobile phones must be switched off and put away.

4.   You are not permitted to use a calculator, paper or other writing material.

5.   On your computer, do not open any additional applications and do not close the running application.

6.   Read all information thoroughly on your screen and carefully follow all of the instructions.

7.   Stay seated and silent at your computer until the experiment ends.

8.   In order for this project to be a success, it is crucial that you do not talk to the other participants or to third parties (e.g., family, friends) about the content of this experiment until the end of the week. This is because the experiment will be performed a couple of times this week, and we wish to test all participants under the same circumstances.

9.   Your data will be collected anonymously and treated as confidential.

Experiment process:

1. Start by reviewing the instructions above. Then, answer the attached comprehension questions. When you are finished, please raise your hand so that the administrator can check your answers. Once all participants have answered the comprehension questions correctly, the experiment will start on your screen.

2. You form a group with the other 5 participants in the room. The participant on the far left is participant 1, the participant on his right is participant 2. The participant on the right side in the back is participant 6. All group members receive identical tasks.

3. To begin, we ask that you answer a short questionnaire.

4. Following the questionnaire, three independent rounds will be played. The procedure in all three rounds is identical, and the rounds follow in direct succession. After finishing each round, you will see a screen showing your score. Preliminary results are not integrated into later rounds. The compensation is based on your total score in all three rounds. One point equals €0.01. In addition, you will receive fixed compensation in the amount of €5.00 for your appearance.

5. Each round will proceed as follows: You will be given 30 multiplication problems. One round lasts 120 seconds. You can increase your compensation by solving as many multiplication problems correctly as possible. For each problem solved correctly, you earn 10 points. Important: Responses must be confirmed by clicking the "OK button" or your answer will not be evaluated. It will be possible to make corrections afterward.

In the next step, you have to make an investment decision. For this purpose, you have a limited budget of 100 points that must be completely split up between the following two alternatives:

Alternative 1 guarantees safe repayment of the amount of the invested capital, regardless of the chosen condition.

Alternative 2 takes into account two conditions (positive and negative). In the case of a positive condition (likelihood of occurrence 1/3), you will receive back 2.5 times your invested capital. In the opposite case (likelihood of occurrence 2/3), your invested capital will be lost.

Example:

Investment in alternative 1	28 points	28 points	72 points	72 points
Investment in alternative 2	72 points	72 points	28 points	28 points
Condition	positive	negative	positive	negative
Result	$28 + 72 \cdot 2.5 =$ 208 points	$28 + 72 \cdot 0 =$ 28 points	$72 + 28 \cdot 2.5 =$ 142 points	$72 + 28 \cdot 0 =$ 72 points

6. In each round (all together three times), the condition will be determined by drawing balls out of a pot. The administrator visibly draws the balls, and the pot contains two red balls (negative condition) and one green ball (positive condition). To avoid manipulations, you will first receive a numerical code that represents the occurred condition. After notification, you will have to enter the numerical code in the corresponding field. The numerical code indicates the status of the occurred condition. The numerical code varies in each round.
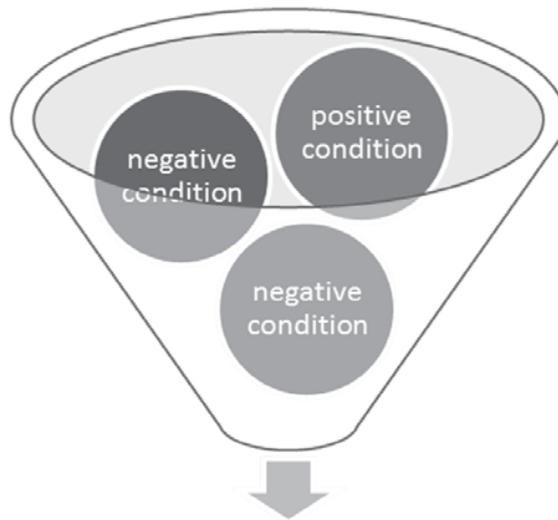
numerical code will be announced

7. Next, your screen will show an overview of your results by round.

Example:

| **Result**	
Round:	3 of 3
Payout of your investment:	100
Previous achieved points:	0
Total score:	100

In addition, you will be informed about your own placement as well as the other participants' placements. Placement is determined by the total score that was reached (total score = points earned in the multiplication task + points earned in the investment task).

	Participant 1	Participant 2	Participant 3	Participant 4	Participant 5	Participant 6
Points in multiplication task	80	110	80	130	90	100
Points in investment task	140	120	100	165	190	110
Total score	220	230	180	295	280	210
Ranking	4	3	6	1	2	5

At the end of each round, you will be informed about your ranking as follows:

8. Overall, the experiment is structured as follows:
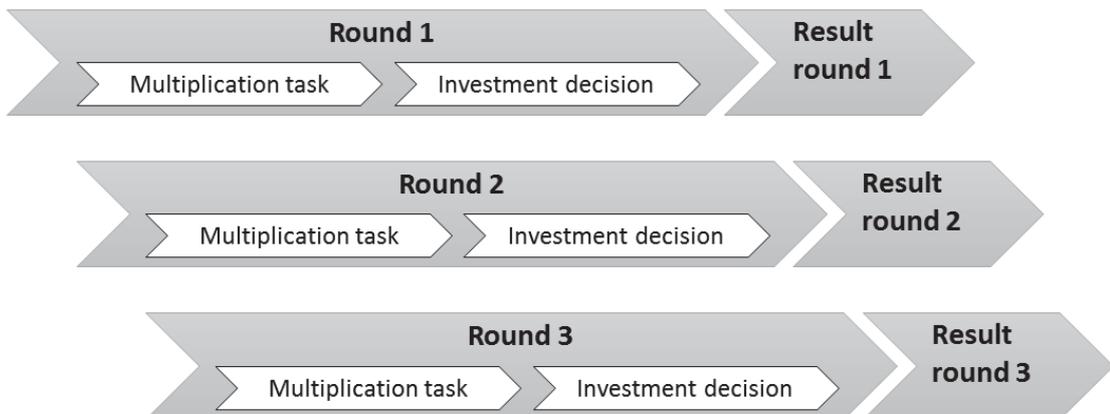
9.   Once you have completed all three rounds, we kindly request that you answer some further questions.

10.   After completion of the experiment (the corresponding information will appear on your screen), we would like to ask you to stay at your computer workstation until the administrator asks you to come forward. At that time, you will receive your payment document, which is required to receive your compensation for the experiment.

           On November 9, you can collect your compensation during the institute's regular office hours. Please keep your payment document in a safe place.

The experiment starts in a few minutes. During the experiment, there will be waiting periods. Remain seated at your computer workstation until the administrator declares the experiment to be finished. Please leave your instructions at your computer workstation. The instructions will be needed for the next participants. After completion of the experiment, we ask that you not talk to anyone else about the content of the experiment.

Comprehension questions

1.   **What types of tasks need to be solved in each round?**

    ☐ Search for letters and multiplication problems.

    ☐ Multiplication problems and investment decisions.

    ☐ The task type changes in each round.

2.   **What are the most points that can be earned by solving the math problems in each round?**

    ☐ 300 points.

    ☐ 3.000 points.

    ☐ 270 points.

3.   **How is the investment decision structured?**

    ☐ You have to allocate the whole 100 points to a safe investment and a risky investment.

    ☐ You can allocate up to 100 points to a safe investment and a risky investment.

    ☐ You have to allocate the whole 100 points to a safe investment or to a risky investment.

4.   **You have decided to allocate your investment as follows:**
    Alternative 1: 20 points
    Alternative 2: 80 points
    The positive condition is drawn. How many points do you get?

    ☐ 20 points.

    ☐ 200 points.

    ☐ 220 points.

5.   **How is your placement determined in comparison with other participants?**

    ☐ The placement depends on the total score from a particular round.

    ☐ The placement depends on the cumulative total score from all previous rounds.

    ☐ The placement depends on the investment decision from a particular round.