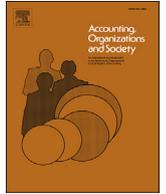




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The use of a single budget or separate budgets for planning and performance evaluation

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ABSTRACT

Budgeting has different functions in the firm that are not necessarily congruent with each other but conflict. In many firms, budgets are simultaneously used for both operative planning and performance evaluation. Although prior literature recommends using different budget levels for different purposes to resolve potential conflicts between these functions, empirical evidence indicates that most firms use a single budget level for planning and performance evaluation. To examine the questions of whether and why firms do so, we analyze potential costs emerging from these budgeting conflicts. We suggest that firms trade off these costs against the behavioral costs of reduced credibility when the performance evaluation budget deviates from the planning budget. We test our hypotheses using survey data from management accounting executives and find evidence for the predicted trade-offs. Moreover, we find that using a single budget level for both purposes at the beginning of the year does not imply using a single budget level at the end of the year as firms often adjust budgets differently for planning and performance evaluation. Our study contributes to the literature by reconciling discrepancies between descriptive empirical practice and recommendations from prior literature about the use of a single versus separate budgets for multiple purposes.

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Occasionally a company uses a budget with “stretch” in it for motivating performance ... and a more “realistic” budget for planning More commonly, companies use the same document for both purposes.

Churchill (1984, p. 150)

1. Introduction

Budgeting is one of the most important planning and control mechanisms firms employ (Luft & Shields, 2003; Merchant & Van der Stede, 2017). A challenging aspect of budgeting is that it often simultaneously serves multiple purposes in the firm. Specifically, in many firms, budgets are concurrently used for both planning-oriented functions like forecasting of operative activities and

performance evaluation-oriented functions like determining bonus payments (Becker, Mahlendorf, Schäffer, & Thaten, 2016; Hansen & Van der Stede, 2004). These functions are distinct, not necessarily congruent and potentially conflicting. However, prior literature has largely neglected the questions of whether and why firms set the same level of budget targets or use different levels for these distinct, potentially conflicting functions. Therefore, this study investigates whether and why firms use either the *same level* of budget targets for operative planning and performance evaluation purposes (hereafter, use of a single budget) or *different levels* of budget targets for these two purposes (hereafter, use of separate budgets).

Gaining insight into these questions is important for at least two reasons. First, prior literature has conflicting views on whether firms use or should use separate budgets for planning and performance evaluation. Some prior contributions emphasize that various budgeting functions are often in conflict, and therefore, the budgets used for these different purposes should differ to resolve these conflicts (Baiman, 1982; Barrett & Fraser, 1977; Hopwood, 1974; Otle, 1982). For instance, whereas the planning function is usually aimed at providing an accurate and realistic forecast of the

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firm's future activities (e.g., Churchill, 1984; Dunbar, 1971), the performance evaluation-oriented function can lead to easier or more ambitious budget levels than the planning function to better motivate managers (Arnold & Artz, 2015; Merchant & Manzoni, 1989). Similarly, the practitioner-oriented literature also recommends separating the planning and performance evaluation functions of budgets and using different budget levels for different purposes (Hansen, Otley, & Van der Stede, 2003; Jensen, 2003).

Remarkably, this recommendation contrasts with empirical evidence that firms seem to rarely use different budget levels for different purposes (Churchill, 1984; Merchant & Manzoni, 1989; Umaphathy, 1987). Additionally, many empirical studies on target setting implicitly assume that firms use identical budget levels for planning and performance evaluation (e.g., Becker et al., 2016; Libby & Lindsay, 2010). An explanation for these puzzling contradictions may be that no study so far has explicitly considered that the use of separate budgets may have drawbacks for the firm. As explained in more detail below, a performance-evaluation budget that deviates from the planning budget level may be perceived as less credible, thereby negatively affecting managers' motivation. Considering such behavioral aspects may help to explain why firms deliberately choose a single budget level for operative planning and performance evaluation.

Second, investigating the use of a single budget or separate budgets may call for attention beyond the beginning of the period when the corporate budget is set up. Prior literature has emphasized and discussed the idea of flexible budgets during the period for both planning (Brownell & Merchant, 1990; Palermo & Van der Stede, 2011) and performance evaluation (Arnold, Artz, & Grasser, 2016; Kelly, Webb, & Vance, 2015). For our research question, though, we do not mainly focus on the level of budget flexibility as such but on the question of whether budgets exhibit *different* levels of flexibility for *different* budgeting functions. The reason is that separate budgets may arise if a single budget level is set for different purposes at the *beginning* of the fiscal year, but this level is adjusted differently for different purposes *during* the year.¹

As we explain in our theory development, different adjustments may occur because for performance evaluation purposes, it can be beneficial for firms to commit to *not* fully adjusting budgets to actual, deviating performance (e.g., Indjejikian & Nanda, 2002; Indjejikian, Matejka, Merchant, & Van der Stede, 2014) whereas efficient planning requires flexible reactions to changing conditions, consistent with a dynamic planning philosophy of the firm (Hansen et al., 2003; Merchant, 1984). Thus, even if many firms may appear to be unresponsive to economic and behavioral determinants of separate budgets at the beginning of the year, these firms can in fact respond to these forces *during* the year when adjusting the single budget differently for different purposes. Relying solely on information about beginning-of-year budget levels may therefore lead to biased conclusions about firms' budgeting processes. Disentangling these issues helps explain the contradictory positions in the literature.

Our study addresses this topic by considering both economic and behavioral determinants of whether firms set a single budget or separate budgets for planning and performance evaluation. As recommended in the literature (e.g., Dikolli, Evans Hales, Matejka, Moser, & Williamson, 2013), we base our predictions on a formal model and analysis of the determinants shown in Appendix A. The

fundamental driver for the firm's choice of using separate versus single budget level(s) is related to whether and how strongly the planning and performance evaluation functions conflict. In other words, whether firms set separate budgets or a single budget is likely driven by how similar the two budget levels would be when each budget could be set *in isolation* without consideration of the other budgeting purpose. We predict that the more similar the two levels, the smaller the conflict between the two budgeting functions and the more likely a firm will set a single budget.

In addition, firms may have to consider behavioral aspects arising from the use of separate budgets on their potentially reduced credibility. Credibility is usually defined as "the quality or power of inspiring beliefs" (Merriam-Webster, 2018). The credibility of a budget is particularly important for its use in performance evaluation. Whether a manager perceives budgets to be credible and, thus, believes in them is an important prerequisite for their acceptance and, consequently, motivational effects (Podsakoff & Farh, 1989; Rynes, Gerhart, & Parks, 2005). A performance evaluation budget that deviates from the planning budget (i.e., is set to an easier or a more difficult level) may invoke questions for the manager as to how credible the budgets are, thereby also reducing the manager's motivation. This is particularly the case when the planning budget is aimed at providing an accurate and realistic estimate of achievable performance—which is often the case (e.g., Churchill, 1984; Dunbar, 1971)—and the performance evaluation budget deviates from it, as deviations from a realistic benchmark reduce credibility (Beaulieu, 2011; Hirst, Koonce, & Miller, 1999). We predict that the larger the negative consequences of reduced credibility from deviating budgets, the more likely a firm uses a single budget.

Finally, we predict that the decision about adjusting budgets differently or equally for different budget functions *during* the year is similarly affected by the two determinants. Specifically, we predict that the more similar the planning and the performance evaluation budgets and the larger any negative consequences from reduced credibility, the more likely firms will adjust budgets *equally* and therefore end up with a *single* budget level at year-end.

We empirically investigate our research questions via survey data from management accounting executives of companies in German-speaking countries. Heads of management accounting or corporate control are particularly suitable for our study because they have precise knowledge about and insights into the processes of budget preparation for both planning and performance evaluation purposes (Becker et al., 2016; Libby & Lindsay, 2010). In addition to our main independent variables of interest, we also measure and analyze the additional costs of setting up a separate budget, the importance of planning and performance evaluation as different budgeting functions, and additional firm control variables.

Our results show that, consistent with prior literature, more than two-thirds (72%) of the firms in our sample set a *single* budget at the *beginning* of the year for planning and performance evaluation despite the potential conflict of the two functions. We also find that firms trade off the costs arising from the conflict of the two functions against the negative consequences of reduced credibility of the performance evaluation budget. That is, firms are more likely to use a single budget at the beginning of the year when the conflict between planning and performance evaluation is low and the potentially negative consequences of reduced credibility are high.

In contrast to our findings for the beginning of the year, a majority of firms (71%) have *separate* budget levels for planning and performance evaluation at the *end* of the year. Thus, for 60% of the firms using a single budget at the beginning of the year, different adjustments of planning and performance evaluation budgets during the year lead to separate budgets at year-end. Similar to the decision at the beginning of the year, the lower the conflict between

¹ In business practice, the most representative budgeting cycle period by far is the fiscal accounting year. We therefore refer to the beginning and end of a fiscal year when describing our dependent variables. Our theory is also predictive for other budgeting cycles such as quarters. All firms in our data use one fiscal year as the budget cycle.

planning and performance evaluation and the more negative the consequences of reduced credibility of the performance evaluation budget, the more likely firms are to continue to use a single budget level *during* the year. Overall, our evidence suggests that firms respond to economic and behavioral determinants of separate budgets either at the beginning or in the course of the year.

Our study contributes to the literature on the integration of control- and decision-oriented functions of management accounting instruments along two main dimensions. First, we shed light on the puzzling evidence in prior literature that the majority of firms seem to use a single budget level for multiple budgeting purposes even though these purposes conflict. We demonstrate that although the majority of firms *start the year* with a *single* budget, they adjust this budget level differently for different purposes during the year, and consequently *conclude the year* with *separate* budget levels. For future research, this finding suggests that consideration of intra-year budget revisions is essential to reaching a conclusion about whether to use a single budget or separate budgets for planning and performance evaluation.

Second, we provide evidence that when deciding between a single or separate budget level(s), firms respond to the behavioral aspect of reduced credibility of separate budgets. Our theory and evidence provide a rationale for why firms may set a single budget level for multiple purposes despite an existing budgeting conflict for which prior literature often favors separate budget levels (Baiman, 1982; Barrett & Fraser, 1977; Hopwood, 1972; Otley, 1982). Thus, our study suggests that the recommendation to use separate budgets may not be universally applicable and results underline the importance of considering behavioral forces.

Finally, our study is the first to inform research and practice about the joint effect of relevant economic drivers. We predict and show that beyond credibility as a behavioral driver, firms also respond to economic determinants such as the degree of conflict between the planning and performance evaluation functions, the additional fixed costs of setting up a separate budget, and the importance of budgeting functions. In this vein, we respond to calls in the literature (e.g., Chenhall, 2003) for simultaneous empirical analyses to avoid spurious findings and to be able to draw *ceteris paribus* statements from our predicted effects while holding other influences constant.

2. Hypotheses development

2.1. Related literature

Our study is related to different streams in the budgeting and target-setting literature (for an overview, see, e.g., Luft & Shields, 2003, and Covaleski, Evans, Luft, & Shields, 2003). Our hypotheses about the use of a single budget versus separate budgets *at the beginning of the year* are related to the question of how difficult budgets should be optimally set for different purposes (e.g., Merchant & Manzoni, 1989; Van der Stede, 2000). For performance evaluation, prior—mainly experimental—research demonstrates that difficult targets lead to the highest performance (e.g., Bonner & Sprinkle, 2002; Locke & Latham, 1990, 2002).² Based on this literature, it has often been suggested that performance evaluation budget should be set to a challenging level (i.e., higher than what can realistically be expected) (e.g., Barrett & Fraser, 1977; Dunbar, 1971; Emmanuel, Otley, & Merchant, 1990). In contrast, other studies have

identified situations where easy goals can be beneficial, reflecting the less conclusive findings in empirical research regarding the benefits of challenging budgets (e.g., Hansen & Van der Stede, 2004; Hirst & Lowy, 1990). For example, easy goals may improve employees' performance in tasks that require more outside-the-box thinking (Webb, Williamson, & Zhang, 2013) or can avoid excessive risk taking (e.g., Sprinkle, Williamson, & Upton, 2008).

For planning, it has often been suggested that the budget should represent a realistic estimate of the expected output (e.g., Berry & Otley, 1975; Churchill, 1984; Lowe & Shaw, 1968). Others have emphasized that including slack into the planning budget, i.e., setting it to a lower than the realistically expected level, can be beneficial for firms because lower budgets act as a “buffer” giving the manager leeway to react to unexpected negative developments or to use additional resources creatively (Davila & Wouters, 2005; Galbraith, 1973, 1977; Lukka, 1988). These discussions imply that recommendations about optimal budget levels are not universally applicable but strongly depend on the specific circumstances and environment of a firm. In contrast to this literature, we mainly focus on the *difference* in optimal budgeting levels as this difference is related to the conflict between the budgeting function and, consequently, to the potential use of separate budgets. Our theoretical framework is sufficiently general to capture the potentially different optimal budget levels just discussed.

The hypotheses about dynamic changes of budget levels for planning and performance evaluation during the year are related to the discussion about budget flexibility (e.g., Brownell & Merchant, 1990; Frow, Marginson, & Ogden, 2010). This discussion emerged primarily as a response to the often-criticized rigid nature of “traditional” budgets (Chapman, 1997; Hansen et al., 2003; Otley, 1999). While some studies have emphasized that management accounting instruments outside the regular budgeting process can be used to respond to the need for flexibility (e.g., Ahrens & Chapman, 2004, 2006, pp. 1–19; Abernethy & Lillis, 1995), more recent research has emphasized the continued relevance of annual budgets even under high uncertainty (Frow et al., 2010; Johansson & Siverbo, 2014; Marginson & Ogden, 2005). For planning, the most intensively discussed questions are whether and when firms would benefit from more budget flexibility (Brownell & Merchant, 1990; Hansen et al., 2003). For performance evaluation, the flexibility discussion relates mainly to the benefits and drawbacks of “tight” budgetary control systems (e.g., Anthony & Govindarajan, 1998; Van der Stede, 2001).

Again, the majority of contributions in this field either focus on one budgeting function in isolation or implicitly assumes that budgets are identical for multiple purposes (e.g., Brownell & Merchant, 1990; Hope & Fraser, 2003). Only few studies on budget flexibility differentiate between budgeting functions. These studies focus mainly on the performance effect of budget flexibility and generally find that it is less positive for performance evaluation than for planning purposes (Arnold & Artz, 2015; Ekholm & Wallin, 2011; Hansen & Van der Stede, 2004). This finding reflects the importance of giving managers a standard against which they can benchmark themselves (Bandura & Schunk, 1981; Marginson & Ogden, 2005) and firms' commitment to *not* fully adjust performance evaluation budgets to actual performance levels to decrease a manager's incentives to reduce effort or to manage earnings during the year (Milgrom & Roberts, 1992; Weitzman, 1980). While the latter effect has been intensively discussed in the literature on the between-year “ratcheting” of targets (e.g., Bol & Lill, 2015; Indjejikian & Nanda, 2002; Indjejikian, Matějka, Merchant, & Van der Stede, 2014), it also applies to adjustments of performance evaluation budgets *during* the year. The more strongly a firm commits to not fully revising performance evaluation budgets during the year when actual performance deviates from budgeted

² This effect of increasing difficulty usually holds unless overly difficult goals decrease goal commitment or create pressure or anxiety, which can have negative motivational effects (Beilock, Kulp, Holt, & Carr, 2004; Hollenbeck & Klein, 1987; Locke, Latham, & Erez, 1988).

performance, the more the firm reduces the manager's incentives to take actions to avoid upward adjustments or foster downward adjustments of the budget.³ In contrast, such negative effects of budget adjustments are absent for planning purposes because the firm does not face such a commitment issue (Merchant, 1984). In fact, a dynamic planning philosophy even implies that planning budgets *should* be adjusted during the year—e.g., through rolling budgets—to update plans to changing conditions. Otherwise, the plan may be useless. Resulting differences in budget flexibility for planning and performance evaluation can induce separate budget levels during the year *even if* firms set a single budget level at the beginning of the year.

2.2. Framework and determinants of using a single budget versus separate budgets

Our framework is based on the analytical model shown in Appendix A. The model refers to a setting in which a firm has two budgeting purposes, operative planning and performance evaluation, for which it can potentially set two different budgets, b_{plan} and b_{PE} . Neither budget has to correspond to the firm's forecasted output level—that is, the output level expected by the firm. Instead, the firm could set both the planning and performance evaluation budget to an easier or a more challenging level than the expected output, which reflects the variety of potentially optimal budget levels outlined above. As we will explain in the following, the optimal level for every budget depends on the costs for the firm if variances occur—that is, if the *realized* output, \bar{x} , deviates from one or both of the budgets (hereafter, variance costs).

Variances between the realized output and each budget can induce costs for the firm. For the planning budget, these costs might stem from, for example, adjustments in the production process, such as capacity extensions in the case of an upward planning budget variance or inventory increases in the case of a negative planning budget variance (Bhimani, Horngren, Foster, & Datar, 2008; Hansen, 2011). For the performance evaluation budget, variance costs can result from suboptimal motivation if the performance evaluation budget proves to be too easy or too difficult to achieve (Erez & Zidon, 1984; Locke & Latham, 2002). For example, a manager may reduce his effort if the bonus from beating the performance evaluation budget turns out to be unreachable (downward variance) or if he beats the budget and reaches a cap in his bonus function (upward variance) (Jensen, 2003).⁴ The costs of upward and downward variances for both budgeting functions can vary. For example, a firm may find that acquiring additional production capacities in case actual demand exceeds the planning budget is very expensive but storing unsold products is relatively cheap. Vice versa, another firm may find the storage of products is impossible or prohibitively costly but expansion of production is relatively cheap if actual demand exceeds the planning budget. In any case, as formally shown in the Appendix, the variance cost parameters for planning and performance evaluation determine the level at which each separate budget should be optimally set if

each budget could be set in isolation.

Specifically, the level of the performance evaluation budget is determined by the *relation* of the potential variance cost parameters for falling short of the performance evaluation budget (downward variance costs, c_D^{PE}) and for exceeding the performance evaluation budget (upward variance costs, c_U^{PE}) (i.e., $\frac{c_U^{PE}}{c_U^{PE} + c_D^{PE}}$). Likewise, the level of the planning budget is determined by the *relation* of upward (c_U^{Plan}) and downward (c_D^{Plan}) variance cost parameters for planning (i.e., $\frac{c_U^{Plan}}{c_U^{Plan} + c_D^{Plan}}$). In both cases, the larger (smaller) the upward variance costs relative to the corresponding downward variance costs, the higher (lower) the budget should be set. The intuition of this result is that setting the budget at a high (low) level when the upward variance costs are relatively high (low) reduces the likelihood of obtaining more expensive upward (downward) variance and, thus, minimizes expected variance costs.

Importantly, our theory is sufficiently general to capture the suggestions regarding the optimal budget level outlined above. For example, a firm might estimate a manager to be (highly) motivated even if he thinks that he may not reach the budget, whereas his motivation decreases once the performance evaluation budget has been reached. Translated into our framework, this means that the costs of falling short of the performance evaluation budget (downward variance costs) are relatively low compared to the costs of exceeding the budget (upward variance costs). The comparison implies that the firm should set a “challenging” performance evaluation budget above the realistically expected level. In another example, a firm's costs may be relatively high when the output negatively deviates from the planning budget (downward variance costs) because the manager cannot react to unexpected negative deviations. In contrast, upward variance costs may be lower when the manager can use additional time and resources creatively. As a consequence, our model would predict that the planning budget should be set to a relatively low level to reduce the likelihood of incurring the large downward variance costs.⁵

The result that each individual optimal budget level is determined by the relation of variance cost parameters also implies that the two optimal budget levels for planning and performance evaluation can only accidentally be identical, namely if these relations are identical for both budgets. Unless this is the case, the two budgeting functions are in conflict and the larger the difference, the higher the level of conflict. Thus, from a variance cost perspective only, the two budget levels should generally be set to different levels. Clearly, the intuition of using two separate budgets is that two budgets are better able to minimize the variance costs of two budgeting purposes than a single budget (Baiman, 1982; Barrett & Fraser, 1977; Otley, 1982).

However, when deciding whether to use a single or separate budgets, a firm may have to consider behavioral aspects as well. Specifically, we suggest that for its motivational effect, it is relevant how credible a performance evaluation budget is perceived. Credibility is defined as “the quality or power of inspiring beliefs” (Merriam-Webster, 2018). The reason for its relevance is that prior research identifies managers' acceptance of performance evaluation budgets as an important prerequisite for their motivational effects (e.g., Lawler, 1968; Locke & Latham, 1990; Merchant & Manzoni, 1989). Acceptance of the performance evaluation budget is likely influenced by whether a manager perceives budgets to be credible and, thus, believes in them. For example, prior

³ The underlying assumption of such a reasoning is that firms cannot perfectly distinguish between the manager's effort, noise, or slack included in the budget at the beginning of the year as the main reason for the deviation between actual and targeted performance. This assumption follows established agency theoretical literature in budgeting (e.g., Antle & Eppen, 1985; Baiman & Evans, 1983). It is justified, as in practice, shared responsibilities, interdependencies and uncontrollable factors often lead to only partial controllability of the manager over the output under his responsibility (e.g., Frow, Marginson, & Ogden, 2005; Merchant & Otley, 2006).

⁴ For ease of exposition, we will use female pronouns for the firm and male pronouns for the manager.

⁵ Consistent with suggestions in the literature (e.g., Thompson, 1967), our model would not suggest to fully buffer against all potential downward variances as long as the firm also has some kind of upward variance costs as well.

research finds that in performance evaluation and goal setting, the more credible information is, the more strongly it is considered (Albright & Levy, 1995; Podsakoff & Farh, 1989; Rynes et al., 2005). In budgeting, setting a performance evaluation budget that deviates from the budget level the firm uses to plan its activities may invoke questions for the manager as to how credible the budgets are, thereby reducing the manager's motivation. This is particularly the case when the planning budget is aimed at providing an accurate and realistic estimate of achievable performance—as it is typically suggested (e.g., Churchill, 1984; Dunbar, 1971). When the performance evaluation budget deviates from this realistic estimate, its credibility is likely reduced as deviations from a realistic benchmark reduce credibility (Beaulieu, 2011; Hirst et al., 1999). This, in turn, likely reduce the manager's motivation.⁶

Because we investigate trade-offs in using separate versus a single budget level from the perspective of the firm, the relevant factor for the firm is not the reduced credibility per se but the costs associated with the motivation loss caused by the manager's perception of reduced credibility. We term the reduced motivation arising from reduced credibility in the following as credibility costs. The further the performance evaluation budget deviates from the planning budget, the less credible it is likely to be perceived. We therefore model credibility costs with the term $k_{cred}(b_{PE} - b_{Plan})$, with k_{cred} capturing the level of credibility costs in the firm.⁷

2.3. Hypotheses development

As we outline above, a firm's decision between a single or two separate budget levels is likely to involve a trade-off between minimizing variance costs by using separate budget levels versus minimizing credibility costs by using a single budget level. To derive our hypotheses, we analyze and explain how the difference in optimal budget levels reacts to these costs.

Similarity of relative upward and downward variance costs. When set in isolation, every optimal budget level is influenced by the relation of upward and downward variance cost parameters, and the two optimal separate budget levels can only accidentally be identical. Thus, a single budget always represents a compromise in minimizing variance costs for both budgeting functions (Merchant & Van der Stede, 2017). However, the more similar these upward and downward variance costs for the two functions, the more similar are the two optimal budgets and the lower are any additional variance costs incurred by setting a single instead of two separate budgets. A single budget then approaches the optimal (separate) solutions relatively well. Thus, *ceteris paribus*, the

likelihood of using a single budget should increase when the relation of upward and downward variance costs becomes more similar for the two functions. We predict:

H1. *The similarity of relative upward and downward variance costs for planning and performance evaluation is positively associated with the likelihood of using a single budget for both planning and performance evaluation at the beginning of the year.*

Credibility costs. The more the performance evaluation budget level deviates from the level of the planning budget, the less likely budgets are perceived as credible which, in turn, likely affects managers motivation negatively (Libby, 2001; Podsakoff & Farh, 1989; Steers, Mowday, & Shapiro, 2004). This means, the larger the deviation between the two budgets and the more the manager weighs such reduced credibility for his personal motivation, the larger are the costs for the firm due to the this resulting lack of motivation. As a consequence, we predict that the firm takes these emerging credibility costs into consideration. The larger the credibility costs, the smaller the difference in optimal separate budget levels, leading more likely to a single budget:

H2. *The amount of credibility costs of setting two separate budgets for planning and performance evaluation is positively associated with the likelihood of using a single budget for both planning and performance evaluation at the beginning of the year.*

H1 and H2 relate to the use of a single versus separate budgets at the beginning of a year. However, even if firms have conceivably set up a single budget level for planning and performance evaluation at the beginning of the year they may adjust the budget levels differently for the two purposes during the year, resulting in the use of separate budgets at the end of the year. For the reasons explained above, budget flexibility is likely to be greater for planning than for performance evaluation. We therefore investigate how the similarity of upward and downward variance costs for planning and performance evaluation as well as credibility costs affect firms' decision about intra-year adjustments differently for planning and performance evaluation for firms having a single budget at the beginning of the year.

Similarity of relative upward and downward variance costs. When the relation of upward and downward variance costs for both functions is very similar, the compromise between the two individually optimal separate budget levels is small and the single budget is relatively close to each individually optimal separate budget. In contrast, when the difference in the relations of upward and downward variance costs for both functions is large but still small enough to justify a single budget, the distance between this single budget and each optimal separate budget level is relatively large. In the latter case, the compromise of a single budget is less robust to changing conditions during the year than in the former case. We discuss both cases.

When the two optimal separate budget levels at the beginning of the year are similar (as the relation of upward and downward variance costs is similar), any change in conditions would likely lead to new separate budget levels that are still similar. Specifically, changes due to new conditions are either minor and do not result in changes in budget levels or, alternatively, are significant and likely shift both budgets downward or upward, leading to a single end-of-year budget as well.

In contrast, if the distance between the individually optimal separate levels at the beginning of the year is relatively large (as the relation of upward and downward variance costs is not very similar), a single budget represents a considerable compromise even at the beginning of the year. In this scenario, a change in conditions is more likely to have different and asymmetric effects on the optimal separate budgets for the two budgeting functions.

⁶ Importantly, even if the level of the deviating planning budget was not realistic, any deviation between the two budgets will likely invoke questions related to their credibility that would not exist in case of a single budget level. Additionally, our model does not predict that a firm necessarily has to set a single budget when credibility costs exist. However, in such a case, the motivational power of a separate performance evaluation budget likely decreases.

⁷ We consider symmetric credibility costs for both cases in which the performance evaluation budget would be larger than the planning budget and cases in which the performance evaluation budget would be smaller. However, it may be that credibility costs are particularly large if the performance evaluation budget is larger than the planning budget. The reason is that having to beat a performance evaluation budget above the level of the planning budget that is often seen as realistic could trigger more negative reactions from the manager than the reduced credibility of a performance evaluation budget that deviates from the planning budget on the downside. Even on the downside, however, a deviating performance evaluation budget likely invokes questions and reduces the credibility of budgets. Thus, whether the performance evaluation budget deviates from the planning budget on the downside or upside may influence the magnitude, but not the direction of the effect. While such an asymmetry would leave the predictions about the effects of credibility costs unaffected, we examine this asymmetry empirically in a supplemental analysis.

Especially if changes in business conditions are significant, we expect a shift in optimal budget levels for one budget but not necessarily for the other. Specifically, if a single budget represents a substantial compromise at the beginning of the year, changes in conditions can make the single budget fulfill one function less well than before but the other function even *better* than before. For instance, a single budget compromise based on an optimal low planning budget and an optimal high(er) performance evaluation budget might no longer be the final firm choice if new conditions shift both optimal budgets downward. In this case, the single budget level may have to be adjusted downward for planning but will still be acceptable (or even better) for performance evaluation. Thus, the intuition is that in the case of low similarity and significant changes in conditions, the compromise of having a single budget is often no longer economically justified. We therefore predict:

H3. *The similarity of relative upward and downward variance costs for planning and performance evaluation is positively associated with the likelihood of using a single budget for both planning and performance evaluation at the end of the year.*

Credibility costs. Firms also very likely respond to credibility costs when deciding about intra-year adjustments and whether to maintain a single budget for planning and performance evaluation during the year. If reduced motivation results from a manager's perception of reduced credibility when his performance evaluation budget differs from the planning budget, firms are unlikely to adjust the single budget differently for different purposes. If credibility costs are high, firms will either not adjust the budget at all or, alternatively, adjust it for planning and performance evaluation to the same extent. Thus, we expect credibility costs to be a relevant determinant for having a single budget at year-end, and we formally state:

H4. *The amount of credibility costs of setting two separate budgets for planning and performance evaluation is positively associated with the likelihood of using a single budget for both planning and performance evaluation at the end of the year.*

2.4. Additional budgeting determinants

As indicated by Appendix A, several additional determinants have to be considered by the firm when deciding about the use of a single versus separate budget levels for multiple purposes.⁸

Delta budget costs. The first important control variable comprises the additional fixed costs a firm may incur when setting up an additional planning process to determine a second, separate budget. While in some firms, a separate budget level may be determined with marginal additional costs, for example, in a top-down budgeting process, in other firms, these costs may be much larger. Such costs may occur, for example, because additional meetings or negotiations become necessary to determine the separate budget level. Thus, they are mainly determined by *whether*

⁸ As has been suggested in the literature, a single budget sets incentives for managers to create slack and using separate budgets may alleviate slack creating incentives for the manager during the planning process (Churchill, 1984; Schoute & Wiersma, 2011). However, separate budgets may only be helpful if the information revealed during the planning process does not carry over to the performance evaluation budget (Arya, Glover, & Sivaramakrishnan, 1997), which seems unlikely. Consistent with this, prior experimental evidence shows that the use of separate budgets versus a single budget for planning and performance evaluation does not decrease slack (Arnold & Gillenkirch, 2015). In our sample, we also do not find any significant relation between the level of information asymmetry allowing for managers' creation of slack and the use of a single budget at the beginning or end of the year.

a second separate budget exists but not so much by *how strongly* the separate budgets deviate from each other. Consequently, these costs vary in the number of budget levels (single vs. separate) but not in the amount of deviation, given separate budget levels exist.⁹ *Ceteris paribus*, the larger the fixed costs of setting up the additional planning process, the more difficult it is to overcome these additional costs through the benefits of setting separate budgets. Thus, we expect the additional planning costs to be positively associated with the likelihood of using a single budget for planning and performance evaluation *at the beginning of the year*.

However, owing to the way planning is usually carried out in flexible budgeting approaches, the fixed costs of setting up an additional planning process are unlikely to play a major role for different adjustments of the budgets during the year. The basic idea of flexible budgeting is that only key input information is updated in the case of new conditions, and overall *ex ante*-defined frameworks and relations stay constant, such as transfer pricing methods, currency exchange rules, or cost allocation methods (Davila & Wouters, 2005; Palermo & Van der Stede, 2011). Thus, the additional costs of adjusting budget levels for planning purposes are likely to be small and we do not expect any association between the costs of an additional budgeting process and the adoption of a single budget at year-end.

Importance planning and importance performance evaluation. Based on prior research (Becker et al., 2016; Hansen & Van der Stede, 2004; Merchant, 1984), we conceptualize planning and performance evaluation as budget roles with potentially different and varying importance for firms. In some firms, the planning function of budgeting may be more important than the performance evaluation function because, for example, the firm bases financial incentives, pay raises or promotions on budgets only to a small degree. Vice versa, in other firms, performance evaluation may be more important than the planning function when firms heavily rely on the fulfillment of budgetary targets for bonus payments or other types of incentives but have little need for coordination or planning in their production processes. Finally, in some firms, *both* functions may be relatively important and in other firms *both* functions may be relatively unimportant.¹⁰

The more important the performance evaluation function, the more heavily the firm is likely to weigh the variance costs from the performance evaluation budget and the credibility costs associated with a motivation loss when the budget level deviates. This holds for both setting up the budget at the beginning of the year and for maintaining a single budget during the year. In contrast, the more important the planning function, the more heavily a firm is likely to weigh the variance costs from the planning budget relative to the credibility costs when setting up the budget at the beginning of the year. Additionally, in this case, a firm likely adjusts the planning budget to changing conditions more often (Hansen & Van der Stede, 2004; Hansen, 2011), increasing the likelihood that separate budgets will emerge during the year. As a consequence, we expect a *positive* association of the importance of performance evaluation with the use of a single budget at the beginning and the end of the year, and we expect a *negative* association of the

⁹ In our model, we capture these additional costs through the fixed cost parameter K^{prep} . Owing to the fixed costs nature, it would be optimal for the firm to either use a single budget and *not* incur the additional costs K^{prep} or, alternatively, set both budgets to their individually optimal levels and incur additional costs K^{prep} . In the latter case, any deviation from the two optimal budget levels can never be optimal, as additional fixed costs K^{prep} would be incurred but the benefits of separate budgets would not be fully realized.

¹⁰ In our formal model included in Appendix A, the importance of the planning function is captured by the parameter $\alpha_{plan} > 0$ and the importance of the performance evaluation function is captured by the parameter $\alpha_{pe} > 0$.

importance of planning with the use of a single budget in both cases.

3. Method

3.1. Unit of analysis and sample selection

Our hypotheses tests require a unit of analysis at which operative budgets for planning and performance evaluation are set. Because data of the granularity needed are not publicly available and because our research question requires cross-sectional variation in budgeting practices, we collected questionnaire data from a cross-section of business units in the service and manufacturing sectors.

Following the guidelines from the Tailored Design Method (Dillman, Smyth, & Christian, 2009), we collected survey data by email from top executives responsible for budgeting practices in German, Austrian, and Swiss firms.¹¹ We identified each executive by searching in address databases such as AMADEUS and corporate websites. In some cases, this information was obtained or verified by phone calls to companies' headquarters. In most cases, the key person identified was the CFO or the head of Management Accounting. These executives most likely have precise knowledge about how the budgeting process and incentive functions are designed and how budgets are set for multiple purposes. Additionally, they are likely to provide a neutral perspective on the costs and benefits as, e.g., credibility costs, potentially affecting a firm's decision about a single budget level. In our invitation letter, we asked this manager to respond to or, alternatively, to forward the personalized link to an online questionnaire to the management executive most familiar with the firm's budgeting practices. The letter emphasized the importance of participation and assured the confidentiality of answers. We followed up with two reminders within the next eight weeks. As an incentive, we offered a benchmarking report from our study and a small gift in acknowledgment of the time spent answering the questions. Managers could choose an e-commerce voucher or donate the amount to a charitable organization. This procedure achieved a response of 125 questionnaires.¹² We excluded one firm that has no regular annual budgeting cycle and nine firms that use budgets only for operative planning and not for performance evaluation.¹³ Our final sample covers 115 observations.

To relate the unit of analysis to a firm's business unit, we asked

participants to respond to all questions for the largest business unit in their firm. In case the firm had no specialization into different business units, our unit of analysis is the entire firm. Since this procedure guarantees only one business unit per firm in our final sample, all observations are treated as independent from each other in our analyses. We therefore use the terms "business unit" and "firm" interchangeably.

We apply recent suggestions for using the survey method in accounting research. Specifically, we substantially reduce the potential for subjective interpretations by asking for hard facts instead of subjective perceptions of latent constructs, and we address concerns regarding common method variance and sample selection (Bertrand & Mullainathan, 2001). Following prior literature, we deal with the problem of common method variance *ex ante* by using procedural remedies when designing the questionnaire and *ex post* by applying statistical controls (Podsakoff, MacKenzie, & Podsakoff, 2003).¹⁴ As our study considers practices that are less likely to be affected by social desirability intentions and many variables are deduced by a combination of answers instead of taking survey responses as raw measures, a significant common method bias is highly unlikely.

To check for a potential self-selection bias in the sample, we employ the widely used early-late respondents' test (Armstrong & Overton, 1977). We compare the earliest and latest one-third of respondents with respect to differences in effort (i.e., the time invested in answering the survey), personal interest in the topic (i.e., participants' interest in a results report), and type of reward (i.e., commerce voucher vs. donation to charity), as well as respondents' age, professional work experience, and tenure in the current position. We further compare major organizational characteristics such as firm size (i.e., number of employees), sales, or profitability (i.e., return on assets). In none of these tests did we find any significant difference ($p > .10$ in all cases). Additionally, we compare all survey variables on the construct level but find no significant differences ($p > .10$ for all constructs). Overall, the results support the absence of any significant (non-) response bias.

3.2. Sample and respondent

Table 1 shows sample distributions for industry, size by number of employees, and key respondent. Panel A reports the industries of the participating business units. Panel B indicates that most business units are mid-sized with a mean of 2052 employees (median: 800). Panel C shows the distribution of our key respondents. About two-thirds of the sample (68%) consists of heads of management accounting, and, including CFOs, around 94% are directly responsible for corporate control functions. This distribution closely mirrors that in related studies on North American and European budgeting practices (e.g., Arnold & Artz, 2015; Becker et al., 2016; Ekholm & Wallin, 2011; Libby & Lindsay, 2010). Furthermore, 85% of respondents have professional work experience of over 10 years and 51% have over five years of experience in the current job (not tabulated). The hierarchical position and tenure of our key respondent favor high validity and reliability of key informant data (Homburg, Klarmann, Reimann, & Schilke, 2012).

¹¹ We follow recommendations in the survey method literature and restrict our data collection to a single respondent per firm as our study design fulfills criteria for high validity and reliability of a single key informant (Homburg et al., 2012; Rindfleisch, Malter, Ganesan, & Moorman, 2008). These criteria relate to, for example, whether constructs represent objectively verifiable phenomena or refer to internal organizational issues rather than to the firm environment. While a second, additional key informant as, e.g., line managers, may improve the validity of responses, it also can have disadvantages such as costs, length of the data generation process, low participation rates per firm due to "oversurveying" or even additional measurement error due to strategic consensus aspirations or conflicting interests (Rogelberg & Stanton, 2007). In our specific case, the benefits of a second key informant do not seem to outweigh its costs. We therefore consider a single informant approach as appropriate.

¹² As in prior work (Indejikian et al. (2014)), the use of several databases likely created overlaps in firm addresses and potentially multiple contacts to a single firm (e.g., in cases where business units and firm holdings had equivalent addresses). This reflects imprecise job titles, invalid email addresses, outdated addresses, etc. Our response rate is at least 5.0% (but probably much higher) and therefore comparable to Indejikian et al. (2014) with at least 4.3%.

¹³ These firms likely use alternative control instruments beyond budgets for incentive design. Thus, they are similar to firms using separate budgets because they are separating the instruments used for different functions. However, as we are specifically interested in the use of a single or separate budget levels, the more conservative approach is to exclude these cases from the final sample.

¹⁴ For instance, we (1) clearly separate the measurement of the dependent and independent variables, (2) ensure the respondent's anonymity, and (3) present the survey as a benchmark study to avoid respondents' forming of implicit theories when answering the questions. We also use clear and familiar terms, avoid complicated syntax, and often use value labels for the end- and mid-points of the scales to ensure unambiguous responses to our questions.

Table 1
Sample distributions by industry, firm size, and survey respondent.

Panel A. Sample by industry	%
Retailing & wholesale	27.83
Mechanical engineering	24.35
Consumer goods	19.13
Construction & utilities	13.91
Electronics & technology	10.43
Financial services	4.35
Panel B. Sample by employees	%
Fewer than 500 employees	30.43
500 to 999 employees	26.96
1000 to 2499 employees	26.96
2500 to 4999 employees	6.09
5000 employees and above	9.57
Panel C. Sample by respondent	%
Head of Management Accounting	67.83
CFO	26.09
Other (e.g., Executive Management Accounting, Head of Business Unit)	6.09

3.3. Variable measurement

Appendix B shows all survey questions. Multi-dimensional constructs are measured by several items and cover different facets of a construct. They are not supposed to have significant intercorrelations and are appropriately represented by an index (Bisbe, Batista-Foguet, & Chenhall, 2007). Facts such as the number of full-time equivalent working days to prepare the annual budget are captured by single-item measures.

3.3.1. SINGLE BUDGET YEAR BEGIN and SINGLE BUDGET YEAR END

Our main dependent variable is the use of a single budget level versus separate budget levels for planning and performance evaluation. Therefore, on a seven-point Likert scale we asked our participants whether earnings (respectively revenues, costs, and non-financial) budget target levels at the beginning of the fiscal year are identical (=1) or extremely different (=7) for planning and performance evaluation purposes on a seven-anchored Likert scale. Our main construct, SINGLE BUDGET YEAR BEGIN, is a binary variable with a value of one (=1) if, and only if, (a) earnings budget target levels are identical, (b) costs budget target levels are identical (and the firm does not use earnings targets in its budget), (c) revenue budget target levels are identical (and the firm uses neither earnings nor costs budget targets), and (d) non-financial target levels are identical (in the case of no financial budget targets).¹⁵ In any other case, SINGLE BUDGET YEAR BEGIN shows a value of zero. The use of a dichotomous dependent variable is theoretically justified and consistent with our theory.¹⁶

Our second construct, SINGLE BUDGET YEAR END, captures whether a firm uses a single budget at year-end. This is the case when the firm starts the year with a single budget and either does

not make any adjustments throughout the fiscal year or adjusts budget levels for planning and performance evaluation equally (SINGLE BUDGET YEAR END = 1).¹⁷ In contrast, SINGLE BUDGET YEAR END takes a value of zero if (1) SINGLE BUDGET YEAR BEGIN is zero or (2) SINGLE BUDGET YEAR BEGIN is one and the firm adjusts the budget for only one purpose during the fiscal year or (3) SINGLE BUDGET YEAR BEGIN is one and the firm adjusts the budget levels for both purposes but differently during the fiscal year.¹⁸

3.3.2. SIMILARITY VARIANCE COSTS

The costs of downward (upward) variance refer to those costs the firm is confronted with when the actual numbers underperform (outperform) the budget targets. These costs can occur owing to planning budget variances (i.e., costs mainly caused by not using capacity or acquiring additional capacity in the short run) and owing to performance evaluation budget variances (i.e., costs resulting from miscalibrated managerial incentives). As our theory requires a measure of the similarity in relative variances, we (1) measure downward and upward variance cost parameters of planning and performance evaluation, (2) calculate the respective ratios for downward and upward costs, and (3) form a similarity measure (SIMILARITY VARIANCE COSTS).

3.3.2.1. Downward/upward planning variance costs.

Unfavorable variances create costs owing to unused production capacities, storage of unused material or goods, or unused production, sales, and service staff. In the case of favorable variances, costs occur because additional capacity is necessary to handle more demand than expected. Examples are overtime work premiums, extra resources spent to keep delivery promises, short-term increases in production capacity, or additional storage space. We capture downward and upward costs by respondents' estimation of 10 cost positions, each using a seven-anchored Likert-scale from (1) no additional costs to (7) high additional costs. Downward (upward) planning variance costs are measured by the unweighted mean of their respective 10 items.

3.3.2.2. Downward/upward performance evaluation variance costs.

Motivation losses owing to miscalibrated incentives trigger upward and downward variance costs with regard to performance evaluation. If we consider a non-linear bonus function with an incentive zone starting above 0% target achievement and a cap in case of extraordinary target achievement, a manager can lose motivation by dropping out of this incentive zone (Arnold et al., 2016). Specifically, in the case of a downward variance, the manager might no longer be able to reach the incentive zone even by expending maximum effort. This situation is likely to result in a loss in motivation and real earnings management (e.g., shifting business to the next period, pulling future expenditures forward into the current period). Consequently, we measure the downward variance costs for performance evaluation by the lower bound of the incentive zone with a theoretical range of 0%–100%, where 100% represents full target achievement.

In case of an upward variance and a cap in the incentive function, any increase in performance beyond the level of the cap does not pay off either, potentially resulting in lower effort and real

¹⁵ We do not restrict budgets to financial information, but refer to budgets as the variety of targets in the planning and budgetary control systems of a firm. Commonly, these targets also comprise non-financial measures included in these plans (Bhimani et al., 2008).

¹⁶ The reason for using a dichotomous variable is that delta budget costs is fixed for the firm once a second, separate budget is set. The fixed costs make it optimal for the firm to either use a single budget or set both budgets to their individually optimal level. In this case, the optimum shifts from zero difference of the budget levels (single budget) to the optimal difference (separate budgets). The distance itself is therefore not informative but only the decision of the firm to either set a single or two separate budgets.

¹⁷ Subjective ex-post adjustments of budget targets could serve as a substitute to formal interim budget target changes. Using survey data that captures firms' use of ex-post subjectivity, we do not find any empirical evidence supporting this idea.

¹⁸ A firm might also have separate budgets at the beginning of the year and changes during the year might lead the firm to end up with a single budget at year-end. Our sample does not contain such a case.

earnings management as well. Thus, upward variance costs mainly arise from a cap in the bonus function. The lower this cap, the more likely the manager will fall out of the incentive zone, reducing or even completely eliminating incentives. Therefore, any empirical measure of upward variance costs should decrease in the upper bound of the bonus function, should be close to zero for a cap with a very high upper bound, and should be zero for bonus functions without any cap.¹⁹ For firms having a cap in their bonus function, we use the actual upper bound captured in our survey and calculate the upward variance costs as:

$$\max(0; 200\% - \text{upper bound bonus incentive } \%)$$

Consistent with our theory, our measure of upward costs decreases as the upper bound of the bonus function increases. For those firms ($n = 42$; 36% of sample) that do not have a cap in their bonus function, these upward costs are set to zero. To limit the influence of outliers, upward costs are also set to zero for $n = 3$ firms (2.5% of sample) that have extreme upper bounds beyond 200%. Our line of reasoning is that managers are very unlikely to regularly beat an upper bound of 200% (i.e., regularly beating double the target achievement), reducing the upward variance costs to zero in this case.

3.3.2.3. Similarity in relative variance costs. In line with our theory, we first construct the relation of upward variance costs to total variance costs for both planning and performance evaluation. With these two variables, we form a measure for similarity that decreases in the absolute distance between both relative costs parameters as follows:

$$(-1) \times | \text{relation variance costs planning} - \text{relation variance costs performance evaluation} |$$

Given that both relations have different original units (i.e., Likert-scales and target achievement in percentages), we cannot simply take the difference. Therefore, we use a non-parametric approach that is also robust to measurement errors for both planning and performance evaluation variance costs. Specifically, we divide the relative variance costs of planning into 10 quantiles and the relative variance costs of performance evaluation into 10 quantiles. The absolute difference between these quantiles multiplied with minus one represents the construct *SIMILARITY DEVIATION COSTS*.²⁰ This approach is not sensitive to the number of quantiles. We receive very similar results using alternative classifications such as 4, 6, 8, 12, or 14 quantiles.

3.3.3. CREDIBILITY COSTS

Credibility costs refer to the potential loss in a manager's motivation when performance evaluation and planning budget levels deviate from each other and, as a consequence, budget credibility is reduced. We measure these costs by asking participants for agreement to two survey questions using a seven-point anchored Likert scale. The two questions refer to managers' lack

of belief in the budget target and the resulting loss in motivation if the operative planning target differs from the one used for performance evaluation. The construct *CREDIBILITY COSTS* is formed from an index of those two questions.

3.3.4. DELTA BUDGET COSTS

We measure the resources consumed for budget preparation by full-time equivalent (FTE) working days. We use a multi-step process. First, we ask participants about the different departments within the firm. Second, for those departments, we ask for the FTE working days spent for budget preparation. On average, about five departments are involved in budget preparation (median three) with an empirical range from one to 12.

Since we are interested in the *delta* of budget preparation costs for preparing a second budget, we ask for (1) the FTE working days to prepare the planning budget, (2) the FTE working days to prepare the performance evaluation budget, and (3) the FTE working days if performance evaluation targets were to be taken "one-to-one" from operative planning targets. *DELTA BUDGET COSTS* is then (1) plus (2) minus (3) and represents the additional number of FTE working days to prepare a second budget. If a firm has identical target levels (and therefore prepares a single budget), we ask for an estimation of the hypothetical expected costs for an additional performance evaluation budget. Our main variable of interest, *DELTA BUDGET COSTS*, is the cost *delta* of preparing a second budget measured in FTE working days.

3.3.5. IMPORTANCE PLANNING and IMPORTANCE PERFEVAL

We asked respondents about the importance of budget targets in the following key management areas: forecasting, coordination, resource allocation, performance evaluation, variable compensation, and internal/external communication. Following prior work (e.g., Arnold & Artz, 2015; Becker et al., 2016), we classify the first three dimensions as planning (*IMPORTANCE PLANNING*) and the second two as performance evaluation (*IMPORTANCE PERFEVAL*). Whereas planning captures the decision-oriented function of budgeting, performance evaluation comprises the control-oriented areas, including not only annual bonus payments, but also, for example, promotions or pay raises as consequence of performance evaluation (Becker et al., 2016; Hansen & Van der Stede, 2004).

We find that on average, the importance of both dimensions for the firms in our sample is rather high (planning: 5.3, performance evaluation: 4.2). The finding that planning seems more important than performance evaluation (5.3 vs. 4.2; $p < .001$) is fully consistent with the evidence reported in Becker et al. (2016) and Hansen and Van der Stede (2004). However, we also observe substantial variation covering almost the full theoretical range of one to seven for both dimensions, consistent with prior evidence on the varying importance of these functions from firms (e.g., Becker et al. (2016); Hansen and Van der Stede (2004); Merchant, 1984).

3.4. Econometric model estimation

To test our hypotheses, we regress *SINGLE BUDGET YEAR BEGIN* (to test *H1* and *H2*) and *SINGLE BUDGET YEAR END* (to test *H3* and *H4*) on our variables of interest and controls for firm i in industry k . We control for the budgeting variables introduced in section 2.4 and variables capturing different dimensions of firm and business unit complexity as well as firm environment (Bruns & Waterhouse, 1975): firm size (*SIZE*), organizational interdependencies (*INTER-DEP*), the number of different departments in the business unit (*N_DEPARTMENTS*), environmental uncertainty (*UNCERTAINTY*), and industry affiliation (*INDUSTRY*). The resulting regressions are described as follows:

¹⁹ Our approach implies that once the general bonus function is determined, upper and lower bounds determine the upward and downward variance costs when the budget is set, as in Healy (1985) or Guidry, Leone, and Rock (1999). Similar to Grabner (2014) and Indjejikian et al. (2014), we acknowledge that the design of the bonus function itself is part of the entire management control system of a company.

²⁰ As an example, if one business unit in our data has relative variance costs of planning that are very low (e.g., in the first quantile over all observations) and relative variance costs of performance evaluation that are very high (e.g., in the ninth quantile over all observations), the absolute difference would be eight, and the final value for *SIMILARITY VARIANCE COSTS* would be minus eight.

$$\begin{aligned}
 PR(\text{SINGLE BUDGET YEAR BEGIN}_i = 1) &= \alpha + \beta_1 \times \text{SIMILARITY VARIANCE COSTS}_i + \beta_2 \times \text{CREDIBILITY COSTS}_i + \beta_3 \times \text{DELTA BUDGET COSTS}_i \\
 &+ \beta_4 \times \text{IMPORTANCE PLANNING}_i + \beta_5 \times \text{IMPORTANCE PERFEVAL}_i + \beta_6 \times \text{SIZE}_i + \beta_7 \times \text{INTERDEP}_i \\
 &+ \beta_8 \times \text{N_DEPARTMENTS}_i + \beta_9 \times \text{UNCERTAINTY}_i + \sum_k \rho_k \times \text{INDUSTRY}_k + \varepsilon_i
 \end{aligned} \tag{1}$$

$$\begin{aligned}
 PR(\text{SINGLE BUDGET YEAR END}_i = 1) &= \alpha + \gamma_1 \times \text{SIMILARITY VARIANCE COSTS}_i + \gamma_2 \times \text{CREDIBILITY COSTS}_i + \gamma_3 \times \text{DELTA BUDGET COSTS}_i \\
 &+ \gamma_4 \times \text{IMPORTANCE PLANNING}_i + \gamma_5 \times \text{IMPORTANCE PERFEVAL}_i + \gamma_6 \times \text{SIZE}_i + \gamma_7 \times \text{INTERDEP}_i \\
 &+ \gamma_8 \times \text{N_DEPARTMENTS}_i + \gamma_9 \times \text{UNCERTAINTY}_i + \sum_k \rho_k \times \text{INDUSTRY}_k + \varepsilon_i
 \end{aligned} \tag{2}$$

As firms make decisions sequentially when setting a single budget level versus separate budget levels at the beginning and at the end of the year, we jointly estimate both regressions using a seemingly unrelated probit estimator (also referred to as a bivariate probit) with heteroscedasticity-robust standard errors (Green, 2011).

Furthermore, we re-run equation (2), restricting the observations included to those firms using a single budget at the beginning of the year. Although lower sample size might reduce statistical power, this approach is likely to represent a cleaner test of H3 and H4. As all firms we refer to in H3 and H4 start with a single budget at the beginning of the year, different budget adjustments during the year can be triggered only by the effects of the different cost drivers on the use of a single budget. Stated differently, firms with a single budget at the beginning of the year but separate budget levels at year-end represent a better control group to the treatment group of firms having a single budget at both the beginning and the end of the year. We run the following probit regression:

budget level versus separate budget levels at the beginning of the year and at year-end. 83 firms (72% of the total sample) use a single budget at the beginning of the year. However, this share decreases during the year owing to intra-year budget adjustments. Only 33 firms (29% of the total sample) finish the year with a single budget. This result indicates that 50 firms (43% of the total sample and 60% of the firms choosing a single budget level at the beginning of the year) changed from a single budget at the beginning of the year to separate budget levels at the end of the year.

Panel B shows the different types of budget adjustments for the planning and the performance evaluation budget. Of the total sample, 74 firms (64%) change either one or both budgets during the year. The majority of changes are due to exclusive revisions of the planning budget in a regular manner (e.g., monthly or quarterly) which is consistent with a dynamic planning philosophy in these firms. In contrast, the performance evaluation budget is less likely to be revised, and any adjustment is usually not done at fixed dates during the year. If budget levels are adjusted, we find that 11%

$$\begin{aligned}
 PR(\text{SINGLE BUDGET YEAR END}_i = 1 | \text{SINGLE BUDGET YEAR BEGIN}_i = 1) &= \alpha + \gamma_1 \times \text{SIMILARITY VARIANCE COSTS}_i + \gamma_2 \times \text{CREDIBILITY COSTS}_i + \gamma_3 \times \text{DELTA BUDGET COSTS}_i \\
 &+ \gamma_4 \times \text{IMPORTANCE PLANNING}_i + \gamma_5 \times \text{IMPORTANCE PERFEVAL}_i + \gamma_6 \times \text{SIZE}_i + \gamma_7 \times \text{INTERDEP}_i \\
 &+ \gamma_8 \times \text{N_DEPARTMENTS}_i + \gamma_9 \times \text{UNCERTAINTY}_i + \sum_k \rho_k \times \text{INDUSTRY}_k + \varepsilon_i
 \end{aligned} \tag{3}$$

In line with H1–H4, we expect $\beta_1, \beta_2, \gamma_1$ and γ_2 to be positive and significant. On the basis of section 2.4, we expect β_3, β_5 , and γ_5 to be positive and significant, and β_4 , and γ_4 to be negative and significant. For γ_3 , we do not expect any statistically significant association. Further, we do not include a prediction for any of the control variables.

4. Empirical results

4.1. Descriptive statistics

Table 2, Panel A, reports the distribution of firms using a single

of firms change both the planning and performance evaluation budgets equally (i.e., both either periodically or both if necessary). Another 10% of firms revise both budgets in different cycles (e.g., periodic adjustments of the planning budget, but less frequent revisions of the performance evaluation budget). Overall, adjustments of budget levels during the year are far more likely for planning purposes. This finding reflects recent discussions on topics such as flexible budgets or scenario-based budgeting (e.g., Hansen & Van der Stede, 2004; Hope & Fraser, 2003; Palermo & Van der Stede, 2011) and is in line with prior evidence on less frequent intra-year target revisions for incentive purposes (Merchant, 2010).

Table 2

Descriptive statistics: Single budgets and dynamic budget adjustments.

Panel A. Single budgets and dynamics during the year				
	Single Budget Beginning of Year		Single Budget End of Year	
	Absolute	Relative	Absolute	Relative
Yes	83	72%	33	29%
No	32	28%	82	71%
<i>thereof (= 100%)</i>				
No (but beginning yes)			50	61%
No (never)			32	39%
Total	115	100%	115	100%

Panel B. Budget adjustments for different purposes during the year						
Adjustments	Periodically		If Necessary		Total	
	Absolute	Relative (%)	Absolute	Relative (%)	Absolute	Relative (%)
Only planning budget	33	29%	11	10%	44	38%
Only performance evaluation budget	0	0%	5	4%	5	4%
Both budgets (same type of adjustment)	3	3%	10	9%	13	11%
Both budgets (different type of adjustment)*					12	10%
Number of individual firms	36	31%	26	23%	74	64%

Note: All shares in percentage (%) refer to total sample of $n = 115$. * Includes observations with periodically adjustments of the planning and irregular adjustments of the performance evaluation budget and vice versa.

Table 3

Descriptive statistics.

Panel A. Descriptive statistics—components of variance costs					
	Mean	SD	Min	Max	
Downward variance costs planning	3.24	1.21	1.00	6.50	
Upward variance costs planning	3.17	1.00	1.30	6.00	
Downward variance costs performance evaluation	0.71	0.29	0.00	1.00	
Upward variance costs performance evaluation	0.39	0.38	0.00	0.99	
Relative upward variance costs planning	0.50	0.07	0.30	0.75	
Relative upward variance costs performance evaluation	0.31	0.30	0.00	1.00	

Panel B. Descriptive statistics—main variables					
	Mean	SD	Min	Max	
1	SINGLE BUDGET YEAR BEGIN	.72	.45	.00	1.00
2	SINGLE BUDGET YEAR END	.29	.45	.00	1.00
3	SIMILARITY VARIANCE COSTS	-3.54	2.54	-9.00	.00
4	CREDIBILITY COSTS	5.19	1.10	2.50	7.00
5	DELTA BUDGET COSTS	19.43	96.21	.00	1000
6	IMPORTANCE PLANNING	5.33	1.27	1.50	7.00
7	IMPORTANCE PERFEVAL	4.22	1.65	1.00	7.00
8	SIZE	6.51	1.70	1.61	1.57
9	INTERDEP	5.00	1.13	2.00	7.00
10	N_DEPARTMENTS	5.47	4.20	1.00	12.00
11	UNCERTAINTY	-4.63	0.94	-6.33	-1.00

Panel A of Table 3 reports summary statistics for the components of (relative) variance costs. Both upward and downward variance costs cover almost the full theoretical range from 1.00 to 7.00 for planning and from 0 to 1 for performance evaluation that we outlined in Section 3.3.2. Relative variance costs for planning show that upward and downward costs are symmetrical (mean = 0.50). Thus, on average, from a planning perspective downward and upward variances are equally important for the firms in our sample. Moreover, mean relative variance costs for performance evaluation are .31, which is plausible as 37% of the firms do not have a cap in their incentive function. Panel B displays summary statistics for the main variables of interest. All measures cover almost the full range of theoretical values, and the resulting high standard deviations underline the heterogeneity in economic and behavioral budget cost drivers in our cross-section of firms.

Table 4 reports the Pearson correlations among all variables. SINGLE BUDGET YEAR BEGIN and SINGLE BUDGET YEAR END correlate significantly ($r = .39$; $p < .01$). The correlation is modest, which is consistent with our evidence that many firms switch to separate budgets throughout the year. The positive and significant correlations between SINGLE BUDGET YEAR BEGIN/END and SIMILARITY VARIANCE COSTS ($r = .17$; $p < .10$ for YEAR BEGIN and $r = .23$; $p < .05$ for YEAR END) as well as BUDGET YEAR BEGIN/END and CREDIBILITY COSTS ($r = .19$; $p < .05$ and $r = .23$; $p < .05$) represent initial evidence in favor of H1–H4. Generally, all correlations are not sufficiently high to warrant concerns about multicollinearity. Nevertheless, a more rigorous test of our theory requires a multivariate setting to account for potential interdependencies between our economic and behavioral determinants.

Table 4
Correlations main variables.

		1	2	3	4	5	6	7	8	9	10	11
1	SINGLE BUDGET YEAR BEGIN	1.00										
2	SINGLE BUDGET YEAR END	0.39***	1.00									
3	SIMILARITY VARIANCE COSTS	0.17*	0.23**	1.00								
4	CREDIBILITY COSTS	0.19**	0.23**	-0.03	1.00							
5	DELTA BUDGET COSTS	0.12	-0.03	-0.15	0.03	1.00						
6	IMPORTANCE PLANNING	0.03	0.06	0.08	0.08	0.02	1.00					
7	IMPORTANCE PERFEVAL	0.09	0.14	0.18*	0.01	0.05	0.29***	1.00				
8	SIZE	0.16*	0.01	-0.03	-0.12	-0.06	0.15	0.06	1.00			
9	INTERDEP	-0.12	-0.04	-0.13	0.05	-0.02	0.09	-0.06	-0.02	1.00		
10	N_DEPARTMENTS	-0.12	-0.02	0.11	-0.10	-0.12	-0.04	0.11	0.34***	0.20**	1.00	
11	UNCERTAINTY	-0.12	-0.01	-0.04	-0.08	-0.03	-0.14	-0.14	-0.17	0.07	-0.02	1.00

Note: *, **, and *** denote significance at the 10%, 5%, and 1% levels (two-tailed).

Table 5
Regressions determining the use of a single business unit budget.

Model	Hypothesis	Prediction	2		
			1a	1b	2
			SINGLE BUDGET YEAR BEGIN	SINGLE BUDGET YEAR END	SINGLE BUDGET YEAR END (YEAR BEGIN = 1)
SIMILARITY VARIANCE COSTS	H1/H3	+/+	0.12** [0.07]	0.15*** [0.06]	0.14** [0.06]
CREDIBILITY COSTS	H2/H4	+/+	0.32** [0.15]	0.32*** [0.12]	0.30** [0.14]
DELTA BUDGET COSTS		+/NR	0.17*** [0.06]	0.00 [0.00]	-0.00 [0.00]
IMPORTANCE PLANNING		-/-	-0.35** [0.17]	-0.01 [0.14]	0.01 [0.16]
IMPORTANCE PERFEVAL		+/+	0.17** [0.10]	0.10* [0.08]	0.11 [0.09]
SIZE		NP	0.28*** [0.09]	-0.01 [0.09]	-0.16 [0.13]
INTERDEP		NP	-0.00 [0.12]	0.01 [0.11]	0.04 [0.13]
N_DEPARTMENTS		NP	-0.10** [0.04]	-0.01 [0.03]	0.00 [0.04]
UNCERTAINTY		NP	-0.13 [0.27]	0.04 [0.19]	-0.01 [0.24]
INDUSTRY FE			YES	YES	YES
Observations			115	115	83
Estimation			BIVARIATE (SUR) PROBIT		PROBIT

Note: Constant term included but not reported. NR = no relation. NP = no prediction. FE = Fixed effects. Robust standard errors are shown in brackets. *, **, and *** denote significance at the 10%, 5%, and 1% levels; one-tailed for a directional prediction, two-tailed otherwise.

4.2. Hypotheses tests

Table 5 reports the results of the three multivariate regression equations. Model (1) shows the joint estimation using the seemingly unrelated probit estimator with results for SINGLE BUDGET YEAR BEGIN (Model (1a)) and SINGLE BUDGET YEAR END (Model (1b)). As predicted, SIMILARITY VARIANCE COSTS has a positive and significant association with SINGLE BUDGET YEAR BEGIN ($\beta_1 = .12$; $p < .05$) in Model (1a), supporting H1. We also find support for H2, as CREDIBILITY COSTS ($\beta_2 = .32$; $p < .05$) is also positively associated with SINGLE BUDGET YEAR BEGIN. Consistent with our expectations on the other budgeting determinants, DELTA BUDGET COSTS ($\beta_3 = .17$; $p < .01$) and IMPORTANCE PERFEVAL ($\beta_5 = .17$; $p < .05$) are positively and IMPORTANCE PLANNING ($\beta_4 = -.35$; $p < .05$) is negatively associated with SINGLE BUDGET YEAR BEGIN.

Model (1b) and Model (2) refer to SINGLE BUDGET YEAR END and test H3 and H4. Model (1b) includes all observations from the joint estimation with Model (1a), whereas Model (2) includes only firms that started with a single budget at the beginning of the year. Here, any heterogeneity can only be driven by dynamic intra-year adjustments of budgets that either lead or do not lead to separate budgets for planning and performance evaluation at year-end.

For SIMILARITY VARIANCE COSTS, coefficients are positive and significant ($\gamma_1 = .15$; $p < .01$ in Model (1b) and $\gamma_1 = .14$; $p < .05$ in Model (2)), providing support for H3. In line with H4, we also find a positive association of CREDIBILITY COSTS with SINGLE BUDGET YEAR END ($\gamma_2 = .32$; $p < .01$ for Model (1b) and $\gamma_2 = .30$; $p < .05$ for Model (2)). We find no evidence in favor of a relation between DELTA BUDGET COSTS and SINGLE BUDGET YEAR END ($p > .10$ for both Model (1b) and Model (2)), which is in line with the idea that separate budgets during the year mainly emerge from the adjustment of the planning budget to new conditions. Finally, we find SINGLE BUDGET YEAR END and IMPORTANCE PERFEVAL to be positively associated ($p < .10$) for Model 1b.

4.3. Supplemental analysis: asymmetric effects of credibility costs

Even though our theoretical framework and the derived hypotheses were not intended to explicitly predict asymmetries in credibility costs *ex ante*, our empirical results indicate that such asymmetries might exist.²¹ As we suggest in Footnote eight, the

²¹ We thank an anonymous reviewer for suggesting such an ex-post supplemental analysis.

effect of credibility costs may be stronger when the performance evaluation budget is set to a higher level than the planning budget. We conduct an additional empirical analysis to test this conjecture. Specifically, we first calculate the difference between relative upward variance costs planning and relative upward variance costs performance evaluation. When this difference is positive (negative), the relative upward variance costs are larger (smaller) for planning than for performance evaluation, and consequently the planning budget should be set to a higher (lower) level than the performance evaluation budget. We split the sample along these lines into two subgroups. The first subgroup contains business units for which, according to this measure, the performance evaluation budget should be larger than the planning budget. The second subgroup contains the cases in which the performance evaluation budget should be equal or smaller. We then re-ran Model (1a) of Table (5) for both subgroups including all firm controls. We find (results untabulated) that the effect of credibility costs on SINGLE BUDGET YEAR BEGIN is significantly positive (0.70, $p = 0.04$; one-tailed) when the performance evaluation budget should be larger than the planning budget but insignificant in the reverse case (-0.03 , $p = 0.84$; two-tailed). These results suggest that credibility costs may be asymmetric.

5. Conclusion

Budgeting has different functions in the firm that are not necessarily congruent with each other and may conflict. Although prior literature recommends using different budgets for different purposes to resolve those conflicts (Baiman, 1982; Otley, 1982), prior empirical evidence indicates that the majority of firms seem to use a single budget for planning and performance evaluation (Churchill, 1984; Merchant & Manzoni, 1989; Umamathy, 1987). In this paper, we empirically investigate the questions of whether and why firms set a single budget level or separate budget levels to address the budget functions of planning and performance evaluation.

Our study helps to reconcile the apparent differences in descriptive empirical practice and recommendations based on academic literature for two reasons. First, consistent with prior literature, we find that the majority of firms in our sample (72%) use a single budget at the *beginning* of the year. However, we also find that the majority of firms (71%) use separate budgets for planning and performance evaluation at the *end* of the year. These findings suggest that firms adjust budgets differently for planning and performance evaluation in the course of the year. The evidence resembles prior findings from research on intra-year budget revisions (Arnold & Artz, 2015; Hansen & Van der Stede, 2004). Thus, our study suggests that focusing on beginning-of-year budgets may not be sufficient to study the use of a single versus separate budget levels.

Second, we find evidence for our hypotheses predicting that firms are more likely to use a single budget when the conflict between planning and performance evaluation is low and potential motivational losses from a deviating performance evaluation budget are high. Our study provides a rationale for why firms may set a single budget level for multiple purposes despite an existing budgeting conflict in which prior literature often favors separate budget levels (e.g., Barrett & Fraser, 1977; Otley, 1982). Thus, our study underlines the importance of considering behavioral forces and suggests that the recommendation of using separate budgets may not be universally applicable. Beyond credibility as a behavioral driver, we also show that firms do respond to economic determinants of using separate budgets, such as the degree of conflict between the planning and performance evaluation functions. Thus, firms in our sample seem to trade off the economic and behavioral

costs of a single budget versus separate budgets either at the beginning of the year or during the year.

Our study is subject to the limitation that survey-based research has the potential for measurement error. Although our study design partially alleviates concerns about measurement errors because we use highly experienced respondents as key informants, we cannot rule out the influence of such errors. Future studies may use triangulation techniques with a second key informant per firm to gain more granular insights into the use of separate budgets in firms. Additionally, it may have represented a challenge to our respondents to estimate delta budget costs, especially in case a separate budget did not exist in their firm. Further, our measure does not consider any costs of a second budget beyond employee capacity. Although our empirical findings are in line with expectations, they should be interpreted in light of these issues. Finally, our cross-sectional data set cannot definitely establish the causality of purported relationships and causal inferences cannot be drawn from our study.

Despite these limitations, our study contributes to the literature on the integration of control- and decision-oriented functions of management accounting instruments (Arnold & Gillenkirch, 2015; Shields & Shields, 1998) by providing systematic evidence about why firms do or do not use separate budgets for planning and performance evaluation. Additionally, we contribute to the literature on intra-year budget revisions (Arnold & Artz, 2015; Hansen & Van der Stede, 2004) by showing that firms adjust the single budget used at the beginning of the year differently for planning and performance evaluation purposes, responding systematically to different cost factors of the planning and performance evaluation function.

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Appendix A. A formal model of budgeting costs

Assumptions

We assume that the expected costs associated with setting a single budget versus separate budgets consist of the following parts:

- (i) Variance costs arising from a realization of the output \bar{x} that deviates from one or both of the budgets. These costs can be different for upward variances from the budgets (i.e., \bar{x} exceeds the budget) and downward variances from the budget (i.e., \bar{x} falls short of the budget). Moreover, these costs can differ for each budgeting purpose. Let the variance cost parameters of an upward or downward variance of the realized value \bar{x} from these budgets be c_D^i and c_U^i for $i = \{Plan; PE\}$, where *Plan* signifies the planning purpose and *PE* signifies the performance evaluation purpose. For simplicity, we assume that the variance costs for the upward and downward variances from the budgets are linear (Weitzman, 1980).

- (ii) Costs for setting up an additional planning process. We assume that these costs are represented by the indicator function $I(b_{PE}, b_{Plan}) = \begin{cases} 0 & \text{if } b_{PE} = b_{Plan} \\ K^{prep} & \text{if } b_{PE} \neq b_{Plan} \end{cases}$. Thus, if the firm wants to set separate planning and performance evaluation budgets, it incurs additional fixed costs.
- (iii) Credibility costs arising from a reduced credibility of the performance evaluation budget when employees notice that it does not correspond to the planning budget. Let k_{cred} be the cost parameter for the variance between the two budgets. Thus, $k_{cred}|b_{PE} - b_{Plan}|$ represents the cost function of a variance between the two budgets.

Taken together, the expected costs of using a separate or a single budget add up as follows:

$$\int_{\bar{x}}^{b_{Plan}} c_D^{Plan}(b_{Plan} - \bar{x})f(\bar{x})d\bar{x} + \int_{b_{Plan}}^{\bar{x}} c_U^{Plan}(\bar{x} - b_{Plan})f(\bar{x})d\bar{x} + \int_{\bar{x}}^{b_{PE}} c_D^{PE}(b_{PE} - \bar{x})f(\bar{x})d\bar{x} + \int_{b_{PE}}^{\bar{x}} c_U^{PE}(\bar{x} - b_{PE})f(\bar{x})d\bar{x} + I(b_{PE}, b_{Plan}) + k_{cred} \cdot |b_{PE} - b_{Plan}| \tag{1}$$

where $c_D^i(b_i - \bar{x})$ are the variance costs for a downward variance from budget i ($i = Plan, PE$) and $c_U^i(\bar{x} - b_i)$ are the upward variance costs from budget i .

The importance of the two budgeting functions for the firm is captured by the weighting parameters $\alpha_{Plan} > 0$ and $\alpha_{PE} > 0$. That is, we assume that the relevant costs associated with the planning and the performance evaluation functions for the firm are weighted by the corresponding weighting parameters. This implies that the more important a budgeting function, the more the relevant costs enter into the firm's decision. Importantly, we do not require α_{Plan} and α_{PE} to add up to a certain sum (e.g., 1) because there may be firms in which both functions are relatively important and firms in which both functions are relatively unimportant.

Including the importance parameters, the firm's expected total costs $E(\bar{C})$ are:

$$E(\bar{C}) = \alpha_{Plan} \left(\int_{\bar{x}}^{b_{Plan}} c_D^{Plan}(b_{Plan} - \bar{x})f(\bar{x})d\bar{x} + \int_{b_{Plan}}^{\bar{x}} c_U^{Plan}(\bar{x} - b_{Plan})f(\bar{x})d\bar{x} \right) + \alpha_{PE} \left(\int_{\bar{x}}^{b_{PE}} c_D^{PE}(b_{PE} - \bar{x})f(\bar{x})d\bar{x} + \int_{b_{PE}}^{\bar{x}} c_U^{PE}(\bar{x} - b_{PE})f(\bar{x})d\bar{x} \right) + \alpha_{PE} \cdot k_{cred} \cdot |b_{PE} - b_{Plan}| + I(b_{PE}, b_{Plan}) \tag{2}$$

For traceability, assume in the following that the separate performance evaluation budget is larger than the separate optimal planning budget ($b_{PE}^* > b_{Plan}^*$).²²

²² This assumption corresponds to the empirical evidence collected in our survey. All conclusions that we draw also hold the other way around. The assumption simplifies the representation of the solution as it does not require us to engage in lengthy case-by-case analyses of the absolute term $k_{dev} \cdot |b_{PE} - b_{Plan}|$.

Baseline solution

Differentiating $E(\bar{C})$ with respect to b_{Plan} and b_{PE} gives the first-order conditions for the firm's optimal performance evaluation (b_{PE}^*) and planning budget (b_{Plan}^*). As we have not further specified the density function $f(\bar{x})$, the condition is implicitly defined as follows:

$$\frac{c_U^{Plan} + \frac{\alpha_{PE}}{\alpha_{Plan}} k_{cred}}{c_U^{Plan} + c_D^{Plan}} = F(b_{Plan}^*) \tag{3a}$$

$$\frac{c_U^{PE} - k_{cred}}{c_U^{PE} + c_D^{PE}} = F(b_{PE}^*) \tag{3b}$$

where $F(b_{Plan}^*)$ and $F(b_{PE}^*)$ are the values of the cumulative distribution function (CDF) at the optimal budget levels b_{Plan}^* and b_{PE}^* , respectively.

If $k_{cred} = 0$, Equations (3a) and (3b) reduce to:

$$\frac{c_U^{Plan}}{c_U^{Plan} + c_D^{Plan}} = F(b_{Plan}^*) \tag{3a1}$$

$$\frac{c_U^{PE}}{c_U^{PE} + c_D^{PE}} = F(b_{PE}^*) \tag{3b2}$$

That means that every optimal budget is then determined only by the relation of the upward and downward variance cost parameters but not by the absolute amount of these costs.

Comparative statics at the optimum

In the following, we will examine how the difference between the two individually set budgets changes when the parameters of our model change.

If the CDF is monotonically increasing, we can investigate the difference $\Delta^* = F(b_{PE}^*) - F(b_{Plan}^*)$. Substituting Equations (3a) and (3b) into this equation yields:

$$\Delta^* = F(b_{PE}^*) - F(b_{Plan}^*) = \frac{c_U^{PE} - k_{cred}}{c_U^{PE} + c_D^{PE}} - \frac{c_U^{Plan} + \frac{\alpha_{PE}}{\alpha_{Plan}} k_{cred}}{c_U^{Plan} + c_D^{Plan}} \tag{4}$$

Similarity of variance costs

Every optimal budget is influenced by the relation of the upward and downward variance cost parameters $c_U^i/c_U^i + c_D^i$. The more similar the coefficients for the two budgets, the closer are the optimal budgets in the optimum, thus, the smaller is Δ^* .

We prove this claim by differentiating Δ^* with respect to c_U^{PE} . As we assumed that $b_{PE}^* > b_{plan}^*$, an increase in c_U^{PE} further increases the difference in the relation of the upward and downward variance cost parameters of the two budgets, making these relations less similar. Differentiating Δ^* gives:

$$\frac{\partial \Delta^*}{\partial c_U^{PE}} = \frac{c_D^{PE} + k_{cred}}{(c_U^{PE} + c_D^{PE})^2} > 0 \quad (5)$$

Thus, the less similar the coefficients of the variance costs for the two budgets, the larger the distance between the two optimal separate budgets.

Credibility costs

To investigate the effect of an increase in the credibility cost parameter k_{cred} on the distance between the two separate budgets, we differentiate Δ^* with respect to this parameter:

$$\frac{\partial \Delta^*}{\partial k_{cred}} = -\frac{1}{c_U^{PE} + c_D^{PE}} - \frac{\frac{\alpha_{PE}}{\alpha_{plan}}}{c_U^{plan} + c_D^{plan}} < 0 \quad (6)$$

The larger the credibility cost parameter, the smaller the distance between the two separate budgets.

Importance of budgeting functions

We will now also examine how changes in the importance of each budgeting function affect the distance between the two separate budgets.

First, we differentiate Δ^* with respect to the importance of the planning function α_{plan} and find:

$$\frac{\partial \Delta^*}{\partial \alpha_{plan}} = \frac{\frac{\alpha_{PE}}{\alpha_{plan}^2} \cdot k_{cred}}{c_U^{plan} + c_D^{plan}} > 0 \quad (7)$$

Thus, the more important the planning function of budgeting, the larger the distance between the two separate budgets.

Second, differentiating Δ^* with respect to the importance of the performance evaluation function α_{PE} gives:

$$\frac{\partial \Delta^*}{\partial \alpha_{PE}} = -\frac{1}{c_U^{plan} + c_D^{plan}} < 0 \quad (8)$$

As shown in Equation (8), the more important the performance evaluation function, the smaller the distance between the separate budgets.

Appendix B. Survey instrument

In this survey, we refer to the operative planning process of your firm that might also have a slightly different name in your firm such as “budgeting,” “operative planning,” or “short-term planning” and usually refers to one fiscal year. We will refer to the set of targets in this operative plan in the following as “budget” or “budget target”. This can (but does not have to) include sales plans, profit plans, production cost per unit, plans of SG&A costs, or planning staff capacities. (We neither refer to short- or long-term liquidity planning nor to cash planning in this survey).

A. SINGLE BUDGET YEAR BEGIN/SINGLE BUDGET YEAR END

1. Single budget at the beginning of year

1. Is the revenue budget target level that your business unit uses for operative planning identical with the revenue budget target level your business unit uses for performance evaluation?

[7-point Likert scale anchored from “identical” (1) to “extremely

different” (7)]

2. Is the cost budget target level that your business unit uses for operative planning identical with the cost budget target level your business unit uses for performance evaluation?

[7-point Likert scale anchored from “identical” (1) to “extremely different” (7)]

3. Is the earnings budget target level that your business unit uses for operative planning identical with the earnings budget target level your business unit uses for performance evaluation?

[7-point Likert scale anchored from “identical” (1) to “extremely different” (7)]

4. Is the non-financial budget target level that your business unit uses for operative planning identical with the non-financial budget target level your business unit uses for performance evaluation?

[7-point Likert scale anchored from “identical” (1) to “extremely different” (7)]

2. Single budget at the end of year

Some firms adjust their budget target levels during the year by using flexible or rolling budgets. Does your business unit adjust budget target levels for operative planning/performance evaluation during the fiscal year on a regular basis (e.g. monthly, quarterly), only if it is necessary, or never?

- (1) on a regular basis, every ___ months
- (2) only if necessary, about ___ times a year
- (3) never

In case of (1) or (2):

You have indicated that your business unit adjusts budget targets for both operative planning and performance evaluation during the year. Are the budget target levels after an adjustment always identical?

- (1) Yes
- (2) No
- (3) No, but adjustments go into the same direction. Please state the percentage of which budget targets for performance evaluation are adjusted in relation to budgets for planning ___%

B. SIMILARITY VARIANCE COSTS

1. Downward/upward variance costs planning

Assume for the following question that your business unit prepared an annual budget at the end of the last fiscal year for the current fiscal year. After several months of the current fiscal year, you realize that the demand for your business unit's goods/services in the next few months will be considerably lower (higher) than planned at the beginning of the fiscal year.

Please estimate the costs of a lower (higher) than expected demand at the beginning of the fiscal year for your business unit's goods/services. Please take into account all costs associated with such a deviation of actual from expected demand (please consider monetary expenses as well as opportunity costs).

[7-point Likert scale anchored from “no additional costs” (1) to “high additional costs” (7)]

Downward variance costs of planning

- (1) Storage of material which was already bought/still has to be bought due to existing contracts and is not needed in the near future
- (2) Depreciation in the value of unused material

- (3) Unused capacity (idle capacity costs) in the production
- (4) Lost sales due to an alternative use of production/service capacity
- (5) Unplanned production stops
- (6) Unused inventory space
- (7) Unused production staff capacity
- (8) Unused sales staff capacity
- (9) Unused service staff capacity
- (10) Lost revenues due to extraordinary discounts

Research & Development	_____	Purchasing	_____
Production	_____	Sales/Customer Relations	_____
Logistics	_____	Marketing	_____
Management Accounting	_____	Human Resources	_____
IT	_____	Financial Accounting/Finance	_____
CEO Staff	_____	Other	_____

Upward variance costs of planning

- (1) Price surcharges for additional commodities and materials
- (2) Accelerated delivery of commodities and materials
- (3) Additional storage space
- (4) Short-term increases in the production of goods/services
- (5) Repairing charges due to accelerated production
- (6) Additional production staff and overtime premiums
- (7) Additional sales staff and overtime premiums
- (8) Additional service staff and overtime premiums
- (9) Discounts or penalty payments due to late delivery
- (10) Lost sales due to longer delivery times or late delivery

2. Downward/upward variance costs performance evaluation

Downward variance costs performance evaluation. Do your department heads receive any variable compensation in case they do not achieve their budget targets to a level of 100%?

- (1) No, just in case of full achievement (= lower bound of 100%).
- (2) Yes, at a target achievement of _____ %

Upward variance costs performance evaluation. Is there a maximum budget target achievement in your business unit from which on the bonus of the department heads will not increase any further?

- (1) Yes, at a target achievement of _____ %
- (2) No.

C. CREDIBILITY COSTS

Please state whether you agree to the following statements for your business unit's budget targets. [7-point Likert scale anchored from "not agree at all" (1) over to "fully agree" (7)]

- Managers do not believe budget targets to be realistic and achievable if budget target levels for operative planning differ from budget target levels for performance evaluation.
- Budget targets for performance evaluation are only motivating for managers if they consider these budgets targets to be realistic and achievable.

D. DELTA BUDGET COSTS and N_DEPARTMENTS

How many working days do the various departments spend on the preparation of the budget targets for operative planning which were valid at the beginning of the current fiscal year?

If, for example, three full-time employed (FTE) employees of the production department spend 10 full days each on the preparation of the budget targets for operative planning, this corresponds to 30 full-time equivalent working days.

– In case budget target levels for planning and performance evaluation are not identical:

- How many working days do the various departments spend on the preparation of the budget targets for operative planning which were valid at the beginning of the current fiscal year?
- How many working days do the various departments spend on the preparation of the budget targets for performance evaluation which were valid at the beginning of the current fiscal year?

(table as above with FTEs for the different departments).

Now imagine that your business unit takes the budget target levels for operative planning "one-to-one" for performance evaluation target levels.

- How many full-time equivalent working days would the various departments spend in this case on the preparation of the budget targets which are valid at the beginning of the fiscal year?

(table as above with FTEs for the different departments).

– In case budget target levels for planning and performance evaluation are identical:

Imagine for the following questions that the budget target levels for performance evaluation deviated from the budget target levels for operative planning (i.e., if a department uses a profit budget of 10,000 for operative planning, the profit target used for the department head's performance evaluation would be larger or smaller than 10,000). For example, companies could use easier budget targets for performance evaluation because they want to give their managers a risk buffer, or companies could use more difficult budget targets for performance evaluation because targets for operative planning are based on a rather pessimistic scenario and achieving those targets would not be sufficiently challenging for department heads.

- How many working days would the various departments in this case additionally spend on the preparation of the budget targets for performance evaluation?

(table as above with FTEs for the different departments).

E. IMPORTANCE PLANNING and IMPORTANCE PERFEVAL

How important are budget targets for the following activities in your business unit?

[7-point Likert scale anchored from "not important at all" (1) to "very important" (7)]

- (1) Projection of future costs and revenues.
- (2) Coordination between different departments (e.g., coordination between the Purchasing Department and the Production Department or between the Production Department and the Sales Department).

- (3) Resource allocation (e.g., requested staff, budgets) to departments.
- (4) Performance evaluation of department heads.
- (5) Determination of the variable compensation for department heads.
- (6) Internal communication (e.g., strategy, goals, expectations).
- (7) External communication (e.g., to the public/media, banks, analysts).

F. INTERDEP

To what extent does the performance of one department depend on the decisions/actions of other departments (e.g., along the value chain purchasing – production – sales).

[7-point Likert scale anchored from “not at all” (1) to “very high extent” (7)]

To what extent can the different departments perform their activities as a “stand-alone” unit?

(e.g., products/services can be purchased/sold to external markets).

[7-point Likert scale anchored from “not at all” (1) to “very high extent” (7)]

G. UNCERTAINTY

How good are the department heads of your business unit in forecasting the following aspects in your industry?

[7 point Likert scale anchored from “very bad” (1) to “very good” (7)]

- Competitor behavior
- Customer behavior
- Supplier behavior

H. Respondent Characteristics

Please specify in years:

- (1) your total job experience
- (2) your experience in the current position in the firm
- (3) your age.

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