Management accounting in organizational design

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Publication date:
2002

Document Version
Publisher's PDF, also known as Version of record

Management Accounting in Organizational Design:

Three Essays

Management Accounting in Organizational Design:

Three Essays

PROEFSCHRIFT

ter verkrijging van de graad van doctor aan de Universiteit van Tilburg, op gezag van de rector magnificus, prof.dr. F.A. van der Duyn Schouten, in het openbaar te verdedigen ten overstaan van een door het college voor promoties aangewezen commisie in de aula van de Universiteit op vrijdag 8 november 2002 om 10.15 uur door

Michal Matějka,

geboren op 2 september 1974 te Brno, Tsjechië.

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Acknowledgement

Some time ago I set out on a journey to explore a world that has always new continents to be discovered. I only knew enough about it to be curious, but I was eager to learn more. Now it is the time to make the first major stop on the way and look back. This dissertation is nothing more and nothing less than collecting notes of what I have observed so far. While I would like to call it the book of my discoveries, I do not really think it is a book and more importantly, I do not think the discoveries are mine. I just looked around on the way and took notes.

My notes would not be complete without mentioning those who organized the journey. CentER has been a great environment for making discoveries. I cannot recall anything I really needed on my journey which would not readily be available. But I do recall my initial amazement when I came as a first-year student and found out that all the facilities are here for me. Many thanks to CentER faculty, staff, and other colleagues at the Tilburg University who helped to make this possible.

I am especially grateful to Anja De Waegenaere and Doug DeJong, my supervisors, who made sure that I did not get lost on the way. Anja has always been very supportive which gave me the courage and confidence I badly needed at the outset of the journey. The first discoveries we made together; it helped very much that I had somebody to rely on. Doug taught me how to develop a good sense of direction which is indispensable on a journey like this. Some of the discoveries might have been left behind unnoticed without his contribution.

It was a comforting feeling that there were also other people willing to help. In particular, Harry Barkema and Hans Moors gladly offered their expertise and insights when I needed it. Willem Buijink, Laurence van Lent, and Jan Bouwens agreed to join the dissertation committee and review my notes from the journey. I appreciate that very much.

Support came also from outside the university. I benefited from participating in Ph.D.

courses and workshops of LNBE and EIASM.[1] It was also very motivating to interact with colleagues during the EAA doctoral colloquium and AAA consortium.[2] European Union provided research funds.[3] Most importantly, there were hundreds of managers willing to share their experiences and contribute to the empirical research project. My sincere thanks to all of them.

My journey during the couple of years has been quite fruitful. It is perhaps because it was so pleasant and enjoyable. I owe it to many colleagues, friends, and my family. I will not try to persuade you of the importance of the chapters in this dissertation. But I know that Tilburg will always be one of the best chapters in the book of my life. It is because of you.

Tilburg, July 2002.

[1] Landelijk Netwerk Bedrijfseconomie and European Institute for Advanced Studies in Management.

[2] European Accounting Association and American Accounting Association.

[3] This research was undertaken with support from the European Union's Phare ACE Programme 1997. The content of the publication is the sole responsibility of the authors and it in no way represents the views of the Commission or its services.

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[3] The last chapter is based on joint work with Anja De Waegenaere.

Chapter 1

The Value of Information in Organization Design

It is generally recognized that there are three main institutional devices through which organizations solve control problems: delegating decision rights, measuring, and rewarding performance (Zimmerman, 2000). Implications of different organizational design choices for firms' budgeting and reporting choices are less well articulated. A large majority of the empirical management accounting research, drawing on the economics-based view of organizations, focuses on the role of accounting in performance measurement and compensation (e.g., Ittner et al., 1997; Bushman et al., 1996). The other major role of management accounting systems is to provide relevant information for decision-making. While the theoretical literature (e.g., Baiman and Sivaramakrishnan, 1991) extensively discusses the trade-off between decision-making and control, there is relatively little empirical evidence of what it implies for accounting and organizational design choices.

This study examines relationships between business unit (BU) controller autonomy, budgetary participation and two organizational design choices: decentralization and the relative emphasis on financial vs. non-financial performance targets. High BU controller autonomy implies more decision-making information for BU management and less control information for higher levels (Sathe, 1982; Simon et al., 1954). High budgetary participation has decision-making benefits from improved coordination, yet it is also associated with control costs as subordinates have incentives to introduce slack (Zimmerman, 2000).

The first prediction is that the higher the proportion of a BU manager's bonus linked to financial targets, the stronger the incentives to manipulate accounting data, resulting in control losses. These losses can be reduced by limiting controller autonomy. Thus, the first hypothesis (H1) predicts a negative relationship between controller autonomy and the relative emphasis on financial targets. H2 predicts that there will be a negative relationship between controller autonomy and BU centralization. If both H1 and H2 hold, then there is a conflict in defining the authority and responsibility of BU controllers when it is important that decentralization be accompanied by a greater emphasis on financial targets. While decentralization implies the need for higher controller autonomy, the emphasis on financial targets requires the opposite.

High emphasis on financial targets in BU managers' bonuses also implies that their compensation is more sensitive to the outcomes of budgetary negotiations. Greater incentives to introduce slack imply that control costs of budgetary participation increase. Thus, H3 predicts that there will be a negative relationship between budgetary participation and the relative emphasis on financial targets. H4 predicts a negative relationship between budgetary participation and BU centralization.

Evidence on firms' organizational design decisions was collected by means of a questionnaire survey among BU managers and controllers of seven international firms headquartered in the Netherlands. In total, 308 managers and controllers responded, resulting in a data set of 130 BU's where both informants participated and 48 BU's from which one questionnaire was returned. Sales of the median BU are Euro 155 million; 39% of the sales come from the Netherlands, 29% from other European countries, 27% from North America, and 5% from the rest of the world.

Both controller autonomy and budgetary participation are negatively related to BU centralization (H2 and H4). Although weaker, there is a negative relationship between the proportion of BU managers' bonus depending on financial targets and both controller autonomy and budgetary participation (H1 and H3). The results hold for different measures of controller autonomy and centralization and to a large extent for alternative specifications explicitly addressing endogeneity, measurement error, and multilevel data

issues.

The first contribution of the study is pointing out that the trade-off between decision-making and control implicit in deciding on controller autonomy and budgetary participation is aggravated whenever delegation is accompanied by a high emphasis on financial targets. This finding has implications for empirical studies examining organizational design and accounting decisions. The evidence illustrates that it is difficult to explain choices of performance measures at the BU level without controlling for the impact of delegation on budgeting and reporting systems (controller autonomy and budgetary participation in particular) that generate these measures. Similarly, studying the relationship among the main organizational design variables without considering management accounting choices at the BU level may also suffer from the correlated omitted variable problem.

The second contribution relates to the theoretical debate about the value of private information (e.g., Baiman and Sivaramakrishnan, 1991; Christensen, 1981). The literature shows that the control costs of providing an agent with private information may dominate the decision-making benefits, making the agency worse off. Lambert (2001, p. 68) states: "At present, we do not have a good understanding when the principal is better off providing the agent with a system that generates private information." Appendix A argues that the strong support for H2 and H4 can be interpreted as evidence that decision-making benefits of private information dominate its control costs in a cross-sectional setting. A sufficient 'empirical' condition for the interpretation to be valid is that decentralization is associated with both high benefits and high costs of private information.

The paper proceeds as follows. The next section reviews the literature and puts forward four hypotheses. Section 1.2 provides more details on data collection methods and measurement issues. Section 1.3 presents the results and the final two sections discuss the findings and conclude.

1.1 Accounting Information in Organizational Design

There is a wealth of empirical literature examining determinants of performance measurement practices mainly at the firm (e.g., Ittner et al., 1997; Bushman et al., 1996) but also at the BU level (e.g., Keating, 1997; Bushman et al., 1995). According to Ittner and Larcker (2001, p. 382) a shortcoming of these studies is that "each examines only one or a few uses of performance measures (e.g., compensation or capital justification) and ignores other potential uses (e.g., planning and problem identification) that may be equally or more important to firm success". When the same budgeting and reporting systems that generate performance measures for control purposes are also used for decision-making (Zimmerman, 2000), organizational design choices can have conflicting implications for optimal management accounting systems. This study examines some of the conflicts affecting two important aspects of firms' budgeting and reporting systems: controller autonomy and budgetary participation.

1.1.1 Controller autonomy

The BU controller always has dual responsibility and provides information both to BU and top management (San Miguel and Govindarajan, 1984; Hopper, 1980; Sathe, 1978; Simon et al., 1954). The controller's functional responsibility is to assure that top management know the 'true' financial state of the BU. This includes regular reporting but also maintaining an informal communication line with the functional superior (e.g., providing early warning signals, independent judgement). As a part of the local responsibility, the controller is in charge of local accounting systems and provides reports relevant for decision-making of BU management. The relative emphasis on functional vs. local responsibility varies. This implies more than just formal definitions of BU controllers' authorities and responsibilities. "Of greater importance than the lines of formal authority is the question of how much leeway should be given the accounting man, at a decentralized location, to run his own shop" Simon et al. (1954, p. 8). This 'leeway' is further referred to as BU controller autonomy.

As one of the organizational design choices, firms decide how to measure performance of BU managers. An important aspect of the decision is whether to emphasize financial or non-financial performance targets (Banker et al., 2000; Ittner and Larcker, 1998). The relative weight placed on financial performance measures in BU managers' bonus contracts can have implications for BU controller autonomy. The accounting literature discusses the risk of misreporting financial outcomes that are not directly observable by the claimholders. Both the theoretical (Penno, 1984; Ng and Stoeckenius, 1979) and empirical findings (Gaver and Paterson, 2001, Becker et al., 1998) suggest that control losses arising from this risk can be reduced by employing a verification technology. It is an important part of BU controllers' functional responsibility to perform such a verification role. Therefore, the control loss due to the risk of misreporting financial outcomes is a function of not only BU managers' incentives to misreport (relative weight on financial targets) but also their ability to actually do so as in the case of greater controller autonomy.

It seems natural to assume that reducing controller autonomy (limiting their authority to design locally specific accounting systems) prevents misreporting of financial performance measures to a greater extent than misreporting of non-financials. In other words, the decrease in the control loss as a result of a decrease in controller autonomy will be higher when there is a higher emphasis on financial targets (i.e., BU managers have greater incentives to misreport financial outcomes). The argument implies that the control costs of allowing greater autonomy are increasing in the emphasis on financial targets. Assuming further that firms behave optimally on average and all other factors are controlled for[1] leads to the following hypothesis.

H1: *There will be a negative relationship between controller autonomy and the proportion of business unit managers' bonus linked to financial targets.*

Another key organizational design decision frequently discussed in the empirical management accounting literature (Nagar, 2002; Baiman et al., 1995; Christie et al., 1993) is delegation of decision rights, further referred to as BU (de)centralization. Simon et al. (1954, p. 14) and Sathe (1978, p. 101) predict a positive relationship between de-

[1] These assumptions will not be reiterated but they apply equally for all the other hypotheses.

centralization and controller autonomy based on the assumption that decentralization is positively associated with the decision-making benefits of providing BU management with information. Theoretical management accounting research (e.g., Christensen, 1981) cautions that control costs also be considered. Johnson (1978) describes the control system of General Motors in the 1920s, the aim of which was to accomplish "centralized control with decentralized responsibility". Management accounting innovations within GM increased the emphasis on company-wide accounting procedures (and lowered BU controllers' autonomy), yet enabled a greater extent of decentralization (Johnson, 1978, p. 494). Thus, there may be instances when control considerations dominate decision-making benefits of providing information to BU management and decentralization is negatively associated with controller autonomy. Assuming that the decision-making benefits dominate control costs leads to the following hypothesis (see Appendix A for more details).

H2: *There will be a negative relationship between controller autonomy and business unit centralization.*

It is not the purpose of this study to explain the choice of decentralization and/or the relative emphasis on financial targets. The aim is to highlight that for a plausible combination of the two organizational design variables, namely low centralization together with a high emphasis on financial targets, a conflict between decision-making and control may arise when deciding on optimal controller autonomy. This will be the case when both H1 and H2 hold.

1.1.2 Budgetary participation

Bottom-up budgeting allows BU activities to be coordinated by a target in which local information is reflected. As a result, managers are more likely to perceive budgets and accounting reports as relevant and use them in their decision-making (Merchant, 1981; Hopper, 1980). At the same time, BU managers have incentives to set loose targets, especially if information asymmetry between top and BU management is high (Dunk, 1993; Chow et al., 1988; Young, 1985). Thus, the empirical findings suggest that the optimal degree of budgetary participation is determined by the trade-off between decision-

making benefits and control costs, which is consistent with theoretical insights (Penno, 1990, 1984; Baiman and Evans, 1983; Magee, 1980).

The relative weight placed on the financial performance in BU managers' bonus contracts affects control losses associated with budgetary participation. Meeting a budgetary target is the most important element of financial performance. High emphasis on financial targets means that BU managers' compensation is more sensitive to the outcomes of budgetary target negotiations. Greater incentives to introduce slack increase the risk of 'shirking', i.e., control costs of budgetary participation are higher. This leads to the following hypothesis.

H3: *There will be a negative relationship between budgetary participation and the proportion of business unit managers' bonus linked to financial targets.*

When more (important) activities are delegated to the BU level, benefits from improved coordination are greater. On the other hand, if 'loose targets' imply 'shirking', then decentralization also means that more (important) decisions will be affected, resulting in a greater control loss. Merchant (1981) and Bruns and Waterhouse (1975) present some preliminary evidence that the risk of setting inappropriate targets outweighs potential control losses[2]. Assuming that the decision-making benefits dominate the control costs of budgetary participation leads to the following hypothesis.

H4: *There will be a negative relationship between budgetary participation and business unit centralization.*

If H3 and H4 hold, then the decision on budgetary participation is also affected by the conflict between decision-making and control whenever decentralization is accompanied by a high emphasis on financial targets. The implications of the conflict for our understanding of organizational design choices are discussed in section 1.5.

[2] They find in a sample of 14 and 20 observations respectively that participation in budgeting is positively related to participation in other decisions. Both studies had data at the firm level only. The contribution of this study is examining the relationship at the BU level.

1.2 Empirical Methods

1.2.1 Sample and Data

The sample consists of business units[3] of firms listed on the Amsterdam Exchanges with sales above Euro 2 billion, excluding BU's of financial institutions and the four largest firms[4]. Nineteen of the 26 firms fulfilling the criteria were invited to participate in the study. Seven firms agreed to give access to their BU's and to provide all required information. Sales of these firms ranged between Euro 2 and 15 billion, their primary activities were food processing (1 firm), manufacturing and trading (4), and services (2).

Data on organizational design choices were largely collected by means of a questionnaire survey. Further insights were obtained from internal documents (accounting manual, organizational charts) and interviews with controllers at different organizational levels (5 to 10 controllers per firm, 48 in total). To get access to all these information sources, chief financial officers or corporate controllers were approached and offered a benchmarking study of BU controllers performance. As a result, 363 questionnaires were sent to managers and controllers of 188 BU's of the seven firms. Thirteen to 33 major BU's per firm were selected. Most of the excluded BU's were relatively small, were about to be divested, or had recent changes in the top two managerial positions. There was a separate survey for each of the firms. Recommendations of the "total design method" (Dillman, 1978) were followed. Questionnaires were sent out and collected between February 2000 and November 2001. Both the questionnaire for managers and for controllers were slightly

[3] A *business unit* is defined for the purposes of our study as an entity that (i) has its own manager *and* controller, (ii) is held responsible for a clearly defined part of the business by means of a budget. Mostly, it will be a profit center. Cost (revenue) centers qualify as well if they have sufficient operational autonomy (judged on the basis of interviews and organizational charts) *and* if the profit center they are part of can only be defined at the highest hierarchical levels (group or firm).

[4] Shell, Unilever, Ahold, and Philips were excluded for being too large. Seven other firms were not invited because they had no clear BU structure or because it was clear that they were unwilling to give access to outsiders as corporate staff were dealing with negative publicity in the press during the period of negotiating participation. Among the invited firms the most common explanation for rejecting participation was that corporate staff or BU's had no time to engage in external projects.

modified[5] for each of the separate surveys to make them more applicable in different contexts and to improve measurement in some aspects. In all firms, the first mailing went from the headquarters and included a recommendation letter from the corporate controlling director.

308 questionnaires were returned (85% response rate). The final sample consist of 178 BU's (95% of those contacted) from which at least one respondent participated and 130 from which both did (21, 20, 28, 19, 21, 12, 9 per firm). Sales of the median BU are Euro 155 million; 39% of the sales come from the Netherlands, 29% from other European countries, 27% from North America, and 5% from the rest of the world.

1.2.2 Variable measurement

The dependent variables are controller autonomy and budgetary participation. The independent variables are the proportion of bonus linked to financial targets, centralization, and several control variables. The measure of controller autonomy is newly designed for the purposes of this study, all the other measures are adapted from previous studies. Appendix B presents the questionnaire items and measurement details.

Controller Autonomy. There are 18 items in total; 14 on the C (controller) questionnaire and 4 on the M (manager) questionnaire. Item selection relied mainly on Simon et al. (1954), an extensive study of the controlling function which is, despite its age, still a widely cited source of unique insights. Simon et al. report several elements of controller autonomy. Two of the elements, formal authority relations and the structure of the accounts and reports, readily lend themselves to an operationalization based on instruments previously used in the literature.

(i) Formal authority relations. BU controllers may report directly to their manager and have only a 'dotted' functional line to a group/corporate controller or the other way round (Sathe, 1978). These authority relationships are captured by two constructs[6].

[5] These modifications mostly concerned control variables. The only important change relating to the main variables of interest was including a measure of budgetary participation for the third firm and all firms thereafter.

[6] The constructs were calculated as an equally-weighted average of responses on the respective items.

CA_HIRE (4 items) is adapted from San Miguel and Govindarajan (1984) and reflects the BU manager's authority to appoint and determine the salary of the BU controller. Confirmatory factor analysis supports unidimensionality (CFA1: p=.41)[7], reliability as measured by Cronbach's α is .83. *CA_INFL* (2 items) measures the actual influence of the group/corporate controller on the work of the BU controller.

(ii) The structure of the accounts and reports. Controllers answered 12 items concerning their authority to change various accounting techniques and reporting procedures. The items relate to several areas – the choice of allocation (*CA_ALOC*) and valuation (*CA_VALU*) techniques, internal performance indicators (*CA_PMES*), and the design of internal planning and reporting (*CA_PLAN*). The expected item structure was tested with a CFA, resulting in three items being dropped. After the modification, CFA2 shows an acceptable fit (p=.07) for a model with the four factors.

CATOTAL, the overall measure of controller autonomy, is the sum of all the six constructs transformed to have a mean of zero, variance of one, and the opposite sign. High scores reflect high autonomy. The underlying assumption behind the overall composite measure is that controller autonomy can be increased along several dimensions independently. This is consistent with Simon et al. (1954, p.20) who emphasize that the elements of controller autonomy are independent; more autonomy in one element by no means implies that it is necessary or desirable to have more autonomy in other elements. Therefore, high correlation among the six constructs of *CATOTAL* is not a necessary condition for them to be valid (Diamantopoulos and Winklhofer, 2001; Bollen and Lennox, 1991). Still, standard tests of unidimensionality and reliability were conducted (see CFA3 and CFA4 in Appendix B). Figure 1.1 presents correlations of the six constructs.

As the meaning of *CATOTAL* cannot be judged from its item covariances, it is important to establish some external criteria for its validity (Bollen and Lennox, 1991).

The same applies for all other constructs presented further, unless indicated otherwise.

[7] CFA1 refers to confirmatory factor analysis the details of which are presented in Appendix B. In general, a CFA tests whether covariances of the observed items correspond to a theoretically implied covariance matrix. Various statistics that are functions of the difference between 'theoretical' and 'observed' covariance matrices are presented in the appendix. P-value refers to the probability that a χ^2 statistic is significantly different from zero. Insignificant result is a sign of a good fit.

	CA_ALOC	CA_VALU	CA_PMES	CA_PLAN	CA_HIRE	CA_INFL
CATOTAL	0.642*	0.610*	0.574*	0.644*	0.463*	0.441*
n	129	129	129	129	129	129
CA_ALOC		0.201*	0.290*	0.307*	0.157	0.143
n		164	164	164	130	163
CA_VALU			0.149	0.353*	0.158	0.122
n			164	164	130	163
CA_PMES				0.281*	0.113	0.089
n				164	130	163
CA_PLAN					0.111	0.078
n					130	163
CA_HIRE						0.034
n						129

* correlations are significant at the 0.01 level (two tailed).
CATOTAL – the overall controller autonomy measure, an equally weighted average of all the dimensions (after standardization), CA_ALOC – autonomy to change cost allocation and transfer pricing techniques, CA_VALU – autonomy to change valuation techniques, CA_PMES – autonomy to design internal performance indicators, CA_PLAN – autonomy to design local planning and budgeting systems, CA_HIRE – autonomy of the manager to select and hire local BU controller, CA_INFL – autonomy as reflected in the influence of the group/corporate controller.

Figure 1.1: Correlations among controller autonomy dimensions

High controller autonomy improves cooperation with the BU manager, which should lead to higher managers' evaluations of the services provided by their controlling department (Hopper, 1980) and a higher influence on internal decision-making (Sathe, 1982). There is a weak positive correlation (ρ=.15, p=.09) with managers' evaluations as measured by four items representing satisfaction with key controller's functions (three of them were adapted from Simon et al., p. 5). *CATOTAL* also correlates positively (ρ=.18, p=.06) with controller's influence on strategic decisions as measured by a three-item instrument adapted from Sathe (1982, p. 160).

Budgetary participation. A single-item instrument of Hofstede (1967) with a fully-anchored scale was used (item m21 in Appendix B). Brownell (1982) presents evidence of its validity. Additionally, scope for budgetary slack was measured with a fully-anchored item on which managers indicate the difficulty of the budget target ranging from (1) easy to attain, to (5) practically unattainable (Van der Stede, 2000). As expected, *BUDPART* correlates negatively (ρ=-.23, p=.02, n=96) with target difficulty.

Proportion of bonus linked to financial targets. Managers indicated the percentage of their bonus determined by (i) a financial formula relating to the BU performance, (ii) a financial formula relating to aggregate performance, (iii) a non-financial formula, (iv) subjectively (Gupta and Govindarajan, 1986). *FIBONUS* is the sum of (i) and (ii)[8].

Centralization. The measure, *CENTRAL*, consists of 16 items covering four broad 'item-areas' – purchasing, marketing, operational, and financial management decisions. The selection of items relied mainly on Inkson et al. (1970), some items were adapted from Ghoshal and Nohria (1989) and Govindarajan (1988). Previous research points out that centralization in one area can be accompanied by decentralization in another area (Martinez and Jarillo, 1992). Thus, individual items need not be highly correlated to be valid. Still, standard tests of unidimensionality and reliability were conducted (see CFA4 and CFA5 in Appendix B).

To assess inter-rater reliability, nine of the 16 items were also included in the C questionnaire. Correlations of managers' and controllers' responses are moderate to high for seven items (ρ=0.3-0.6, p<.00), low but significant for two items (ρ=0.18, p=.04; ρ=0.24, p=.01). The overall inter-rater reliability was assessed by a model proposed by Anderson (1987). It assumes that responses of different informants are caused by an underlying latent variable at the organizational level (for each item). The CFA includes one factor per item and one additional factor for each informant capturing an informant specific bias. The nine items included in both the M and C questionnaires were grouped into four item parcels[9] of similar content. The assumption that the item parcels reflect latent variables at the BU level rather than individual perceptions is supported by a CFA[10].

[8] The proportion of bonus for BU performance, (i) over [(i) + (ii)] is later used as an instrument, IVBON. Another instrument is the amount of bonus as a percentage of total compensation (the question appeared together with the other bonus items on the M questionnaire.

[9] This method is proposed in Hoyle (1995, p.70) to reduce the number of estimated parameters and deviations from normality. The item parcels were constructed along the 'item areas'. Each one is calculated as an equally weighted average of its items after normalization assuming that there is an underlying continuous variable having a standard normal distribution (Boomsma, 1992; Jöreskog and Sörbom, 1988).

[10] Fit of the six factor model (four item areas, two informants) with item loadings constrained to be equal for both informants is moderate: χ^2=18.2, d.f.=10, p=.051, RMSEA=.081, GFI=.97, NNFI=.91,

While inter-rater agreement confirms validity of the instrument, further evidence was sought by examining relationships of *CENTRAL* with other variables. There should be a positive relationship between centralization and standardization of production technology (Lawrence and Lorsch, 1969). In line with the prediction, *CENTRAL* correlates negatively (ρ=-.41, p=.00, n=72) with a measure of production customization used in two firms (Bouwens and Abernethy, 2000). Additionally, *CENTRAL* correlates negatively (ρ=-.20, p=.05) with a variable indicating the importance of managers' contribution to BU strategy[11] (a Likert-scale on the M questionnaire added to the instrument of Hopwood, 1972).

1.2.3 Control Variables

Inferences about the value of private information based on observing the relationships predicted by H1 to H4 will only be valid to the extent that it is possible to control for other possibly confounding effects. The organizational design literature (e.g., Keating, 1997; Bushman et al., 1995, Baiman et al., 1995) commonly discusses the following determinants of centralization and bonus reward policies: BU size, growth, interdependencies, and environmental volatility. Budgetary participation and controller autonomy appear in the empirical literature mostly as independent variables and relatively little is known about their determinants. A possible exogenous predictor of controller autonomy is the time period spent in the BU, i.e., how long the controller has held the position. To reduce the risk of a bias due to an omitted variable, all the exogenous variables are measured[12]:

LSIZE is the log of the number of people employed in a BU.

SGROW is square root of the percentage of total sales for which the strategy is "increase sales and market share, be willing to accept low returns on investment in the

n=128.

[11] A composite of this variable and the measure of customization is later used as an instrument for centralization, *IVCEN*.

[12] Most control variables were transformed to reduce deviations from normality. In several cases, missing values were replaced by collecting information from other sources LSIZE (3 cases), SHARE (21), SGROW (24). In cases where no additional information was available, the mean for similar BU's within the firm was imputed SHARE (1), SGROW (3).

	N	Min.	Max.	Mean	S.d.	Correlations							
						BUDPART	CENTRAL	FIBONUS	LSIZE	SGROW	ENVIR	SHARE	BUTIME
CATOTAL	129	-6.2	8.3	0.0	3.4	0.332**	-0.485**	-0.222*	0.055	0.003	-0.265**	-0.093	0.178*
BUDPART	96	1.00	2.45	1.57	.35		-0.233*	-0.379**	-0.080	-0.049	-0.071	-0.113	0.045
CENTRAL	142	1.8	6.2	3.3	0.8			0.137	-0.016	0.016	0.184*	0.080	-0.148
FIBONUS	137	30	100	74.9	20.3				0.217*	0.084	0.130	0.034	0.053
LSIZE	161	1.9	10.6	6.0	1.3					-0.148	-0.044	0.037	0.104
SGROW	126	0.0	10.0	4.1	2.8						0.039	-0.185	-0.164
ENVIR	172	1.0	5.0	3.3	0.6							-0.067	-0.050
SHARE	130	1.0	2.5	1.6	0.3								0.002
BUTIME	163	-4.6	3.5	0.8	1.3								

**, * correlations are significant at the 0.01, 0.05 level respectively (two tailed).
CATOTAL – the overall controller autonomy measure, BUDPART – budgetary participation, CENTRAL – centralization, FIBONUS – the proportion of BU managers' bonus depending on financial targets, LSIZE – log of total number of employees, SGROW – square root of a percentage 'sales of products with a growth strategy' of total sales, ENVIR – unpredictability of the environment, SHARE – the extent of business sharing with other BU's, BUTIME – log of years a controller has held the position in the BU.

Figure 1.2: Descriptive statistics

short-to-medium term, if necessary" (see Gupta and Govindarajan, 1984).

ENVIR is an equally weighted average of 12 items reflecting perceived environmental uncertainty in product design, technology, purchasing, competitors, market demand, and government regulation (an instrument of Gul and Chia, 1994, included in both the M and C questionnaire). High score means high uncertainty.

SHARE is the square root of an equally weighted average of 7 items reflecting the sharing with other BU's in the same firm in the following areas: customers, sales force, plant facilities, advertising, R&D, internal transfers, and purchasing (Davis et al., 1992). High score means high sharing.

BUTIME is the log of years the controller has held the position in the BU.

Figure 1.2 provides descriptive information about the main variables of interest. The distribution of most of the variables is close to normal (exceptions are *BUTIME*, highly skewed to the right, and *FIBONUS*, exhibiting too many values of 100); the variables also seem to have sufficient variation. On average 75% of BU managers' bonus is linked to

financial performance measures. Ittner et al. (1997) report an average of 87% for firm CEO's. Bivariate correlations between organizational design variables and environmental characteristics are relatively weak. *FIBONUS* is positively related to size. *CENTRAL* correlates positively with *SHARE* and *ENVIR*[13].

1.3 Results

To test the four hypotheses, controller autonomy and budgetary participation were regressed on *CENTRAL*, *FIBONUS* and the control variables. This specification assumes that centralization and bonus decisions are exogenous to controller autonomy and budgetary participation choices. While this assumption is theoretically problematic, it will be empirically valid to the extent that the causal effect *from* fundamental organizational design variables (Jensen and Meckling, 1992) *to* other design variables is stronger than the opposite direction of causality. Reflecting this assumption, the basic model was estimated using the weighted least squares (WLS) estimation method.

However, it is recognized that virtually all accounting and organizational design decisions are interrelated and that the basic model suffers to some extent from a simultaneous equation bias. The endogeneity problems together with multilevel data and measurement error issues are addressed in the second part of this section that presents results of alternative specifications and estimation methods.

1.3.1 Basic model

The fact that BU's are clustered within firms violates the assumption of observation independence. Different types of interdependencies can be modeled. WLS estimates firm-specific error terms. However, regression coefficients are constrained to be equal across

[13] The relationship with *SHARE* is not significant. However, *CENTRAL* correlates significantly with three items of *SHARE*. The relationship with *ENVIR* seems to contradict previous findings (e.g., Christie et al., 1993). Note that *CENTRAL* explicitly measures division of decision-making authorities between a BU and headquarters (rather than delegation within the BU). While theoretically justified, this modification in the measurement of *CENTRAL* means that the findings are not directly comparable with the existing literature.

		Intc.	CENTRAL	FIBONUS	SIZE	GROW	ENVIR	SHARE	BUTIME	Adj. R^2
Panel A										
WLS	CATOTAL	7.81***	-1.75***	-0.019†	0.01	0.14*	-0.72†	0.59	0.28†	0.27
		(3.50)	(-5.53)	(-1.55)	(0.04)	(1.75)	(-1.63)	(0.84)	(1.59)	
	BUDPART	-0.62*	-0.15***	-0.008***	0.04	0.00	-0.11	0.02		0.54
		(-1.68)	(-3.63)	(-4.35)	(1.36)	(0.18)	(-1.04)	(0.29)		
Panel B										
2SLS	CATOTAL	5.92	-1.52*	0.013	-0.14	0.15†	-0.97†	0.81	0.26	0.20
		(1.30)	(-1.67)	(0.21)	(-0.37)	(1.57)	(-1.61)	(0.76)	(1.34)	
	BUDPART	-0.36	-0.27**	-0.014†	0.07	0.00	0.09	-0.05		0.0
		(-0.56)	(-2.15)	(-1.55)	(1.03)	(0.31)	(1.05)	(-0.38)		

***, **, *, † significant at the 0.01, 0.05, 0.1, and 0.15 level respectively (two tailed); White heteroscedasticity adjusted s.e.; t-values in brackets; for controller autonomy and its dimensions n=122, for budgetary participation n= 80. Weighted least squares estimation (WLS, Panel A) and two-stage least squares estimation (2SLS, Panel B). 2SLS instruments for CENTRAL and FIBONUS in both regressions: IVCEN - a composite of the two variables validating CENTRAL (customization and importance of strategy in performance measurement), IVBON - the percentage of bonus based on BU performance as opposed to more aggregate performance measures, BTOT – bonus as a percentage of total compensation. CATOTAL – the overall controller autonomy measure, BUDPART – budgetary participation, CENTRAL – centralization, FIBONUS – the proportion of BU managers' bonus depending on financial targets, LSIZE – log of total number of employees, SGROW – square root of a percentage 'sales of products with a growth strategy' of total sales, ENVIR – unpredictability of the environment, SHARE – the extent of business sharing with other BU's, BUTIME – log of years a controller has held the position in the BU.

Figure 1.3: Regressions of controller autonomy and budgetary participation

firms. Figure 1.3 (Panel A) and Figure 1.4 present the results.

An obvious generalization is to include firm-specific coefficients. Figure 1.5 presents results of estimating a model with firm-specific intercepts and coefficients for *CENTRAL* and *FIBONUS*[14] (control variables' coefficients are constrained to be equal across firms to reduce the number of estimated parameters).

H1 predicts a negative relationship between *CATOTAL* and *FIBONUS*. The WLS estimate of the coefficient in Panel A of Figure 1.3 is negative and marginally significant (p=.12). Figure 1.4 shows that there is a strong negative relationship between *FIBONUS* and *CA_ALOC*. The other dimensions of controller autonomy are not related to *FIBONUS*. Similarly, the firm-specific coefficients in Figure 1.5 are significant only for *CA_ALOC*. Thus, the prediction of H1 is only supported for one of the controller

[14] Next to substantially reducing the number of degrees of freedom, the other drawback of this specification is that it only captures within-firm variance. Firm level differences, potentially supporting theoretical predictions, are filtered out by including firm-specific intercepts.

	Intc.	CENTRAL	FIBONUS	SIZE	GROW	ENVIR	SHARE	BUTIME	Adj. R^2
CA_ALOC	-0.46	-0.50***	-0.031***	0.20***	0.11***	-0.17	0.39	0.27***	0.32
	(-0.54)	(-4.06)	(-7.07)	(3.00)	(3.63)	(-1.07)	(1.42)	(2.98)	
CA_VALU	-0.98	-0.60***	0.000	-0.21**	0.11**	0.02	-0.26	0.01	0.45
	(-0.82)	(-3.17)	(0.00)	(-1.98)	(2.54)	(0.07)	(-0.69)	(0.12)	
CA_PMES	-1.96	-0.32**	-0.003	0.00	0.00	-0.19	0.57	0.20	0.02
	(-1.58)	(-2.08)	(-0.38)	(0.03)	(0.01)	(-0.87)	(1.54)	(1.63)	
CA_PLAN	0.21	-0.26	-0.008	-0.05	0.04	-0.31*	-0.26	0.09	0.19
	(0.18)	(-1.47)	(-1.16)	(-0.52)	(0.90)	(-1.83)	(-0.89)	(1.34)	
CA_HIRE	-2.67***	-0.67***	0.004	-0.01	0.05*	0.20	0.25	-0.07	0.53
	(-2.76)	(-5.88)	(0.81)	(-0.10)	(1.66)	(1.21)	(1.04)	(-1.18)	
CA_INFL	-0.18	-0.23**	-0.006	-0.08	-0.02	-0.36**	-0.10	0.01	0.31
	(-0.22)	(-2.17)	(-0.97)	(-1.19)	(-0.70)	(-2.15)	(-0.41)	(0.21)	

***, **, * significant at the 0.01, 0.05, and 0.1 level respectively (two tailed); White heteroscedasticity adjusted s.e.; t-values in brackets; n=122, weighted least squares estimation.
CATOTAL – the overall controller autonomy measure, CA_ALOC – autonomy to change cost allocation and transfer pricing techniques, CA_VALU - autonomy to change valuation techniques, CA_PMES – autonomy to design internal performance indicators, CA_PLAN – autonomy to design local planning and budgeting systems, CA_HIRE – autonomy of the manager to hire local BU controller, CA_INFL – autonomy as reflected in the influence of the group/corporate controller, BUDPART – budgetary participation, CENTRAL – centralization, FIBONUS – the proportion of BU managers' bonus depending on financial targets, LSIZE – log of total number of employees, SGROW – square root of a percentage 'sales of products with a growth strategy' of total sales, ENVIR – unpredictability of the environment, SHARE – the extent of business sharing with other BU's, BUTIME – log of years a controller has held the position in the BU.

Figure 1.4: Regressions of controller autonomy dimensions

autonomy dimensions.

H2 predicts a negative relationship between *CATOTAL* and *CENTRAL*. As expected, the *CENTRAL* coefficient in Figure 1.3 is significantly negative (p=.00). Except for one (CA_PLAN) all dimensions of controller autonomy have a significantly negative relationship with *CENTRAL*. Four of the six firm-specific coefficients are negative, three of them significantly so. Thus, the evidence strongly supports H2.

H3 predicts a negative relationship between *BUDPART* and *FIBONUS*. The estimate in Figure 1.3 is significantly negative (p=.00). Figure 1.5 shows that the relationship is quite strong for firm 4. Even after deleting 16 BU's of firm 4, the coefficient in the pooled sample (Figure 1.3) remains significant (p=.00). Thus, there is evidence to support H3.

H4 predicts a negative relationship between *BUDPART* and *CENTRAL*. The estimate in Figure 1.3 is significantly negative (p=.00). Again, the negative relationship is particularly strong in firm 4. Dropping the firm increases the p-value of the coefficient but it remains significant (p=.07). Thus, the evidence supports H4.

	CATOTAL	CA_ALOC	BUDPART
CENTRAL_1	-2.09***	-0.34*	
	(-2.67)	(-1.82)	
CENTRAL_2	0.29	0.37	
	(0.50)	(1.03)	
CENTRAL_3	-1.99***	-0.42**	-0.04
	(-5.27)	(-2.54)	(-0.40)
CENTRAL_4	-2.05	0.10	-0.24***
	(-1.32)	(0.16)	(-5.75)
CENTRAL_5	-2.56*	-0.88	-0.10
	(-1.91)	(-1.12)	(-0.64)
CENTRAL_7	0.33	1.06	0.04
	(0.20)	(0.43)	(0.19)
FIBONUS_1	-0.051	-0.032***	
	(-0.78)	(-3.01)	
FIBONUS_2	-0.032	-0.044***	
	(-1.42)	(-3.17)	
FIBONUS_3	0.028	-0.029***	-0.003
	(1.36)	(-4.62)	(-0.66)
FIBONUS_4	0.012	0.011	-0.011***
	(0.18)	(0.54)	(-3.15)
FIBONUS_5	-0.053	-0.034**	-0.003
	(-0.94)	(-2.03)	(-0.60)
FIBONUS_7	-0.022	0.120	0.013
	(-0.18)	(0.48)	(0.56)
LSIZE	0.32	0.16*	0.02
	(1.26)	(1.79)	(0.69)
SGROW	0.04	0.08**	0.01
	(0.48)	(2.22)	(0.73)
ENVIR	-0.23	-0.14	-0.15
	(-0.49)	(-0.73)	(-1.09)
SHARE	1.20	-0.14	0.06
	(1.28)	(-0.46)	(0.78)
BUTIME	0.33*	0.25**	
	(1.69)	(2.29)	
Adj. R^2	0.32	0.31	0.63
n	110	110	68

***,**,* significant at the 0.01, 0.05, and 0.1 level respectively (two tailed); White heteroscedasticity adjusted s.e.; t-values in brackets.
Weighted least squares regressions (firm specific intercept included but not reported); firm 6 excluded as FIBONUS was uniformly 100% for all 12 BU's, additionally firms 1 and 2 excluded in the last regression as data on BUDPART are not available.

Figure 1.5: Controller autonomy and budgetary participation - firm specific coefficients

1.3.2 Alternative specifications and estimations

Potential endogeneity problems were addressed by specifying *CENTRAL* and *FIBONUS* as endogenously determined variables and applying the two-stage least squares (2SLS) technique, which partially addresses the measurement error issue as well. Three instruments were used: *IVCEN* a composite of two variables (customization and the importance of strategy in performance measurement) validating the measure of centralization, *IVBON* the percentage of bonus based on BU performance as opposed to more aggregate performance measures, and *BTOT* the amount of bonus as a percentage of total compensation[15]. The 2SLS results are presented in Panel B of Figure 1.3. The relationship between *CATOTAL* and *FIBONUS* is now insignificant. Significance of the other results is also reduced (the absence of better instruments inflates standard errors) but qualitative conclusions are in line with findings based on the WLS estimates.

To further address the measurement error issue, an alternative measure of controller autonomy was constructed by summing percentile ranks (rather than standardized scores) for all sub-constructs of *CATOTAL*. This procedure may alleviate the measurement error bias (Green, 2000). Results are very similar to those presented in Figure 1.3. Both main coefficients remain significant (p-value for *FIBONUS* coefficient improves to .10) and adjusted R^2 increases from 0.27 to 0.34.

Moreover, an alternative model was specified assuming that controller autonomy and centralization are latent constructs reflected in correlations among their sub-constructs (see CFA4 and CFA6 in Appendix B)[16]. *BUDPART* and all the control variables are assumed to be error-free. Structural equation model (SEM) estimates of the structural part are presented in Figure 1.6. The overall fit is rather low, but the findings are qualitatively similar to the WLS results.

Finally, hierarchical clustering of the data can be concisely described by a random

[15] Note that the instruments are not completely exogenous to the decision on controller autonomy either. Practically, it is virtually impossible to find instruments that arguably correlate with the two organizational design variables and are completely free of the endogeneity problem.

[16] As discussed before, there is little theoretical justification for this assumption but it can be exploited to address the problem of measurement error and to assess robustness of the findings.

	CAF	BUDPART
CENTRF	-0.94*	-0.25*
	(-2.82)	(-2.04)
FIBONUS	-0.031*	-0.45*
	(-2.77)	(-4.45)
LSIZE	0.11	0.07
	(0.71)	(0.87)
SGROW	0.14	-0.02
	(1.94)	(0.48)
ENVIR	-0.34	0.09
	(-1.14)	(0.47)
SHARE	0.09	-0.07
	(0.60)	(-0.81)
BUTIME	0.18	
	(1.42)	
R^2	0.64	0.27
χ^2	132.5	39.7
	(n=122, df=82)	(n=80, df=20)
P-value	.00	.01
RMSEA	0.071	0.11
GFI	0.88	0.91
NNFI	0.67	0.35

* significant at the 0.05 level (two tailed). All variables are transformed to have zero mean and the intercept is dropped.
CAF – a single factor underlying the six dimensions of controller autonomy, CENTRF – a single factor underlying the four 'item areas' of centralization. The fit of the BUDPART model is very low. One modifications setting the error covariance between LSIZE and one 'item area' of centralization free to be estimated is sufficient to improve it (χ^2=26.8, df=19, p=.11, RMSEA=.07, GFI=.94, NNFI=.73). Coefficients in the structural part do not change much after the modification.

Figure 1.6: SEM structural part for controller autonomy and budgetary participation

coefficient model (RCM). It assumes that firm-specific coefficients are drawn at random from a multivariate normal distribution. Therefore, variation in each coefficient can be described by two parameters, its overall mean and variance. Between-firm coefficient variation leads to an increase in standard errors (Green, 2000). Given that there are only seven (five for budgetary participation) firm-specific coefficients, the power of the test is very low. Nevertheless, the relationships between *CENTRAL* and both *CATOTAL* (H2) and *BUDPART* (H4) remain significant (p=.02 and p=.09 respectively). To some extent, there is also support for H1 as the relationship between *FIBONUS* and one dimension of controller autonomy, CA_ALOC, is significantly negative (p=.03)[17].

In summary, results of the WLS estimation support H2, H3, and H4. H1 finds support only for one dimension of controller autonomy, the authority to change cost allocations and transfer prices within the BU. Alternative tests addressing some shortcomings of the WLS regressions indicate that the findings are quite robust. However, it is important to emphasize that, given practical limitations inherent in collecting the type of data used in this study, there is no single model that satisfactorily addresses all of the econometric issues. Results should be interpreted in light of this limitation.

1.4 Discussion

The evidence relating to H1 is consistent with the interpretation that giving BU controllers freedom to decide on cost allocations and transfer prices increases the scope for earnings management at the BU level. It seems that the other dimensions of controller autonomy are less likely to cause this control problem. Similarly, support for H3 is consistent with the view that budgetary participation is associated with control costs increasing in the emphasis on financial targets.

Support for H2 and H4 shows that decentralization is closely aligned with high controller autonomy and high budgetary participation despite the control costs. One corpo-

[17] To be able to estimate the RCM, only three control variables were included (selected ex post). Including all of them would leave only one degree of freedom for the within-firm regression with the lowest number of observations.

rate controlling director from this study made a pertinent comment:

> "I think that the business group[18] controller should be, within the context of the business group, a sort of CFO. A chief financial officer who translates the business group strategy into strategic goals, but who also translates back into strategic steps the financial requirements on the business group. Thus, he has to be fully part of the business, one of the business group management team. He should make no compromises with his financial responsibility because then he would run the risk of not being taken seriously within the business group, of being by-passed with certain information, and of getting a merely registration function. Whereas I think that the financial discipline has to have a strong influence on the strategy and the policies within the business group. Then, you cannot have dual loyalties. Your loyalty must not be questioned."

This quote is representative of other controllers' comments (cf., Sathe, 1982). It illustrates that the trade-off between providing information to local management and to top management is real. Further, it suggests that it is more important to make local management aware of what the impact of their action is than to assure top management that these actions are in line with the firm's objective. Given the trade-off between these tasks, controller autonomy must be high in the most decentralized BU's because the costs of "not being taken seriously" are too high.

1.5 Conclusions and Limitations

While it is recognized that organizational design choices have an effect on budgeting and reporting systems in general (Jensen and Meckling, 1992), there is relatively little evidence documenting what exactly these effects imply. This study presents evidence concerning two important aspects of budgeting and reporting systems at the BU level:

[18] The firm is organized into 14 relatively independent business groups that have full operational responsibility and even propose their own strategy. Thus, a business group can be seen as a very autonomous business unit.

controller autonomy, and budgetary participation. First, the findings show that a high emphasis on financial targets in performance measurement is associated with limiting BU controllers' freedom to decide on cost allocations and transfer prices and also with limiting BU managers' participation in the target-setting process. Second, decentralization usually goes together with BU controllers' autonomy to design local accounting systems and with BU managers' participation in the target-setting process. While there is preliminary evidence consistent with the latter two findings (Merchant, 1981; Simon et al., 1954), this is probably the first study to test the relationships with data at the BU level.

As the first contribution of the study, these findings point out that some organizational design choices may have conflicting implications for management accounting systems. A high emphasis on financial targets is aligned with low autonomy to change cost allocations and low budgetary participation. The opposite holds for delegation. In environments where the optimal organizational design choice is to combine delegation with a high emphasis on financial targets, the trade-off between decision-making and control affecting management accounting systems must be particularly severe. It is difficult to argue how the trade-off is resolved because testing statements about causality directions is problematic given data availability constraints. Nevertheless, even the associations between the two organizational design variables and the two characteristics of management accounting systems have potentially important consequences for empirical studies of organizational design choices.

Much of the existing compensation literature relies on firm level data. Bushman and Smith (2001) argue that focusing on compensation of BU managers within large firms is a promising direction for the literature to develop. Yet, shifting the focus to the BU level requires different research designs. Nagar (2002) points out that centralization is an important determinant of BU managers' incentive schemes commonly omitted in the literature due to data availability constraints (Holthausen et al., 1995, Bushman et al., 1995). The contribution of this study is illustrating that even the relationship between centralization and bonus rewards may suffer from the omitted variable problem if the role of controllers in organizational design and the degree of budgetary participation are not

considered explicitly.

For example, there is some evidence that optimal organizational design choices in BU's pursuing a 'build' strategy include an emphasis on non-financial performance measures (Gupta and Govindarajan, 1985). A plausible interpretation is that strategy has a direct effect on BU managers' incentive schemes. However, to the extent that 'build' BU's tend to be more decentralized, the evidence of this study is consistent with an alternative interpretation: BU's with a 'build' strategy are less centralized, thus, controller autonomy and budgetary participation are higher, as a result of which the emphasis on financial targets is reduced. Without controlling for centralization and characteristics of BU's management accounting systems, it is difficult to make conclusions about the direct effect of strategy on incentive schemes. This study proposes controller autonomy regarding cost allocations and budgetary participation as suitable control variables, but the general point is that studying compensation issues at the BU level requires data that goes well beyond information from compensation contracts.

Another contribution relates to the theoretical debate about the value of private information (e.g., Penno, 1984; Christensen, 1981). Analytical research points out that decision-making benefits of providing an agent with information that is not observed by the principal may be dominated by its control costs. General conditions for information to have positive value are difficult to derive (Baiman and Sivaramakrishnan, 1991; Baiman and Evens, 1983). In a recent survey, Lambert (2001, p. 68) concludes: "At present, we do not have a good understanding when the principal is better off providing the agent with a system that generates private information." Thus, the relative size of control costs of private information is an open issue.

To the extent that the cross-sectional findings can be generalized, it can be argued that the strong support for H2 and H4 implies that control costs of private information are relatively small compared to its decision-making benefits. Appendix A presents a simple framework that proves that a sufficient 'empirical' condition for this interpretation to be valid is that decentralization is associated with both high benefits and high costs of private information.

The conclusions are subject to several caveats. First, they are based on evidence from only seven international firms headquartered in the Netherlands. Second, examining organizational design choices is fraught with endogeneity problems that are difficult to fully overcome given data availability constraints. Third, the conclusions are only valid to the extent to which all other potentially confounding effects on the main variables of interest are controlled for. These limits to generalizibility of the findings presented here can be addressed by future research.

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1.7 Appendix A

Several implicit assumptions were made in deriving Hypotheses 2 and 4. The discussion below makes them explicit. It also explains how the relative size of decision-making benefits and control costs of private information can be inferred from optimal organizational design choices. In particular, the case of a simultaneous choice of organizational variables is addressed (Proposition 2).

Assume that the contribution of a BU to overall firm's profit $P(\alpha, \gamma, e)$ is the difference between the contribution of local management in the 'first-best case' $p(\alpha, \gamma, e)$ and a control loss $c(\alpha, \gamma, e)$:

$$P(\alpha, \gamma, e) = p(\alpha, \gamma, e) - c(\alpha, \gamma, e), \tag{1.1}$$

where $\alpha \in (0, 1)$ is the amount of private information made available to the agent by existing accounting systems (the proportion of private and public information that the system provides); $\gamma \in (0, 1)$ is centralization of decision-making authority, and $e \in (0, \infty)$ represents exogenous effects of the environment (strategy, business sharing, environmental uncertainty, etc.).

Definition 1. An increase in $p(\alpha, \gamma, e)$ as a result of an increase in α, denoted as p_α[19], is further referred to as *the decision-making benefits*.

Definition 2. An increase in $c(\alpha, \gamma, e)$ as a result of an increase in α is further referred to as *the control costs*.

Assume further:

(A1) $p_\alpha > 0$, $p_{\alpha\alpha} < 0$. The decision making benefits are positive and decrease in the amount of private information.

(A2) $c_\alpha > 0$, $c_{\alpha\alpha} > 0$. The control costs are positive and increase in the amount of private information.

(A3) $p_\gamma < 0$, $p_{\gamma\gamma} < 0$. Delegating more decision rights (reducing centralization) increases the contribution of local managers to overall firm's profit. This effect decreases in the amount of decision rights delegated.

[19] In what follows, the first and second derivatives of a function $f(x, y, z)$ with respect to x are denoted as f_x and f_{xx} respectively.

(A4) $c\gamma < 0$, $c\gamma\gamma > 0$. Limiting the amount of decision rights delegated reduces the control loss with a diminishing effect.

Further, it is necessary to define when the decision-making benefits dominate the control costs in a cross-sectional setting. The study does not compare welfare effects of private information in the same 'agency' but across 'agencies' in different environments. In particular, it examines how firms balance the change in the decision-making benefits ($p_{\alpha\gamma}$) and the change in the control costs ($c_{\alpha\gamma}$) as a result of a change in γ. Assume that an increase in centralization is associated with a decrease in decision-making benefits and a decrease in control costs at the same time:

(A5) $p_{\alpha\gamma} < 0$, $c_{\alpha\gamma} < 0$.

Definition 3. *The decision-making benefits dominate* the control costs of private information if the increase in the decision-making benefits ($-p_{\alpha\gamma}$) as a result of a decrease in γ is larger than the increase in the control costs ($-c_{\alpha\gamma}$), i.e., if $p_{\alpha\gamma} < c_{\alpha\gamma}$. *The control costs dominate* the decision-making benefits if $p_{\alpha\gamma} > c_{\alpha\gamma}$.

Proposition 1. *Assume that firms behave rationally and (A1) – (A5) hold. If the decision-making benefits dominate the control costs of private information, then there will be a negative relationship between the observable proxies for α and γ,*

$$\frac{\partial \alpha^*(\gamma)}{\partial \gamma} < 0. \tag{1.2}$$

If the control costs dominate the decision-making benefits, then

$$\frac{\partial \alpha^*(\gamma)}{\partial \gamma} > 0. \tag{1.3}$$

there will be a positive relationship between the observable proxies for α and γ.

Proof. The observable α is optimally chosen as follows[20]:

$$\alpha^*(\gamma) = \arg\max_{\alpha} P(\alpha, \gamma). \tag{1.4}$$

If there is a global optimum for a level of centralization γ it must be that:

$$\left.\frac{\partial p(\alpha, \gamma)}{\partial \alpha}\right|_{\alpha=\alpha^*(\gamma)} = \left.\frac{\partial c(\alpha, \gamma)}{\partial \alpha}\right|_{\alpha=\alpha^*(\gamma)}. \tag{1.5}$$

[20] Proposition 1 does not yet consider the effect of the environmental variable e, therefore, the notation is also simplified and the argument e is dropped in the proof.

Assumptions (A1) and (A2) assure that it is the maximum. If the decision-making benefits dominate the control costs, i.e., $p_{\alpha\gamma} < c_{\alpha\gamma}$, and both the second derivatives are negative by (A5), then it holds for $\gamma_h > \gamma$ that:

$$\left.\frac{\partial p\left(\alpha,\gamma_h\right)}{\partial\alpha}\right|_{\alpha=\alpha^*(\gamma)} < \left.\frac{\partial c\left(\alpha,\gamma_h\right)}{\partial\alpha}\right|_{\alpha=\alpha^*(\gamma)}. \tag{1.6}$$

If a new optimal $\alpha^*(\gamma_h)$ exists, it must be such that there is an equality in (1.6). Left-hand side (LHS) of (1.6) has to increase and/or the right-hand side (RHS) has to decrease. For a given γ_h, this can only be the case if α goes down, as $p_{\alpha\alpha} < 0$ and $c_{\alpha\alpha} > 0$ by (A1) and (A2).

$$\frac{\partial\alpha^*\left(\gamma\right)}{\partial\gamma} < 0. \tag{1.7}$$

An increase in γ will be accompanied by a decrease in α^* when the decision-making benefits dominate the control costs. A symmetric argument leads to the conclusion that an increase in γ will be accompanied by an increase in α^* when the control costs dominate the decision-making benefits.■

Proposition 1 treats centralization as an exogenous variable. The optimal α^* is derived for a given γ. The following proposition shows that a similar conclusion holds also in the case when α and γ are chosen endogenously in response to an environmental variable e. The only additional restriction is that e directly affects only one of the endogenous variables[21]:

(A6) $p_{\gamma e} \neq c_{\gamma e}$ and $p_{\alpha e} = c_{\alpha e} = 0$.

Proposition 2. *Assume that firms behave rationally and (A1) – (A6) hold. If the decision-making benefits dominate the control costs of private information, then there will be a negative relationship between the observable proxies for α and γ. If the control costs dominate the decision-making benefits, then there will be a positive relationship between the observable proxies for α and γ.*

Proof. For a given e_1, the first order conditions are as follows:

$$\left.\frac{\partial p\left(\alpha_1,\gamma_1,e_1\right)}{\partial\alpha}\right|_{\alpha_1=\alpha^*(e_1)} = \left.\frac{\partial c\left(\alpha_1,\gamma_1,e_1\right)}{\partial\alpha}\right|_{\alpha_1=\alpha^*(e_1)}, \tag{1.8}$$

[21] This excludes the case of a correlated omitted variable affecting directly both the observed α and γ.

$$\left.\frac{\partial p\left(\alpha_1,\gamma_1,e_1\right)}{\partial\gamma}\right|_{\gamma_1=\gamma^*(e_1)}=\left.\frac{\partial c\left(\alpha_1,\gamma_1,e_1\right)}{\partial\gamma}\right|_{\gamma_1=\gamma^*(e_1)}. \tag{1.9}$$

For $e_2\neq e_1$ the RHS of (1.8) still equals the LHS, yet an inequality arises in (1.9) by (A6). If a new equilibrium exists it can only be one of the following four types:

(i) $\alpha^*\left(e_2\right)>\alpha^*\left(e_1\right)\wedge\gamma^*\left(e_2\right)>\gamma^*\left(e_1\right),$ (ii) $\alpha^*\left(e_2\right)>\alpha^*\left(e_1\right)\wedge\gamma^*\left(e_2\right)<\gamma^*\left(e_1\right),$
(iii) $\alpha^*\left(e_2\right)<\alpha^*\left(e_1\right)\wedge\gamma^*\left(e_2\right)>\gamma^*\left(e_1\right),$ (iv) $\alpha^*\left(e_2\right)<\alpha^*\left(e_1\right)\wedge\gamma^*\left(e_2\right)<\gamma^*\left(e_1\right).$

By (A1) and (A2), an increase in α makes the RHS of (1.8) smaller than the LHS. It follows that γ has to have the opposite effect to reach an equilibrium. If $p_{\alpha\gamma}<c_{\alpha\gamma}$, then a decrease in γ makes the RHS of (1.8) greater than the LHS. Therefore, (i) and (iv) can be excluded from the set of possible new equilibria. Both (ii) and (iii) imply that a change in e leads to a change in α^* accompanied by a change in γ^* in the opposite direction if $p_{\alpha\gamma}<c_{\alpha\gamma}$. The proof of the other part of the proposition is symmetric.■

1.8 Appendix B.

Variable: *CATOTAL*

Sum of six constructs that were transformed to have a mean of zero, variance of one, and opposite sign. The constructs are equally weighted averages of the following items.

Item areas	*Constructs*	*Items*[22]	*Dimensionality*
Formal Authority relations	CA_HIRE	m1-3, 16 (α=.83)	**CFA1:** unidimensionality of CA_HIRE χ^2=1.76,d.f.=2,p=.41,RMSEA=.00, GFI=.99, NNFI=1.0, n=140)
	CA_INFL	c1-2 (ρ=.03)	
Authority to change:			
- allocations	CA_ALOC	c3-5 (α=.80)	**CFA2:** after excluding items c10,13,14 there are four factors (the 4 constructs)
- valuation	CA_VALU	c6-7 (ρ=.58)	(χ^2=22.5, d.f.=14, p=.07, RMSEA=.07, GFI=.95, NNFI=.92, n=116)
- perform. measures	CA_PMES	c8-9 (ρ=.67)	
- planning systems	CA_PLAN	c11-12 (ρ=.45)	

Variable: *CENTRAL*

Equally weighted average of 16 items in the following areas: marketing (m4-7), financial management (m8-12), operations (m13-15,17-18), purchasing (m19-20).

Alternative specification tests

CFA3: second-order factor analysis of 15 items (m1-3,16, c3-9,11-12) with the six constructs of *CATOTAL* as first-order factors (χ^2=122.1, d.f.=71, p=.00, RMSEA=.08, GFI=.87, NNFI=.84, n=116).

CFA4: unidimensionality of the six constructs of *CATOTAL*, calculated as averages of the 15 items (χ^2=8.6, d.f.=9, p=.48, RMSEA=.00, GFI=.98, NNFI=1.00, n=116). Cronbach's α of the construct denoted *CAF* is .58 (α=.76 not averaged).[23]

[22] Cronbach's α or Pearson correlation coefficient (ρ) reported. The items are described further in this appendix.

[23] α may underestimate the true reliability if the items do not have equal reliabilities (Gebering and

CFA5: second-order factor analysis of 16 items (m4-15, m17-20) with the four item areas of *CENTRAL* as first-order factors (χ^2=247.25, d.f.=96, p=.00, RMSEA=.11, GFI=.81, NNFI=.75, n=135).

CFA6: unidimensionality of the four item areas of CENTRAL, calculated as averages of the 16 items (χ^2=2.2, d.f.=2, p=.32, RMSEA=.03, GFI=.99, NNFI=.99, n=135). Cronbach's α of the construct denoted *CENTRF* is .71 (α=.84 not averaged).

Anderson, 1988).

The following items were used to measure the main variables of interest. They are numbered m1-21 (items that appeared on the questionnaire for managers), and c1-14 (controllers' items).

How is authority for the following decisions divided between you, as the general manager of the business unit, and higher level controlling?

1 Decision is taken at our business unit without consulting higher levels.

7 Decision is taken at higher levels without consulting our business unit.

		Our BU						Higher level
m1	Hiring of the BU controller	1	2	3	4	5	6	7
m2	Transfer of the BU controller	1	2	3	4	5	6	7
m3	Salary increase of the BU controller	1	2	3	4	5	6	7

Comparing the general manager of your business unit and the business group controller, who of them assigns relatively more tasks to your controlling department?

1 Almost all tasks come from the general manager.

4 Both assign about the same amount of tasks.

7 Almost all tasks come from the group controller.

c1 (general manager) 1 2 3 4 5 6 7 (group controller)

Who of them typically has more influence on final decisions when their views differ?

1 The general manager makes almost always the final decision.

4 The general manager makes the final decision in some areas, the group controller in others.

7 The group controller makes almost always the final decision.

c2 (general manager) 1 2 3 4 5 6 7 (group controller)

How is authority divided between your business unit (BU) and higher levels when a decision to change the following accounting techniques and reporting procedures is made?

1 Decision about the change is taken at our BU without consulting higher levels.

7 Decision about the change is taken at higher levels without consulting our BU.

		Our BU						Higher level
c3	Allocation of manufacturing overhead	1	2	3	4	5	6	7
c4	Allocation of marketing costs	1	2	3	4	5	6	7
c5	Transfer prices for transactions within your BU	1	2	3	4	5	6	7
c6	Expensing vs. capitalizing costs (e.g. provisions, writing-off receivables)	1	2	3	4	5	6	7
c7	Inventory valuation	1	2	3	4	5	6	7
c8	Financial performance indicators to be used within your business unit	1	2	3	4	5	6	7
c9	Non-financial performance indicators to be used within your BU	1	2	3	4	5	6	7
c10	Design of your internal reports (e.g. frequency, breadth of information)	1	2	3	4	5	6	7
c11	Budgeting process within your BU	1	2	3	4	5	6	7
c12	Short-range financial planning	1	2	3	4	5	6	7
c13	Strategic planning	1	2	3	4	5	6	7
c14	Criteria to evaluate capital investment (e.g. accounting measure, satisfactory rate)	1	2	3	4	5	6	7

How is authority divided between your business unit and some higher level for each of the following classes of decisions?

1 Decision is taken at our business unit without consulting higher levels.

7 Decision is taken at higher levels without consulting our business unit.

		Our BU						Higher level
m4*	The price of the output	1	2	3	4	5	6	7
m5*	The extent and type of market to be aimed for	1	2	3	4	5	6	7
m6*	To determine a new product or service	1	2	3	4	5	6	7
m7*	Level of advertising expenditures	1	2	3	4	5	6	7
m8	To make a major capital investment	1	2	3	4	5	6	7
m9*	To decrease working capital	1	2	3	4	5	6	7
m10	Management of financial risk	1	2	3	4	5	6	7
m11*	To spend unbudgeted money on capital items	1	2	3	4	5	6	7
m12*	To take long-term loans	1	2	3	4	5	6	7
m13	The hiring and firing of managerial personnel	1	2	3	4	5	6	7
m14	Salaries of managerial staff	1	2	3	4	5	6	7
m15	Training methods to be used	1	2	3	4	5	6	7
m16	The hiring of business unit controlling staff	1	2	3	4	5	6	7
m17	To create a new job	1	2	3	4	5	6	7
m18	To create a new department	1	2	3	4	5	6	7
m19*	Which suppliers are to be used	1	2	3	4	5	6	7
m20*	Buying procedures	1	2	3	4	5	6	7

* indicates that the item appeared both on the M and C questionnaires.

m21 Please indicate how the budget target is set:

1 Proposed by me, followed by consulting higher level managers, but my opinion prevails.

2 Proposed by me, but decided jointly.

3 Proposed sometimes by me, sometimes by higher level managers, but decided jointly.

4 Proposed by higher level managers, followed by my opinion which has a lot of weight.

5 Proposed by higher level managers, followed by my opinion which does not have much weight.

6 Decided at a higher level without asking my opinion, but the decision is explained to me.

7 Decided at a higher level without asking my opinion and without any explanation.

Chapter 2

The Role of Controllers in Reducing Budgetary Slack

Budgets play a crucial role in organizing economic activities within the firm. Performance rewards based on budgetary targets are key instruments in aligning the objectives of managers with the overall firm goal (Jensen and Meckling, 1992). Easily achievable targets may severely reduce the incentives of managers to meet firm's short-term goals. Nevertheless, budgetary slack is a widely observed empirical phenomenon (Van der Stede, 2000; Merchant, 1985; Onsi, 1973). Its existence is intriguing and not fully understood.

The predominant explanation for the existence of budgetary slack is based on the fact that subordinates have private information. Subordinates naturally have incentives to create slack when negotiating budgetary targets. Access to private information enables them to do so (Dunk, 1993; Chow et al., 1988; Young, 1985). While superiors can predict this 'budget-padding' behavior, they may allow some slack in equilibrium because it facilitates eliciting private information for planning and coordination purposes (Christensen, 1982). Thus, budgetary slack arises from the trade-off between the planning and control roles of budgets in the presence of private information (Zimmerman, 2000; Chow et al., 1988).

The empirical studies are based on the assumption that the extent of information asymmetry between a superior and a subordinate is given and cannot be alleviated by the superior. This assumption is troublesome because one purpose of budgeting, and

management accounting systems in general, is to reduce the information asymmetry. This study extends existing research by examining the existence of budgetary slack when superiors have the possibility to reduce the extent of information asymmetry.

The study examines how targets are set for business units (BU's) within large firms. It extends the previous empirical literature by explicitly considering the role of BU controllers in the target-setting process. BU controllers always have dual responsibility and report both to BU management (local responsibility) and top management (functional responsibility). Top management can influence the extent of information asymmetry by changing the emphasis on BU controller's functional responsibility[1]. Reducing the amount of private information at the BU level should lead to a decrease in budgetary slack. Thus, the first prediction is that there will be a positive relationship between controller autonomy (low emphasis on functional responsibility) and budgetary slack. However, emphasizing functional responsibility also reduces BU controller's capacity to support the local management team (Sathe, 1982; Simon et al., 1954), which is reflected in the following predictions. There will be a positive relationship between controller autonomy and (i) BU managers' evaluations of services provided by controlling departments, (ii) BU controllers' involvement in local decision making.

The findings from 104 BU's of six large international firms largely support the predictions. There is a significantly positive relationship between budgetary slack and controller autonomy. Also, low controller autonomy is associated with low controllers' influence on business decisions within the BU and to some extent also with low BU managers' evaluations.

The study contributes to the existing literature in the following ways. First, this is the first study that I am aware to present evidence consistent with the view that budgetary slack can be reduced by emphasizing functional responsibility of BU controllers.

[1]Top management have potentially infinitely many instruments available to reduce budgetary slack. Fisher et al. (2001) discuss the effects of resource allocation policies on incentives to build slack; Webb (2002) presents experimental results concerning the effects of variance investigation policies and reputation building. The theory suggests that the fundamental cause of budgetary slack is information asymmetry. Therefore, this study focuses on the role of the BU controller because, by design, it is an institution by which the firm reduces the extent of information asymmetry between top and BU management.

This view implies that BU controllers add value in organizational design by reducing control costs. It is also consistent with the theory suggesting that private information is a necessary condition for slack to occur. Second, the empirical literature on budgetary slack implicitly assumes that BU controllers consent to budget-padding behavior. Additionally, top management are assumed to give a tacit approval to such a collaboration between the BU manager and the controller. It is not clear why these assumptions should hold in equilibrium. This study provides a rationale for such a behavior. There are benefits from allowing the BU controller to cooperate closely with the manager. These benefits may outweigh the control costs due to budgetary slack. As a result, budgetary slack can be observed in equilibrium, even if there is an institution by which the firm can reduce the amount of private information at the BU level[2].

The following two sections review the literature and put forward the hypotheses. Section 2.3 describes the research methods. Finally, the last two sections present the results and conclude.

2.1 Literature Review

The early empirical studies on budgetary slack (Onsi, 1973; Merchant, 1985) look for determinants of managers' propensity to create slack. They find that budgetary participation and emphasis on meeting budget are associated with managers' attitudes to create slack. Additionally, Merchant (1985) predicts and finds that managers' propensity to create slack is negatively related to their supervisors' ability to delete slack. Similarly, early experimental studies provide evidence on the propensity to create slack, rather than actual budgetary slack, as they investigate situations where subjects (subordinates) unilaterally set budgets (Chow et al., 1988; Young, 1985). Information asymmetry is hypothesized to affect budgetary slack either directly or as a moderating variable. However, the results

[2] The study assumes that firms behave optimally and what we observe are equilibrium outcomes. However, the equilibrium is not described formally. An explicit link to analytical models explaining slack more rigorously (e.g., Magee, 1980, Antle and Eppen, 1985) remains an opportunity for future extensions of this study.

are rather weak. Young (1985) finds that average self-imposed budget targets of subjects who have private information are not significantly different from average standards chosen by subjects that had no private information. Nevertheless, information asymmetry did have an effect because the variance in slack was much higher in the presence of private information. Chow et al. (1988) examine the difference in slack when using truth-inducing and slack-inducing pay schemes. When information asymmetry about subordinate performance capability was absent, slack did not differ significantly between the pay schemes. However, in the presence of information asymmetry slack was lower under the truth-inducing pay scheme.

An issue not addressed by the early literature is whether the propensity to create slack actually translates into higher slack. A subordinate may have strong incentives to create slack and still not be able to do so because the budget is not set unilaterally by the subordinate (unlike in the experimental situations above). Incentives of the superior have to be considered as well. This issue can be addressed by measuring the actual size of slack as in Dunk (1993) and Van der Stede (2000). In line with the early budgetary slack literature Dunk (1993) investigates the effect of budget emphasis, budgetary participation and information on budgetary slack. He concludes that participation alone is not sufficient to create slack. Van der Stede (2000) finds that slack is negatively associated with budget emphasis and positively associated with past performance. Moreover, there is a negative relationship between budgetary slack and managerial short-term orientation supporting the view that "managers may protect themselves from missing budget targets in other ways than slack creation, such as by limiting their exposure to risky, long-term projects." Another approach addressing the behavior of superiors is presented in Fisher et al. (2000). They find experimentally that superiors make considerable concessions from their initial positions when negotiating budget targets. Social norms and fairness issues are put forward as an explanation of the finding.

In summary, the empirical literature examines what organizational characteristics and practices are associated with the propensity to create slack or actual slack creation. Reoccurring explanatory factors are information asymmetry, budgetary participation, and

budget emphasis. Still relatively little is known about why budget slack actually occurs. First, hardly any of the studies asks why superiors do not adjust budget emphasis, participation, and information asymmetry so as to eliminate slack. Fisher et al. (2000) refer to social norms for an explanation. The findings of Van der Stede (2000) would suggest that some slack is allowed to reduce managerial short-term orientation that might be equally harmful as slack. Second, most of the studies recognize the importance of information asymmetry but none of them asks whether superiors can alleviate information asymmetry to reduce budgetary slack. These two gaps in the empirical literature have motivated the present study.

2.2 Hypotheses Development

Onsi (1973), one of the first studies on budgetary slack, explicitly states several assumptions underlying the existence of budgetary slack. One of the assumptions is as follows (p. 536):

> "The divisional controller in decentralized organizations participates in the task of creating and managing divisional slack.
>
> This assumption indicates that the divisional controller has become a viable member of the divisional team by doing his part to facilitate the creation, distribution and management of divisional slack. This represents a shift towards divisional interest in the dual role a division manager has to assume."

To the best of my knowledge, there is no empirical evidence investigating the influence of BU (division) controllers on the magnitude of budgetary slack. However, there is evidence (San Miguel and Govindarajan, 1984; Sathe, 1982; Simon et al., 1954) suggesting that there are differences in reporting relationships of BU controllers. In some BU's functional responsibility of the controller is relatively strong and limits the controller's autonomy to design local specific management accounting systems. On the other hand, there are BU's where the controller reports to the BU manager and the functional link to

a superior controller is relatively weak. As a result, the BU controller has high autonomy in supporting local management, responsibilities stemming from the reporting link to a functional superior at a higher level are kept at a minimum.

Producing local (private) information improves decision making of local management. At the same time, it limits the ability of top management to collect control information. Therefore, the higher the BU controller autonomy, the greater the information advantage of BU management over corporate executives. In line with much of the previous literature, it is expected that greater information asymmetry results into higher budgetary slack.

H1: *There will be a positive relationship between controller autonomy and the magnitude of budgetary slack*[3].

Stated in more general terms, the hypothesis predicts that information asymmetry regarding budgetary forecasts[4] can be reduced by the superior. This only reinforces the question as to why budgetary slack exists if information asymmetry, one of its most important determinants, is under the control of the superior.

Reducing information asymmetry by limiting BU controller autonomy is costly. It implies emphasis on functional responsibility at the expense of the local role of a controller. Local BU management receive less information for their specific decision making needs, if the BU controller spends more time providing control information to the group/corporate level. This is the case not only because of capacity constraints of local controlling departments but also because meaningful information for control purposes requires standardization (detailed accounting rules and reporting requirements) whereas local decision making needs are always specific. Thus, limiting autonomy compromises the controller's ability to support local decision making. Better support of local management should be reflected in a higher BU manager's evaluation of services provided by the controlling department.

H2: *There will be a positive relationship between controller autonomy and BU manager's evaluation of services provided by the controlling department.*

[3] H1 and all the other hypotheses hold assuming everything else being equal.

[4] Note that this is not the same as arguing that all information asymmetry can be eliminated. It only implies that a large part of the information on which a budget for the next period is based is available to the BU controller and transferable to higher levels.

An important part of the controller's contribution to local decision making is also controller involvement in management (Sathe, 1982). Lower autonomy is likely to reduce the controller's influence on important business decisions taken within the BU.

H3: *There will be a positive relationship between BU controller autonomy and the controller's influence on decisions taken within the BU.*

If H1 holds together with H2 or H3, then there is a trade-off to be made in equilibrium. BU controllers can help to reduce budgetary slack (H1), however it would come at the cost of compromising their responsibility as members of local management teams (H2, H3). BU specific factors (e.g., environment, strategy) determine how the trade-off is resolved. It can be alleviated by employing other instruments to reduce slack. Resource allocation policies, ex post variance investigation, and policies giving incentives to build-up reputation for accepting challenging targets are some of the alternative instruments discussed in the literature (Webb, 2002; Fisher et al., 2001). Nevertheless, support for H1 would imply that the alternative instruments cannot fully eliminate budgetary slack (otherwise the association with controller autonomy would only be due to chance) and the discussed trade-off still exists.

2.3 Methods

2.3.1 Data Sources

The sample consists of business units of firms listed on the Amsterdam Exchanges with sales above Euro 2 billion, excluding BU's of financial institutions and the four largest firms. The primary data collection method is a questionnaire survey in which both the BU general manager (GM questionnaire) and the BU controller (C questionnaire) participated. 363 questionnaires were sent to managers and controllers of 188 BU's of seven participating firms. 308 questionnaires were returned (85% response rate). Sales of the median BU are Euro 155 million; 39% of the sales come from the Netherlands, 29% from other European countries, 27% from North America, and 5% from the rest of the world.

After excluding cases with missing observations for the main variables of interest, the

data set available for this study includes 104 BU's of six firms (20, 26, 17, 20, 12, 9 per firm) from which both the GM and C questionnaires were returned. Further details of the data collection procedures are reported in Chapter 1.

2.3.2 Variable Measurement

Budgetary Slack. The measure, *SLACK*, is a fully anchored scale where BU managers select one of five categories describing difficulty of budget targets (see question Q1 in Appendix). It was adapted from Van der Stede (2000). The five categories were modified to increase the variance and ranged from (1) 'easy to attain' to (5) 'practically unattainable'. The instrument was chosen to measure actual slack rather than the propensity to create slack.

Obviously, budgetary slack is difficult to measure accurately. The instrument used here can at best be considered as a crude proxy. To subject its validity to an empirical test, *SLACK* was correlated with two variables for which theory and previous empirical research predict a significant relationship. If subordinates have incentives to introduce slack in negotiating budgetary targets (Fisher et al., 2000), then the greater their influence on the final target, as reflected in greater budgetary participation, the greater should the slack be. As expected, *SLACK* correlates positively (ρ=.20, p=.05) with a widely used measure of budgetary participation (Hofstede, 1967). Additionally, Van der Stede (2000) finds a highly significant positive relationship between past performance and budgetary slack. In this study, *SLACK* also correlates positively (ρ=.25, p=.01) with a self-reported measure of last year's performance[5]. Thus, *SLACK* is likely to be a very noisy measure, yet it seems that it is capable of discriminating between easily achievable and challenging targets.

Evaluation of Controlling Services. The instrument consists of two questions answered by BU managers. The first question (Q3 in Appendix) asks the manager to 'evaluate the services provided by your controlling department' along four dimensions that were reported as the main tasks of the controlling department in Simon et al. (1954). The

[5] See measure *PERFORM* described in the section concerning control variables.

second question (Q4 in Appendix) lists six information areas potentially available from management accounting systems (e.g., product profitability, externally oriented information) adapted from Chenhall and Morris (1986). Managers indicated on two 1-7 Likert scales to what extent the information areas are *important* and *available*. The sum of the importance scores less the sum of availability scores indicates the lack of information for local decision making. This score together with three items from the first question were analyzed by means of a confirmatory factor analysis (CFA)[6]. A single factor model has an acceptable fit. The final measure *EVAL* consists of the factor scores. Cronbach α of the 4-item construct was satisfactory (0.81).

Controller Involvement. Controllers indicated on 1-7 Likert scales (Q2 in Appendix) what their influence on BU decisions is concerning seven areas (e.g., accounts receivable, targeted customers). The scales were anchored using three stages of controller involvement as in Sathe (1982). A CFA rejected unidimensionality of the seven items. An exploratory factor analysis revealed that there are two factors. Three items referring to incentives within the BU, products, and customers load mainly on the first factor explaining 42% of total variance and the remaining four items load mainly on the second factor explaining 19% of total variance. Based on the results, two measures were constructed. *BUSIN* is an equally-weighted average of scores on the three items concerning strategic business decisions (loading on the first factor). *FININ* is constructed similarly from the four items concerning financial decisions (loading on the second factor).

Qualitative evidence from interviews with top level controllers revealed that a prevailing opinion is that BU controllers' involvement in financial decisions (*FININ*) is a necessary part of their responsibility, however, they add most value by actively influencing strategic business decisions (*BUSIN*). In light of these comments, *BUSIN* probably

[6] While the first item of Q3 reflects an important dimension of controllers' performance, it relates to their functional responsibility rather than their responsibilities in supporting local management. Therefore, it is not included in the final measure. Details of the CFA are as follows: χ^2=4.9, d.f.=2, p=.09, RMSEA=.12, GFI=.98, NNFI=.96, n=104. In general, a CFA tests whether covariances of the observed items correspond to a theoretically implied covariance matrix. Various statistics that are functions of the difference between 'theoretical' and 'observed' covariance matrices. P-value refers to the probability that a χ^2 statistic is significantly different from zero. Insignificant result is a sign of a good fit.

captures greater variance in the benefits from having the BU controller closely cooperate with local management. To assess validity and reliability of the measures, all the seven items were also included in the GM questionnaire in more than a half of the sample (61 BU's of three firms). The two sets of responses do not correlate significantly for any of the *FININ* items. On the other hand, the correlations for all three *BUSIN* items are significant (the correlation between *BUSIN* and its counterpart from the GM questionnaire is ρ=.39, p=.00). For these reasons, *BUSIN* is used in testing H3. To assess the robustness of the findings, results for *FININ* and the sum of *BUSIN* and its GM counterpart (whenever available) are also reported.

Controller Autonomy. The measure of BU controller autonomy, *CATOTAL*, draws on Simon et al. (1954). It is a composite of six dimensions: (1) formal authority relations (four items on GM questionnaire), (2) actual influence of the functional superior vs. BU manager on the work of the BU controller (two items on the C questionnaire), and controller autonomy as reflected in the influence on (3) accounting allocations (three C items), (4) valuation techniques (two C items), (5) internal performance indicators (two C items), (6) the design of internal planning and reporting (two C items). Further details on the reliability and validity of the construct are reported in Chapter 1.

2.3.3 Control Variables

Besides the main variables of interest, several control variables are used to test the hypotheses. While relatively little is known about determinants of slack, managers' evaluation and controllers' involvement, it seems important to control for characteristics of the BU environment. The selection relied on the variables commonly discussed in the organizational design literature: BU centralization, strategy, environmental volatility, interdependencies, and size (see Keating, 1997; Bushman et al., 1995, Baiman et al., 1995). Additionally, Van der Stede (2000), one of the few empirical studies examining determinants of actual budgetary slack, reports that it is increasing in past performance and decreasing in the emphasis on budgets in performance measurement. The following mea-

sures[7] alleviate the correlated omitted variables concerns due to the discussed variables.

CENTRAL is a measure of BU centralization largely based on the widely used instrument of Inkson et al. (1970). It consists of 16 items on the GM questionnaire covering three broad areas - marketing, operational, and financial management decisions.

SGROW is the percentage of total sales for which the strategy is 'increase sales and market share, be willing to accept low returns on investment in the short-to-medium term, if necessary' (Gupta and Govindarajan, 1984).

ENVIRV measures perceived environmental volatility with six items (e.g., product design, technology, competitors) on both the GM and C questionnaires (Gul and Chia, 1994).

SHARE is the square root of an equally weighted average of 7 items from Davis et al. (1992) reflecting the sharing with other BU's in the same firm (e.g., customers, sales force, purchasing).

LSIZE is the logarithm of the number of people employed in a BU.

PERFORM is a measure of BU performance. Controllers were asked to indicate on a Likert scale 1-7 what was last year's BU performance as compared to the rest of the firm. High score means high performance.

BUBONUS relates to performance measurement as reflected in the emphasis on financial results in BU managers' bonus schemes. It is a self-reported percentage of total bonus depending on a financial formula at the BU level (Gupta and Govindarajan, 1986). While other measures were also considered, *BUBONUS* was chosen because it exhibits substantially lower interclass correlation (see the explanatory footnote in Figure 2.1) than the other measures. The basic models were reestimated using alternative measures. The main results of interest do not depend on the choice.

Figure 2.1 and 2.2 report descriptive statistics. While the variance in *SLACK* is relatively low, it is sufficient for the measure to correlate significantly with three other

[7] In several cases, missing values in the control variables were replaced by information collected from other sources LSIZE (3 cases), SHARE (20), PERFORM (26), CENTRAL (2). In cases where no additional information was available, the mean for similar BU's within the firm was imputed SHARE (1), SGROW (5). Additional details concerning some of the measures are reported in Chapter 1.

	Min	Max	Mean	St.D.	ρ^{*}	F-test
SLACK**	2.00	5.00	3.40	.60	.50	.00
EVAL**	1.02	7.19	3.09	1.35	.16	.00
BUSIN	1.00	7.00	3.40	1.27	.14	.00
CATOTAL**	-6.22	8.33	.50	3.27	.07	.05
PERFORM	1.00	7.00	4.15	1.89	.06	.08
SHARE	1.00	2.48	1.55	.40	.80	.00
SIZE	2.20	10.57	6.08	1.35	.38	.00
ENVIRV	1.83	4.83	3.29	.56	.50	.00
GROW	.00	10.00	4.18	2.76	.13	.01
CENTRAL	1.75	5.56	3.35	.75	.41	.00
BUBONUS	.00	100.00	57.34	29.30	.33	.00

√SLACK – budgetary slack, EVAL – managers' evaluation of the services provided by their controlling department, BUSIN – controller involvement, CATOTAL –controller autonomy, PERFORM – last year's BU performance, SHARE – the extent of business sharing with other BU's, SIZE – log of total number of employees, ENVIRV – environmental volatility, GROW – square root of a percentage 'sales of products with a growth strategy' of total sales, CENTRAL – centralization, BUBONUS – the proportion of BU managers' bonus depending on BU financial targets.

* ρ is the proportion of variance accounted for by firm level effects. It is equal to the correlation between variable scores of two randomly drawn BU's within the same firm (Snijders and Bosker, 1999). The F-statistic reported in the next column tests the null hypothesis that there is no firm level effect. Siginificant differences in average scores per firm have to be taken into account when making inferences from the results presented further.

** Reverse coded (high scores mean low slack, evaluations, and controller autonomy respectively). Signs of all association measures reported further are reversed to correspond to meanings implied by the variable labels.

Figure 2.1: Descriptive statistics

variables. The negative relationship between *SLACK* and the measure of BU interdependencies, *SHARE*, was not predicted. It is plausible that the relationship reflects budgetary pressure to realize potential synergies among BU's. Figure 2.2 also shows a negative association between *EVAL* and *GROW*. This result seems consistent with the claims that controllers provide better support in operational rather than in strategic decision making (the latter being more important for growing BU's). The interclass correlation coefficients reveal that most of the variables are significantly affected by firm level effects (which is difficult to control for in a sample of six firms and has to be reflected in model specification and inference). However, this problem is less severe for *CATOTAL*, the main explanatory variable of interest, and for *PERFORM*.

2.3.4 Model specification

H1-H3 are tested separately in three regressions with *SLACK*, *EVAL*, and *BUSIN* as the dependent variables. The main issue in testing the hypotheses relates to the fact that BU's

	SLACK	EVAL	BUSIN	CATOT.	PERF.	SHARE	SIZE	ENVIR.	GROW	CENTR.
EVAL	-.08									
BUSIN	.02	.11								
CATOTAL	.21*	.13	.18							
PERFORM	.32**	-.03	-.14	-.01						
SHARE	-.31**	.07	.07	.03	-.05					
SIZE	-.10	-.04	.11	.08	.16	.16				
ENVIRV	-.15	.02	.12	-.26**	-.10	-.16	-.01			
GROW	.18	-.30**	.09	.03	-.05	-.18	-.16	-.02		
CENTRAL	-.02	-.07	-.08	-.41**	-.04	-.04	-.06	.15	.11	
BUBONUS	.04	-.14	.17	-.07	.04	-.11	.22*	.21*	.04	.01

*, ** Correlation is significant at the .05 and .01 level respectively (2-tailed), N=104.

Figure 2.2: Pearson correlations among variables

are not independent but clustered within six firms. The main regressions reported further address the issue in the following way. First, weighted least squares (WLS) estimates are obtained to allow for firm-specific error terms. Second, firm-specific intercepts are included to isolate the firm level effects as far as the dependent variables are concerned. Further, the interclass correlation coefficient of the main explanatory variable *CATOTAL* is rather low (Figure 2.2). Given that the observation interdependency issue is less severe for *CATOTAL*, the main specifications constrain its coefficient to be equal across firms (a Wald statistic for the restriction is reported) and inferences are based on WLS estimates of standard errors. To save degrees of freedom, coefficients for all control variables are also constrained to be equal across firms. Their standard errors will be underestimated (the higher the interclass correlation, the more severe the bias) and have to be interpreted with caution.

As an alternative, a simultaneous system of equations is estimated to test an assumed path diagram in which *CATOTAL* simultaneously causes *SLACK*, *EVAL*, and *BUSIN* (control variables are also included). Finally, a full structural equation model (SEM) incorporates measurement error in the main variables of interest into the estimation. The

drawback of these SEM models is that they do not account for the multi-level nature of the data. Therefore, tests of H1-H3 are based on WLS estimates. Results of the alternative model specifications are reported as robustness tests.

2.4 Results

2.4.1 Basic Model

H1 predicts a positive relationship between controller autonomy and budgetary slack. Results of the WLS estimation are presented in Figure 2.3. As predicted, the coefficient of *CATOTAL* is significantly positive (p=.00). However, the Wald test rejects the null hypothesis that the coefficients are equal across firms. Allowing the coefficients vary (results not reported) shows that four of the six firm-specific *CATOTAL* coefficients are significantly positive (p<.03). Thus, the evidence supports H1. Additionally, budgetary slack is positively associated with past performance, BU growth and negatively with BU interdependencies. To obtain further evidence on the effect of these variables, additional regressions were estimated (not reported) allowing for firm-specific coefficients of one of these control variables (all other explanatory variables had their coefficient constrained to be equal across firms). Last year's performance has a significant positive relationship with slack in three of the six firms. The negative effect of BU interdependencies is significant in only one firm. The *GROW* variable illustrates the difficulties with pooling of BU's in the presence of firm level effects. BU growth has significant positive relationship with slack in two firms, while there is also one firm for which the relationship is significantly negative. The significance of the *CATOTAL* coefficient is not affected in any of these additional regressions.

H2 predicts a positive relationship between controller autonomy and managers' evaluations of the services provided by their controlling department. Figure 2.3 shows a weak positive relationship (p=.11). The Wald test does not reject the null hypothesis (p=.19). Further, BU growth is negatively related to managers' evaluations. Three of the six *GROW* coefficients are significantly negative if allowed to vary across firms, the other

	SLACK	EVAL	BUSIN
CATOTAL	0.04***	0.06	0.08*
	(2.92)	(1.63)	(1.88)
PERFORM	0.12***	-0.02	-0.09
	(5.61)	(-0.28)	(-1.51)
ENVIRV	-0.10	0.18	0.39*
	(-1.21)	(0.77)	(1.84)
SHARE	-0.31*	-0.12	0.53
	(-1.71)	(-0.31)	(1.39)
SIZE	-0.03	-0.12	0.19*
	(-0.70)	(-1.28)	(1.81)
GROW	0.03*	-0.17***	0.05
	(1.93)	(-3.88)	(1.21)
CENTRAL	0.02	0.01	-0.10
	(0.30)	(0.04)	(-0.56)
BUBONUS	0.001	-0.005	0.007
	(0.48)	(-1.13)	(1.47)
Adj R^2	0.54	0.10	0.13

***, **, * significant at the 0.01, 0.05, and 0.1 level respectively (two tailed).

N=104; White heteroscedasticity adjusted standard errors used; t-values in brackets; firm-specific intercepts not reported. SLACK – budgetary slack, EVAL – managers' evaluation of the services provided by their controlling department, BUSIN – controller involvement, CATOTAL – controller autonomy, PERFORM – last year's BU performance, SHARE – the extent of business sharing with other BU's, SIZE – log of total number of employees, ENVIRV – environmental volatility, GROW – square root of a percentage 'sales of products with a growth strategy' of total sales, CENTRAL – centralization, BUBONUS – the proportion of BU managers' bonus depending on BU financial targets.

Figure 2.3: WLS regressions

three coefficients are also negative but not significantly so. In the additional regressions t-statistic for *CATOTAL* is generally lower than the one reported in Figure 2.3.

Finally, H3 predicts a positive relationship between controller autonomy and controllers' involvement in local decision making. In line with the prediction, Figure 2.3 reports a significantly positive coefficient for *CATOTAL* (p=.06). The Wald test does not reject the null hypothesis (p=.82). Thus, the evidence is consistent with H3. Further, Figure 2.3 reports a positive association between BU size and controllers' involvement. Nevertheless, this relationship is negative in two firms, positive in all the other firms but significantly so in only one firm. Interestingly, there are also two firms in which there is a significant positive relationship between *BUBONUS* and controllers' involvement. The coefficient of *CATOTAL* remains significant in all the additional regressions either at the .10 or .05 level.

2.4.2 Alternative Specifications

First, the basic model was reestimated using alternative measures of controllers' involvement. *BUSINGMC* adds managers' responses available in a half of the sample and *FININ* measures involvement in financial decisions. The results (not reported) show that *CATOTAL* is associated positively with both *BUSINGMC* (p=.11) and *FININ* (p=.19).

Second, a structural equation model was estimated. In this model a number of equations is estimated simultaneously. *CATOTAL* is regressed on all the control variables. *SLACK*, *EVAL*, and *BUSIN* are regressed on *CATOTAL* and the control variables. Moreover, *EVAL* and *BUSIN* are modeled as latent variables causing the observed values on their indicator variables (four and three indicators respectively, as described in the measurement section). Figure 2.4 presents the results[8]. They are largely similar to the findings of the basic model. As before, there is a significantly positive relationship between *CATOTAL* and *SLACK* (p<.01) and a weaker positive relationship between *CATOTAL* and

[8]Note that the overall fit of the full model is rather low (χ^2=106.1, d.f.=61, p=.00, RMSEA=.09, GFI=.89, NNFI=.79). The fit of the structural part (path analysis assuming that the variables are error free) is good (χ^2=2.2, d.f.=3, p=.52, RMSEA=.00, GFI=1.00) suggesting that the problems with the fit of the full model are due to the measurement part.

EVAL (p=.11). In contrast to the WLS estimates, the association between *CATOTAL* and *BUSIN* is not significant in the SEM model. However, it is not a major difference as the p-value for the SEM results is .11, while it was .06 in the basic model. There are also minor changes as far as effects of the control variables are concerned. In the SEM model, last year's performance is significantly negatively associated with controllers' performance, while the effect of size is not significant.

2.5 Discussion and Conclusions

It is commonly recognized that budgets serve two purposes, planning and control, and that trade-offs between them need to be made when setting a budget target. While budgetary slack compromises the control role of a budget, it reduces incentives of subordinates to introduce biases in communication of their private information. As a result, a budget that eliminates slack may be sub-optimal for planning and coordination purposes (Zimmerman, 2000; Demski and Feltham, 1978). This prevailing explanation for the existence of budgetary slack is appealing because it interprets slack as an equilibrium phenomenon. There are also studies pointing out that the principal can alleviate the trade-off between planning and control and reduce budgetary slack through resource allocation and promotion policies (Webb, 2002; Fisher et al., 2001). These instruments may strengthen managers' incentives to share their private information as understating ex ante expected performance could reduce allocation of investment funds, or harm managers' reputation in the long run.

An important gap in the literature is that most studies neglect the role of firms' accounting and reporting systems even though they serve as elementary instruments to deal with slack in practice. All of the discussed explanations for budgetary slack assume that the extent of information asymmetry is exogenous, i.e., the only way top management can access private information at lower levels is to provide incentives to managers so that it is in their best interest to share the information. However, the trade-off between planning and control may not exist and budgetary slack may greatly be reduced if top

	SLACK	EVAL	BUSIN
CATOTAL	0.08***	0.06	0.06
	(2.96)	(1.63)	(1.63)
PERFORM	0.38***	-0.04	-0.22**
	(4.84)	(-0.35)	(-2.03)
ENVIRV	-0.25*	0.16	0.38*
	(-1.69)	(0.86)	(1.87)
SHARE	-0.79***	0.05	0.34
	(-3.84)	(0.18)	(1.21)
SIZE	-0.10*	-0.07	0.08
	(-1.68)	(-0.83)	(0.96)
GROW	0.04	-0.12***	0.07*
	(1.51)	(-3.08)	(1.74)
CENTRAL	0.12	-0.02	-0.03
	(1.07)	(-0.14)	(-0.17)
BUBONUS	0.003	-0.003	0.005
	(0.95)	(-0.82)	(1.17)
R^2	0.39	0.13	0.17

N=104. All variables are transformed to have zero mean and the intercept is dropped. Fit of the full model: χ^2=106.1, d.f.=61, p=.00, RMSEA=.09, GFI=.89, NNFI=.79. SLACK – budgetary slack, EVAL – managers' evaluation of the services provided by their controlling department, BUSIN – controller involvement, CATOTAL –controller autonomy, PERFORM – last year's BU performance, SHARE – the extent of business sharing with other BU's, SIZE – log of total number of employees, ENVIRV – environmental volatility, GROW – square root of a percentage 'sales of products with a growth strategy' of total sales, CENTRAL – centralization, BUBONUS – the proportion of BU managers' bonus depending on BU financial targets.
***, **, * significant at the 0.01, 0.05, and 0.1 level respectively (two tailed).

Figure 2.4: Structural equation model

management can endogenously reduce the amount of private information at lower levels. Interestingly, this is the main function of firms' internal reporting systems and the main part of controllers' functional responsibility.

The role of BU controllers and firms' accounting and reporting systems in reducing budgetary slack are investigated in this study. As expected, budgetary slack is lower whenever BU controller autonomy is reduced. This finding implies that (i) defining authorities and responsibilities of BU controllers is an important instrument by which top management can reduce slack, (ii) all other instruments potentially available to top management are not sufficient to eliminate slack completely.

If considered in isolation, the first finding raises the question as to why is there budgetary slack in equilibrium if BU controllers can reduce it. The answer advocated in this study is that reducing controller autonomy has both benefits and costs. Next to the benefit of curbing slack, limits to controller autonomy may also have adverse consequences. In particular, the emphasis on functional responsibility of BU controllers and reporting reliable information to top management may come at the cost of undermining controllers' position in local management teams and limiting their ability to provide relevant information for decision making within the BU. In line with the predictions, the evidence shows that low controller autonomy is associated with low BU controllers' involvement in important strategic decisions, i.e., with controllers' failure to add value through their active participation. Moreover, low controller autonomy is also associated with lower perceived quality of the information controllers provide to local management, although the relationship is weaker.

The costs and benefits of limiting controller autonomy are likely to be BU specific. The importance of controllers' contribution to local decision making varies across BU's. As a result, different BU's require different levels of controller autonomy implying different consequences for budgetary slack and for controllers' role within the BU. Thus, slack will be observed in equilibrium despite the fact that top management can endogenously reduce the extent of information asymmetry. The empirical evidence presented here is largely consistent with this explanation for the existence of budgetary slack.

The study contributes to the existing literature in a number of ways. First, it is probably the first large-scale investigation of the role of accounting systems and BU controllers in reducing budgetary slack. Second, the study extends the prevailing explanation for the existence of budgetary slack. The trade-off between planning and control is broader than conceived of so far. Slack in budgets exists not only because the same budget is used for planning but also because information potentially available from the BU controller cannot be reported as it would compromise the controller's role in local decision making. Third, there are at least two interesting and robust findings relating to the effect of control variables. Establishing negative relationship between BU growth and managers' evaluations of the support provided by their controlling departments complements theories about the link between environment and perceived usefulness of management accounting systems (Chenhall and Morris, 1986). Negative relationship between last year's performance and budgetary slack confirms the finding of Van der Stede (2000) and raises an interesting question for further research. It is not obvious why it is optimal to "reward" managers of well performing BU's by allowing more slack in the next year.

It is important to emphasize that the research design implies a number of limitations. First, budgetary slack is notoriously hard to measure. This study relies on perceptions of BU managers. Second, the sample of firms participating in the study is quite small because of practical constraints connected with obtaining more data. Finally, while the list of potentially confounding factors affecting organizational design choices is endless, information is available only for a few variables that proxy for fundamental characteristics of BU's and their environment. Addressing the first limitation concerning the measurement of slack is a promising direction for future research. It would be particularly interesting to investigate budgetary slack issues with archival data from a firm's internal reporting system. The data availability issues are an obvious obstacle, yet there are studies (e.g., Davila and Wouters, 2001) proving that even such practical difficulties can be surmounted.

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2.7 Appendix

Q1. Generally, the budget targets are:

1	2	3	4	5
easy to attain	attainable with normal effort	attainable with high effort	attainable with very high effort	practically unattainable

Q2. Below is a list of items that have an effect on the bottom-line. To what extent can you actually influence what business actions are taken with regard to them?

1 no influence (my role is to present information and report the results of actions aken by operating managers).
3 some influence (my role is to present information and recommend action).
7 strong influence (my role is to challenge and modify actions of operating managers).

	Low influence						High influence
Accounts receivable	1	2	3	4	5	6	7
Inventory	1	2	3	4	5	6	7
Operating expenses	1	2	3	4	5	6	7
Capital expenditures	1	2	3	4	5	6	7
Incentive systems within your BU	1	2	3	4	5	6	7
Targeted customer segments	1	2	3	4	5	6	7
Offered range of products/services	1	2	3	4	5	6	7

Q3. How important are the following information items in managing your business unit? To what extent are they actually available to managers?

1 Not important / Not available to managers in our business unit.

7 Extremely important / Routinely provided to managers in our business unit.

	Importance							Availability						
	Low						High	Low						High
Externally oriented information (on customers, competitors, etc.)	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Forward-looking information (forecasts, scenario analysis, etc.)	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Non-financial information (employee turnover, efficiency, etc.)	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Frequent reports (e.g., daily, weekly)	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Precise targets for all departments within your business unit	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Product profitability information	1	2	3	4	5	6	7	1	2	3	4	5	6	7

Q4. How would you evaluate the services provided by your controlling department along the following dimensions?

1 I am satisfied with how they carry out this task.

7 I am not satisfied at all with how they carry out this task.

	Satisfactory					Unsatisfactory	
Timely reporting to higher levels	1	2	3	4	5	6	7
Reporting to you and business unit management	1	2	3	4	5	6	7
Assisting operating managers in current analysis and interpretation of accounting information	1	2	3	4	5	6	7
Providing accounting information for solving business problems on a special studies basis	1	2	3	4	5	6	7

Chapter 3

Organizational Design and Management Accounting Change

This study provides an analytical framework explaining the effect of centralization on the process of change in management accounting systems (MAS). Centralization has probably been the most prominent organizational design factor used as an explanatory variable in the empirical work studying MAS changes (e.g., Gosselin 1997; Libby and Waterhouse 1996). Still, the effect of centralization is not well understood. We complement the literature, that largely relies on organizational behavior arguments, by providing an economic rationale for the link between the organizational design factor and a MAS change.

The empirical studies of MAS change draw on the more general management literature (see Damanpour 1991 for a review) studying the dissemination of management innovations. Centralization was found to be negatively related to the probability of introducing an innovation. However, it has been argued that this relationship is moderated by the stage the change process reaches. Following the MAS change literature (Krumwiede 1998; Gosselin 1997), we distinguish two different stages of the change process: adoption and implementation. The *adoption stage* refers to information gathering and evaluating whether the suggested MAS change is suitable for the firm. During the *implementation stage* the initial idea of MAS change translates into its practical realization. Implementation is contingent upon the information collected in the adoption stage. Zaltman et al.

[0] The last chapter is based on joint work with Anja De Waegenaere.

(1973) hypothesize that low centralization fosters adoption of innovations, whereas high centralization facilitates subsequent implementation. Gosselin (1997) provides evidence supporting the prediction for the case of activity-based costing. Our study shows that such firm behavior is optimal when the lobbying costs of introducing an innovation are taken into account.

We argue that lobbying activities are a prominent force behind the process of a MAS change. The accounting literature provides numerous examples of situations when corporate headquarters imposed a MAS change on divisions, even though it limited their ability to use MAS as a support for local decision-making (e.g., Jones 1992; Colignon and Covaleski 1988). Apparently, an accounting change has to occur simultaneously in several departments some of which will be positively and others negatively affected. A plausible explanation is that MAS uniformity has to be maintained for planning and control purposes. Thus, when a decision-maker considers adopting a change, there are incentives to influence the decision.

Our model, which departs from the mainstream principal-agent framework, focuses on the lobbying aspect of the problem. It abstracts from other aspects which we consider less central to the issue of MAS change. First, we do not model production related activities and consequently do not search for an optimal contract. We assume a linear compensation and in line with empirical evidence (Anderson and Young 1999, Shields 1995), we further assume that the compensation function is not affected by the process of MAS change. Second, we do not explain why a particular degree of centralization is optimal. Centralization enters our model through an exogenous parameter that reflects a key distinction between centralized and decentralized organizations when information has to be obtained from lower levels, namely the distance between the information and the decision-maker. The higher the hierarchical level to which information has to be transferred, the higher the opportunity costs of communication (see McAfee and McMillan, 1995; Jensen and Meckling, 1992). Finally, while the framework is not specific to MAS changes, the decision to implement a change across several departments or not at all is typical for accounting changes and the findings provide an explanation for the evidence

on activity-based costing implementation.

The main virtue of the simplicity is that it clearly exposes why organizational behavior differs in the two stages of the change process and across firms with different degrees of centralization. The rest of the paper is organized as follows. Section 3.1 reviews theoretical literature related to our analytical structure. We present the model and derive its equilibrium in sections 3.2 to 3.4. Section 3.5 points out the implications for adoption and implementation of a change. We discuss them and conclude in the last section.

3.1 Literature Review

The outline of our model is as follows. The decision-maker has to obtain information on the value of a change from organizational participants who will be affected by the change. Communication with them is both costly and informative. The decision-maker optimizes the trade-off between the information benefits and costs of communication by regulating the amount of communication allowed.

The problem of information exchange with interested parties has been dealt with in the lobbying literature (e.g., Che and Gale 1998; Baye et al. 1993). The common feature of this literature is a setting in which two or more agents compete for one good. The core problem is how to design a mechanism that would be optimal given the preferences of the mechanism designer when the agents have an incentive to spend resources on influencing the decision, which may be socially wasteful. We apply these insights to learn more about the organizational process of MAS change and contribute to the underlying analytical literature in two ways. First, we derive the optimal limit on lobbying endogenously by explicitly modeling the preferences and information of the decision-maker. Second, we incorporate information benefits of lobbying into the widely used auction-based models.

Also related to our work, there are studies addressing the issue of optimal centralization in the traditional principal-agent framework. Centralization is modelled as a binary choice between the principal or the agent taking the decision. The motivation of these studies is to explain why delegation is such a common arrangement in practice. Melumad et

al. (1997, 1995) show that delegation dominates centralization when there is a limit on communication. Similarly, the starting point of our analysis is that communication costs can be reduced by delegation of authority (see also Christie et al. 1992, Jensen and Meckling 1992). Rather than looking for the optimal degree of centralization, our study points out the implications of different degrees of centralization for the process of MAS change.

3.2 Analytical Structure

To address our research question, we model the interactions of a principal and two agents. The principal (she) is the decision-maker who is responsible for MAS design. The agents are managers of two competing departments within the firm who have private information about the effect of the change on their departments' profits. The principal first makes the decision whether to allow the agents to collect and present evidence on the effect of the change, which we refer to as the *adoption decision* $A \in \{0,1\}$. If the change is adopted ($A = 1$), the principal revises her beliefs about the value of the change and makes the final *implementation decision* $I \in \{0,1\}$. Only if the change is implemented ($I = 1$), the total departmental profit π_i becomes the sum of the profit from directly productive activities $\bar{\pi}_i$ and the contribution from the MAS change θ_i ($i = 1,2$):

$$\begin{array}{lll} \pi_1(I) = \bar{\pi}_1 + \theta_1 & \pi_2(I) = \bar{\pi}_2 - \theta_2 & if\ I = 1, \\ \pi_1(I) = \bar{\pi}_1 & \pi_2(I) = \bar{\pi}_2 & if\ I = 0, \end{array} \tag{3.1}$$

where θ_1 is the increase in the profit of agent's 1 department due to the change and θ_2 is the decrease in the profit of agent's 2 department (the costs of the change are higher than its benefits for this department). For the principal, θ_i is a realization of Θ_i, a stochastic variable with a uniform distribution on the interval [0,1]. Θ_1 and Θ_2 are independent. The agents may or may not have better information than the principal about the opponent's type. Therefore, we compare two complementary cases. In what follows, we first assume that the agents know as much as the principal about the opponent's type, i.e. the distribution of Θ_i only. Section 3.4 deals with the case where the agents have

perfect information about the opponent's type, while the principal still knows only the distribution of the types.

Both agents exert influencing effort e_i to persuade the principal to make their favored decision. We assume that more effort results into more credible evidence in the adoption stage. The agents also carry out some production related activities a_i. For simplicity, we assume the agents are expected utility maximizers, their compensation is a linear function of the department's profit π_i, and the pay-offs are as follows:

$$U_i^A(e_i) = w + s\pi_i(I) - a_i - e_i \qquad\qquad i = 1, 2, \tag{3.2}$$

where w is a fixed wage and $s \in (0, 1)$ a share of profit the agents receive. We do not model the optimal choice of a_i, we only focus on the change in the agents' pay-offs as a result of a potential MAS change implementation.[1]. If $I = 1$, agent 1 wins $s\theta_1 - e_1$ and agent 2 loses $-s\theta_2 - e_2$. If $I = 0$, agent 1 loses $-e_1$ and agent 2 reduces his loss to $-e_2$. The fact that agent 2 does not leave the firm despite the fact that his utility is adversely affected by the change implies that the agents had been earning a rent before the adoption decision was made. We do not address this issue explicitly but it could be an information rent from communicating production related information (Melumad et al. 1997) or a rent due to acquired expertise (Rottemberg and Saloner 1995).

The principal, when making the adoption and implementation decisions, maximizes expected firm profits. If she refuses to adopt the change ($A = 0$), the game ends and all players receive zero as a pay-off. By adopting ($A = 1$), the principal opens communication channels with the agents. Their influencing efforts are informative but also costly. The principal incurs fixed *adoption costs*, C^A. Moreover, the agents' influencing efforts, e_i

[1] A more general approach would be to let the principal adjust compensation to reflect specific circumstances of a particular change. However, this cannot be done without explicitly including production related information and effort in the model. Given the obvious difficulty of analyzing both the productive and the influencing activities, we only focus on the former as we believe the key effect of influencing would remain. Other examples of abstracting from the production related activities can be found in the auditing literature (e.g., Morton 1993, Baiman et al. 1991, 1987; Townsend, R. 1979). A restriction on the principal's compensation policy can also be found in related work on decentalization and communication in agencies (Harris and Raviv 1996).

$(i = 1, 2)$, cause *organizational influence costs,* $C(e_1 + e_2, c)$[2]. The function $C(\cdot\,, \cdot)$ reflects that the influencing effort has different implications for an agent and for the principal, i.e. the firm as a whole. The agents have disutility from personal effort invested in influencing but they do not internalize all costs incurred by their influencing (e.g., opportunity costs of the decision-maker's time). We assume that the higher the distance between the decision-maker and relevant information, the higher the negative externalities related to influencing. Thus, a large (small) c is a close representation of a high (low) degree of centralization[3].

The principal can reduce $C(e_1 + e_2, c)$ by approving a limited amount of time or money to be spent on searching for and presenting of information[4]. Let us denote this limit on e_i as L. (In what follows, $e_i(L)$ denotes the agents' influencing strategy, which depends in equilibrium on L and θ_i, and e_i denotes a realization of the function.) Thus, the principal decides first on adoption and if the decision is positive, she further chooses a limit on influencing and makes the final implementation decision. Her pay-off is:

$$\begin{aligned} U^P(A, I, L) &= B(I) - C(e_1(L) + e_2(L), c) - C^A, \quad if\ A = 1, \\ &= 0, \qquad\qquad\qquad\qquad\qquad\qquad\quad if\ A = 0, \end{aligned}$$

where $B(I)$, *MAS change value* is defined as follows:

[2]The effect of influencing efforts on organizational influence costs can be represented by a broad class of functions $f(e_1, e_2, c)$. Naturally, organizational influence costs should be increasing in efforts and the increase should be larger for a larger c. For ease of exposition, we state the restrictions formally in the proof of Proposition 3.4.

[3]Centralization is usually defined as the *extent* to which decisions are confined to higher levels of authority (Christy at al. 1993). Decentralization entails delegation of authority to lower levels. It is difficult to explicitly model all the implications of centralization. Therefore, it is common in the literature to focus on the distinctive features of centralization vs. decentralization that are essential for the problem at hand. Baiman and Rajan (1995) focus on the costs of the principal's induced opportunism inherent in centralization, Bushman et al. (2000) model delegation as a setting with unobservable actions and private information (as opposed to centralization where actions are observable but there is no information). We believe that the key distinctive feature for our problem is that the decision-maker's distance from information implies higher opportunity costs of presenting information. In line with the general definition, centralization is modelled as a matter of extent rather than a dichotomous choice.

[4]The idea of restricting influencing efforts is similar to Milgrom and Roberts (1988) who argue that a solution to avoid influence costs is to close the communication channel.

$$B(I) \quad = \pi_1(I) - \bar{\pi}_1 + \pi_2(I) - \bar{\pi}_2 \quad \begin{array}{ll} = \theta_1 - \theta_2, & if\ I = 1, \\ = 0, & if\ I = 0. \end{array} \tag{3.3}$$

Figure 3.1 depicts the timing of the moves in the game. Before the first move, Θ_i is assigned values of the agents' types θ_i $(i = 1, 2)$.

The game proceeds as follows:

1) The principal decides on adoption of the change, A. She knows the distribution of the agents' types, Θ_i, the fixed costs of adoption, C^A, and the cost implications of the agents' influencing efforts, $C(e_1 + e_2, c)$. If $A = 0$, the game ends. If $A = 1$, the principal simultaneously chooses the limit L.

2) Having observed L, the agents simultaneously determine their influencing effort e_1 and e_2. They know their own type and the distribution of the opponent's type. (Section 3.4 considers the case when they know the opponent's type).

3) Having observed e_1 and e_2, the principal makes her final decision on implementation. She can revise her adoption decision and reject the change. All payoffs are realized and the game ends.

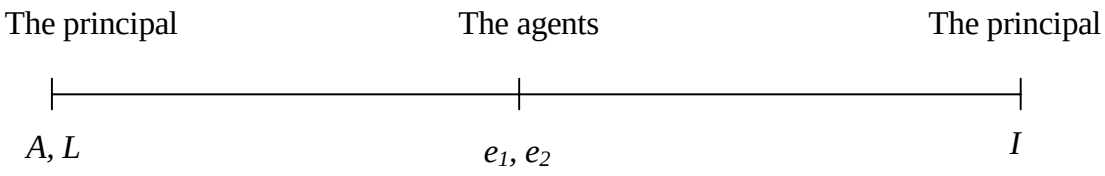

Figure 3.1: Time line

We can apply backward induction to solve the game. The principal's implementation strategy in the third move depends on the agents' strategies in the second move. On the other hand, the agents' strategies depend not only on the L chosen in the first move but also on how the principal decides on the implementation in the third move. In equilibrium, all players will correctly predict the optimal strategies of the other parties. Therefore, we first look for a Bayesian Nash equilibrium (see, e.g., Mas-Colell et al. 1995) of the

subgame that consists of the second and third moves of the overall game, given a fixed L. Second, knowing the equilibrium strategies of the principal and the agents given a fixed L, we look for the optimal L in the first move.

3.3 Results

Given that L was chosen in the first move, denote by $I^*(L)$ the equilibrium implementation strategy of the principal in the third move. Further, denote $e_i^*(L)$ as the equilibrium influencing effort of the agents in the second move.

The following proposition describes the equilibrium strategies in the subgame (moves 2, 3):

Proposition 3.1 *Given a limit L on the agents' influencing effort, the agents simultaneously choose the following strategies:*

$$\begin{aligned} e_i^*(L) &= \tfrac{s\theta_i{}^2}{2}, \qquad if \quad \theta_i \in [0, \tfrac{2L}{s}], \qquad i = 1, 2, \\ &= L, \qquad if \quad \theta_i \in (\tfrac{2L}{s}, 1]. \end{aligned} \tag{3.4}$$

Having observed e_1 and e_2 the principal will make the implementation decision in the following way:
If $e_1 > e_2$, then $I^*(L) = 1$.
If $e_1 < e_2$, then $I^*(L) = 0$.
If $e_1 = e_2$, the principal randomizes, $P(I^*(L) = 0) = P(I^*(L) = 1) = \frac{1}{2}$.

Proof. For a proof see the Appendix . ■

The agents face a trade-off. The influencing effort, e_i, decreases their pay-off but increases the chances that they will persuade the principal to make their favored decision I. Being a higher type results in higher influencing effort as the pay-off from persuading the principal (winning) increases. In equilibrium, the principal predicts this behavior and infers from $e_1 > e_2$ ($e_1 < e_2$) that $\Theta_1 > \Theta_2$ ($\Theta_1 < \Theta_2$). All costs are sunk at this stage, hence $\Theta_1 > \Theta_2$ ($\Theta_1 < \Theta_2$) implies a positive (negative) implementation decision. When $e_1 = e_2$, the principal is indifferent about implementation.

The equilibrium requires that the principal can set the limit L credibly, and the agents will not ignore it. Credibility of the principal's commitment is indeed a problem in many settings where influence costs occur (Rotemberg and Saloner 1995). Ex ante commitment may not be credible for the principal if ex post there are some convincing arguments. Here, L represents a limit in terms of time or money the agents are given to conduct search and present their results. When the time is over, or the allowed budget is spent, the agents simply cannot search any further.

Proposition 1 allows us to analyze the optimization problem the principal faces in the first move when she chooses the limit L. The lower the limit L, the lower are the *expected organizational influence costs* but the less information is revealed and the lower is the *expected MAS change value*. Note that given the agents' optimal strategies, a limit above $\frac{s}{2}$ has no effect. The optimal limit maximizes the principal's expected pay-off:

$$L^* = \underset{L\in[0,\frac{s}{2}]}{\arg\max}\{E[B(I^*(L)) - C(e_1^*(L)+e_2^*(L),c) - C^A]\}. \tag{3.5}$$

C^A are the fixed adoption costs, $E[C(e_1^*(L)+e_2^*(L),c)]$ the expected organizational influence costs, and $E[B(I^*(L))$ the expected MAS change value which can be derived as follows[5]:

$$\begin{aligned} E[B(I^*(L))] &= E[\max_{I=0,1} E[B(I) \mid e_1^*(L), e_2^*(L)]] = E[(\Theta_1-\Theta_2)1_{e_1^*(L)>e_2^*(L)}] \\ &= E[(\Theta_1-\Theta_2)1_{\Theta_2<\Theta_1<\frac{2L}{s}}] + E[(\Theta_1-\Theta_2)1_{\Theta_1\geq\frac{2L}{s},\Theta_2<\frac{2L}{s}}] \\ &= \int_0^{\frac{2L}{s}}\int_0^{\theta_1}(\theta_1-\theta_2)d\theta_2 d\theta_1 + \int_{\frac{2L}{s}}^1\int_0^{\frac{2L}{s}}(\theta_1-\theta_2)d\theta_2 d\theta_1 \\ &= \frac{4L^3}{3s^3} - \frac{2L^2}{s^2} + \frac{L}{s}. \end{aligned} \tag{3.6}$$

The function is increasing in L on the interval $[0,\frac{s}{2}]$. Thus, the influencing efforts generate information benefits. We illustrate that with two extreme examples:

$$\begin{aligned} E[B(I^*(L))] &= E[\Theta_1-\Theta_2] = 0, && \text{if } L=0. \\ &= E[(\Theta_1-\Theta_2)1_{\Theta_1>\Theta_2}] = \tfrac{1}{6}, && \text{if } L=\tfrac{s}{2}. \end{aligned}$$

[5] The notation $E[(\Theta_1-\Theta_2)1_A]$ stands for the expectation taken over all pairs θ_1,θ_2 for which A is true.

The principal will not implement when $e_1 < e_2$. She will infer that $\Theta_1 < \Theta_2$ and set $I^*(L) = 0$, by proposition 1. If $L = 0$, then $e_1 = e_2 = 0$, and the expectation is taken over all realizations of Θ_1 and Θ_2. If $L = \frac{s}{2}$, the principal can identify all the cases where $\theta_1 < \theta_2$. This increases the expected MAS change value, because the profit will not be negatively affected by them.

Knowing how the expected MAS change value and the expected organizational influence costs depend on L allows us to solve the principal's optimization problem (3.5) and to state the following proposition.

Proposition 3.2 *The game of three players described above has a Bayesian Nash equilibrium consisting of the following strategies:*
(1) The principal imposes the optimal limit L^* and makes the adoption decision as follows:

$$\begin{aligned} A^* &= 1, \quad \textit{if } E[B(I^*(L^*)) - C(e_1^*(L^*) + e_2^*(L^*), c) - C^A] > 0, \\ A^* &= 0, \quad \textit{otherwise.} \end{aligned}$$

(2) The agents and the principal play according to the strategies described in proposition 1.

Proof. The proposition largely summarizes the preceding paragraphs. The optimal adoption decision is straightforward. We omit the proof. ■

The following section shows that even if the agents have complete information, the optimal adoption and implementation decision remain unchanged except for a different optimal limit and influencing strategy, which will further be denoted as $\tilde{L}^*$ and $\tilde{e}_i^*(L)$ respectively.

3.4 The Case of Completely Informed Agents

The previous subsection considered the case where the agents do not have better information than the principal about the opponent's type. When deciding on the optimal influencing effort in the second move, they know only the distribution of Θ_i. In practice, it is conceivable that the manager of one department knows more than the headquarters

about the implications of a MAS change for another department. Therefore, we also consider the complementary case of completely informed agents (who know both θ_1 and θ_2) in order to understand how the findings depend on the assumed information structure.

The game remains virtually the same. The only thing that changes is that, in the second move of the game, the agents simultaneously choose e_1 and e_2 knowing the opponent's type. Let $\theta_h = \max\{\theta_1, \theta_2\}$ and $\theta_l = \min\{\theta_1, \theta_2\}$, similarly for Θ_i and e_i. We can state the following proposition which parallels proposition 1:

Proposition 3.3 *Given a limit L, the agents choose their strategies so that:*

$$\begin{aligned} \tilde{e}_1^*(L) + \tilde{e}_2^*(L) &= \tfrac{s\theta_l(\theta_h+\theta_l)}{2\theta_h}, && if\ L > \tfrac{s\theta_l}{2}, \\ &= 2L, && if\ L < \tfrac{s\theta_l}{2}. \end{aligned} \tag{3.7}$$

Having observed e_1 and e_2 the principal will make the implementation decision, $I^*(L)$, in the same way as described by proposition 1.

Proof. For the proof of the first part of the proposition see Che and Gale (1998)[6]. The second part concerns the optimal implementation strategy. $I^*(L)$ does not change because it still holds that:

$$\begin{aligned} e_1 > e_2 \Rightarrow E[\Theta_1 - \Theta_2 \mid \tilde{e}_l^*(L), \tilde{e}_h^*(L)] > 0, \\ e_1 < e_2 \Rightarrow E[\Theta_1 - \Theta_2 \mid \tilde{e}_l^*(L), \tilde{e}_h^*(L)] < 0, \end{aligned}$$

which can be verified by applying the results for the individual influencing strategies in Che and Gale (1998). ■

The fact that the agents know their types forces them to randomize when the limit is sufficiently high. For simplicity, we do not reproduce the individual mixed strategies, only their sum which is sufficient to calculate the expected organizational influence costs.

The expected MAS change value is also different under the new information structure. Due to randomization, it may happen with a small probability that $e_1 < e_2$ ($e_1 > e_2$), although $\theta_1 > \theta_2$ ($\theta_1 < \theta_2$). As a result of that the information benefits from influencing

[6] There are multiple equilibria in the case $L = \frac{\theta_l}{2}$. This occurs with zero probability and can be omitted in our framework.

decrease. We omit the explicit expressions for $E[B(I^*(L))]$ and $E[C(\tilde{e}_1^*(L)+\tilde{e}_2^*(L),c)]$ as they add little beyond what was presented in the previous subsection. The new optimal limit $\tilde{L}^*$ follows from (3.5).

3.5 Implications for Adoption and Implementation

The preceding sections discussed the optimal trade-off between costs and benefits of influencing efforts. This can be used to generate insights about the effect of centralization on the adoption and implementation of a MAS change. The optimal limit will depend on the degree of centralization. It will be denoted in this section as $L^*(c)$ and in the case of complete information as $\tilde{L}^*(c)$. The following proposition shows that in both cases centralized organizations will optimally set a lower limit on communication. All properties of the function $L^*(c)$ derived below hold also for $\tilde{L}^*(c)$.

Proposition 3.4 *The optimal limit $L^*(c)$ is decreasing in c.*

Proof. For the result to hold it is sufficient to impose the following regularity conditions[7]: (i) $\frac{\partial E[C(e_1^*(L)+e_2^*(L),c)]}{\partial L} > 0$,(ii) $\frac{\partial E[C(e_1^*(L)+e_2^*(L),c)]}{\partial^2 L} > 0$,and (iii) $\frac{\partial E[C(e_1^*(L)+e_2^*(L),c)]}{\partial L \partial c} > 0$. Furhter, it follows from (3.6) that $\frac{\partial E[B(I^*(L))]}{\partial L} > 0$ and $\frac{\partial E[B(I^*(L))]}{\partial^2 L} < 0$. The principal's maximization problem (3.5) requires that for every c:

$$\frac{\partial E[B(I^*(L))]}{\partial L}|_{L=L^*(c)} - \frac{\partial E[C(e_1^*(L)+e_2^*(L),c)]}{\partial L}|_{L=L^*(c)} = 0.$$

Condition (iii) implies that for any $\underline{c}, \bar{c}$ such that $\underline{c} < \bar{c}$ the following holds:

$$\frac{\partial E[B(I^*(L))]}{\partial L}|_{L=L^*(\underline{c})} - \frac{\partial E[C(e_1^*(L)+e_2^*(L),\bar{c})]}{\partial L}|_{L=L^*(\underline{c})} < 0.$$

The second derivatives with respect to L imply $L^*(\underline{c}) > L^*(\bar{c})$. ■

Communication of information becomes more costly as the distance from the decision-maker increases. Anticipating the cost implications of communication, the decision-maker

[7]It can be shown that the expected efforts $E[e_i(L)]$ are increasing in L. Given that organizational influence costs should be increasing in efforts and the increase should be larger for a larger c, the conditions are not very restrictive.

optimally puts a lower limit on the influencing efforts and less information is revealed. This has interesting implications for adoption and implementation of a change.

Corollary 3.1 *The expected value of a MAS change in centralized organizations will be lower than the expected value of the same MAS change in decentralized organizations.*

Proof. Proposition 3.4 proved that $\frac{\partial L^*(c)}{\partial c} < 0$. It follows from (3.6) that $\frac{\partial E[B(I^*(L))]}{\partial L} > 0$. Thus, $\frac{\partial E[B(I^*(L^*(c)))]}{\partial c} < 0$ ■

This proposition points out an important finding of this study. Organizational influence costs have both a direct and an indirect negative effect. While the direct costs of influencing activities can be restricted, this will only be at the price of loosing information for the decision making process. The next proposition shows the implications for the *adoption decision.*

Corollary 3.2 *Centralized organizations will optimally adopt less MAS changes than decentralized organizations.*

Proof. Take any two values of the parameter c, (e.g. $\bar{c}$ for a centralized organization and $\underline{c}$ for a decentralized organization), such that $\bar{c} > \underline{c}$. Let C^A, the fixed costs of adoption, depend on the type of MAS change that is considered for adoption. The difference between the expected MAS change value and the expected organizational influence costs is deceasing in c, so there are values of C^A such that:

$$\begin{aligned} E[B(I^*(L^*(\bar{c}))) - C(e_1^*(L^*(\bar{c})) + e_2^*(L^*(\bar{c})), \bar{c})] &< C^A, \\ E[B(I^*(L^*(\underline{c}))) - C(e_1^*(L^*(\underline{c})) + e_2^*(L^*(\underline{c})), \underline{c})] &> C^A, \end{aligned}$$

for which the following is true:

$$E[U^P(L^*(\bar{c}))] < 0 \qquad \textit{and} \qquad E[U^P(L^*(\underline{c}))] > 0.$$

Consequently, $A^* = 0$ for the centralized organization and $A^* = 1$ for the decentralized organization. ■

Considering any particular MAS change, there is always some chance that C^A is such that the change will be adopted in a decentralized organization but rejected in an organization with a higher degree of centralization. In other words, centralized organizations are less likely to adopt changes in their MAS.

Further, our analysis has implications for the *implementation process*. Presumably, it will be affected by the amount of information available to the decision-maker. When $e_1 \neq e_2$, the principal decides on implementation after having obtained all the relevant information from the agents. However, it can happen that the decision-maker implements the change without having better information about the MAS change value than she had ex ante.

Definition 3.1 *Top-down implementation is the process following a positive implementation decision ($I = 1$) made without any information on the MAS change value, i.e.* $E[\Theta_1 - \Theta_2 \mid e_1^*(L), e_2^*(L)] = 0$.

Corollary 3.3 *Centralized organizations that adopt a change are more likely to proceed with a top-down implementation.*

Proof. $E[\Theta_1 - \Theta_2 \mid e_1^*(L), e_2^*(L)] = 0$ if $e_1^* = e_2^* = L^*(c)$ which occurs with probability that we denote as $p(c)$. Having shown that $\frac{\partial L^*(c)}{\partial c} < 0$, it can easily be verified that $p(\bar{c}) > p(\underline{c})$ under both information structures. ■

The conditional probability of implementation, given that adoption occurred, does not vary with the degree of centralization. What differs is the way the implementation decision is made. In centralized organizations, it will frequently happen that MAS change is implemented top-down without knowing whether the benefits are higher than the costs of the MAS change.

Although we do not model the implementation stage explicitly (to avoid an overly complex setting), we can speculate under what conditions centralized organizations would be more likely to complete implementation once a MAS change was adopted (Gosselin 1997). Shifts in the environment can cause the agents' types, θ_i, to randomly change after the implementation decision (e.g. when a new pressing issue arises, the opportunity costs

of MAS change increase). The equilibrium of this modified game would closely parallel our results because all the parties are risk neutral. The difference is that implementing MAS change with communication channels closed ignores signals about increased costs of MAS. It will happen less often that MAS change implementation is halted due to shifts in the environment. Thus, centralized organizations in a changing environment would be more likely to finish implementation, once it started.

3.6 Discussion and Conclusions

Recent literature in organizational economics has addressed implications of influence costs for organizational design[8]. In this study, we have used these insights to look at the implications for an organizational change process. We have applied them to the process of management accounting change because it is a prime example of a change involving two features central to the analysis: a decision-maker not informed about local information needs, and the need to maintain a uniform MAS (this can be seen as another trade-off between decision-making and control, see Zimmerman 1997) which induces competition among the informed parties.

Our findings suggest that the adoption and implementation process of a MAS change will differ among organizations with different degrees of centralization. Optimal change process for centralized organizations encompasses two features. First, there will be a relatively high threshold that expected profit from MAS change has to meet. Below the threshold, change will not even be considered and no further information will be sought (i.e. project will not even reach the adoption stage). Second, top-down implementation will be relied upon more frequently, even though this may sometimes lead to implementation of an undesirable change.

The findings are in line with empirical evidence on MAS changes (Gosselin 1997) and behavioral theories of organizational innovations (Damanpour 1991, Zaltman et al. 1973).

[8] Schaeffer (1998) applies the concept of influence costs to organizational change, Rottenberg and Saloner (1995) model the interfunctional conflict within organizations, Bagwell and Zechner (1993) and Meyer et al. (1992) analyze the relationship between headquarters and divisions and divestiture activities.

We provide an economic rationale for this behavior. Information on the effect of a change is private information of the agents who are going to be affected by the change. They have incentives to influence the principal to make their favored decision. With relatively minor personal disutility they can impose substantial costs on the firm depending on their distance from the decision-maker. The influencing efforts are both costly and informative. Optimal firm behavior can be understood in terms of balancing between the costs and information benefits of acquiring information on the effects of the change.

It is important to emphasize limitations to the generalizibility of our results. First, we have assumed that there are two organizational groups, one opposing, one supporting the change. We can expect that this will mostly be the case, but it is not difficult to imagine MAS changes that will not be too controversial. The key trade-off analyzed in our framework would not apply to these cases.

The second limitation comes from the fact that the only means of information transmission in our analysis is competition between agents. Although Milgrom and Roberts (1992) suggested that "competition among interested parties with opposing interests may offer the best chance for all the relevant facts and desirable alternatives to be effectively advocated", our conceptualization of such an information revelation might be too restrictive. We do not allow for the possibility that one of the parties finds a crucial piece of information with little effort. More (better) evidence can only be presented to the principal through more search effort.

However, our findings shed some light on the developments in management accounting practices in the past. It has often been argued that management accounting is lagging behind developments in the production environment. Martinez and Jarillo (1989) provide evidence that the degree of centralization differs across functional areas and that the finance function is more centralized than other parts of the organization. Whether the same applies to MAS design still needs to be tested. But if the accounting department is more centralized than others, then it is in line with our theory that MAS are relatively rigid and it takes a major innovation such as ABC for changes to occur on a large scale.

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3.8 Appendix

Proof of Proposition 3.1

First, we prove that $I^*(L)$ as described in the proposition is optimal for the principal given that the agents' strategies are (3.4).

Given L, the principal will maximize $E[U^P(1, I, L)]$, her expected pay-off, when making the implementation decision:

$$I^*(L) = \arg\max_{I=0,1} E[B(I) - C(e_1 + e_2, c) - C^A \mid e_1^*(L) = e_1, e_2^*(L) = e_2]. \tag{3.8}$$

From (3.3) we know that:

$$E[U^P(1,1,L)] = E[\Theta_1 - \Theta_2 - C(e_1 + e_2, c) - C^A \mid e_1^*(L) = e_1, e_2^*(L) = e_2],$$
$$E[U^P(1,0,L)] = E[-C(e_1 + e_2, c) - C^A \mid e_1^*(L) = e_1, e_2^*(L) = e_2].$$

We can see that all the costs incurred in the adoption process are sunk and do not influence the decision.

$$E[U^P(1,1,L)] \geq E[U^P(1,0,L)] \Leftrightarrow E[\Theta_1 - \Theta_2 \mid e_1^*(L) = e_1, e_2^*(L) = e_2] \geq 0.$$

Knowing (3.4) and having observed $e_1 > e_2$, the principal can infer that $\Theta_1 > \Theta_2$. Consequently:

$$\begin{aligned} e_1 > e_2 \quad &\Rightarrow E[\Theta_1 - \Theta_2 \mid e_1^*(L) = e_1, e_2^*(L) = e_2] > 0 \\ &\Rightarrow E[U^P(1,1,L)] > E[U^P(1,0,L)] \\ &\Rightarrow I^*(L) = 1. \end{aligned}$$

Equivalent argument yields that $e_1 < e_2$ implies $I^*(L) = 0$. Finally:

$$\begin{aligned} e_1 = e_2 \quad &\Rightarrow E[\Theta_1 - \Theta_2 \mid e_1(\Theta_1, L) = e_1, e_2(\Theta_2, L) = e_2] = 0 \\ &\Rightarrow E[U^P(1,1,L)] = E[U^P(1,0,L)] \end{aligned}$$

The principal is indifferent and any randomization is possible. Yet, as we show below, only randomization with probability $\frac{1}{2}$ can be maintained in the equilibrium.

Secondly, we prove that given $I^*(L)$, the agents will find it optimal to choose the strategies as in (3.4). This part of the proposition was proved in a general form by Laffont and Robert (1996). Here, we present a simple proof for our specific case.

Without loss of generality we derive the optimal strategy of agent 1, given that (3.4) is optimal for agent 2. He maximizes his expected pay-off:

$$E[U_1^A(e_1)] = P_1(I^*(L) = 1 \mid e_1, \Theta_2)s\theta_1 - e_1, \tag{3.9}$$

where $P_1(I^*(L) = 1)$ is the agent's interim probability of winning reflecting his private information θ_1. Given that $e_1 \in [0, L]$ and agent 2 chooses his strategy in line with (3.4), we can specify the probability of winning:

$$\begin{aligned} P_1(I^*(L) = 1) &= P_1(e_2 < e_1) + \tfrac{1}{2}P_1(e_2 = e_1 = L) \\ &= P_1((\Theta_2 < \sqrt{\tfrac{2e_1}{s}}) \cap (\Theta_2 \leq \tfrac{2L}{s})) + \tfrac{1}{2}P_1(\Theta_2 > \tfrac{2L}{s})1_{e_1=L}. \end{aligned}$$

The second expression on the right-hand side is the probability that both agents influence L and the principal randomizes, i.e. the agent has $\frac{1}{2}$ chance of winning. The agent's expected pay-off is:

$$E[U_1^A(e_1)] = \sqrt{\tfrac{2e_1}{s}}s\theta_1 - e_1, \quad if\ e_1 \leq \tfrac{2L^2}{s} \tag{3.10}$$

$$= 2L\theta_1 - e_1, \qquad if\ \tfrac{2L^2}{s} < e_1 < L, \tag{3.11}$$

$$= \tfrac{2L+s}{2}\theta_1 - L, \qquad if\ e_1 = L. \tag{3.12}$$

First, compare (3.10) and (3.11). It is never optimal to influence $e_1 \in (\frac{2L^2}{s}, L)$ because additional effort decreases pay-off without increasing the probability of winning (notice that for $L \in [0, \frac{s}{2}]$ and $s \in (0, 1)$ it is always true that $\frac{2L^2}{s} < L$). Second, the first order condition corresponding to (3.10) yields $e_1 = \frac{s\theta_1^2}{2}$. The highest expected pay-off the agent can get if he influences $e_1 \leq \frac{2L^2}{s}$ is $U_1^A(\frac{s\theta_1^2}{2}) = \frac{s\theta_1^2}{2}$. Third, compare (3.10) and (3.12). It can be easily verified that for $\theta_1 = \frac{2L}{s}$ the agent can do equally well under (3.10) and (3.12). For $\theta_1 < \frac{2L}{s}$ choosing $e_1 = \frac{s\theta_1^2}{2}$, i.e. (3.10), is optimal. For $\theta_1 > \frac{2L}{s}$ choosing $e_1 = L$, i.e. (3.12), is optimal. ■

Chapter 4

Samenvatting

Het coördineren van economische activiteiten binnen organisaties is een fundamenteel probleem. Door de afwezigheid van het marktprijsmechanisme moeten ondernemingen andere manieren vinden om werknemers te motiveren en om hun activiteiten te coördineren. Dit is de inhoud van organisatieontwerp. Er zijn drie elementaire organisatieontwerpkeuzes, namelijk delegatie van bevoegdheden (centralisatie), evaluatie van prestatie en beloning.

Management accounting systemen verzamelen informatie die noodzakelijk is voor delegatie, evaluatie en beloning. Daardoor vormen deze systemen een onderdeel van het coördinatiemechanisme binnen de onderneming.

De theorie benadrukt het belang van een uitgebalanceerd organisatieontwerp. De relatie tussen de drie elementaire ontwerpkeuzes is in voorgaande studies onderzocht om te begrijpen hoe het systeem in balans gehouden kan worden. Hoewel management accounting keuzes een noodzakelijk onderdeel zijn van het algehele coördinatie mechanisme is er nog relatief weinig bekend over de relatie tussen management accounting en organisatieontwerpkeuzes.

Dit proefschrift onderzoekt de wederzijdse beïnvloeding tussen organisatieontwerpkeuzes en management accounting. De eerste twee hoofdstukken richten zich hoofdzakelijk op een belangrijke karakteristiek van management accounting systemen, namelijk hoe ondernemingen de autoriteiten en verantwoordelijkheden van business unit (BU) controllers

definiëren.

Hoofdstuk 1 bestudeert verschillende determinanten van de rol van de BU-controllers, waaronder het effect van organisatieontwerpkeuzes. Hoofdstuk 2 richt zich op de consequenties van de rol van de BU-controllers. De implicaties voor optimale organisatieontwerpkeuzes worden ook bediscussieerd. Hoofdstuk 3 presenteert een analytisch raamwerk dat verklaart hoe centralisatie, één van de elementaire organisatieontwerpkeuzes, het veranderingsproces van bestaande management accounting systemen beïnvloedt. Deze bevindingen zijn hieronder samengevat.

Hoofdstuk 1 rapporteert de bevindingen van een onderzoek onder managers en controllers in 178 business units van 7 bedrijven. Het resultaat suggereert dat BU-controllerautonomie en de deelname van BU-managers aan het opstellen van budgetdoelen negatief zijn gerelateerd aan de hoeveelheid variabele beloning die BU-managers krijgen voor het behalen van financiële budgetdoelen. Controllerautonomie en deelname aan het opstellen van budgetdoelen zijn ook negatief gerelateerd aan centralisatie.

De bijdrage van de studie is als volgt. De bevindingen illustreren allereerst dat empirische studies naar organisatieontwerp er rekening mee moeten houden dat sommige keuzes (vooral, decentralisatie samen met het benadrukken van financiële resultaten) conflicten kunnen veroorzaken voor het ontwerp van management accounting systemen. Terwijl decentralisatie aan controllerautonomie en deelname aan het opstellen van budgetdoelen is gekoppeld, vereist het benadrukken van financiële doelen het tegenovergestelde. Ten tweede, de bevindingen dragen bij aan de theoretische discussies over de waarde van privéinformatie. De bevindingen impliceren dat voordelen van privéinformatie voor het nemen van beslissingen groter zijn dan de controlkosten daarvan.

Hoofdstuk 2 bediscussieert het proces van het opstellen van budgetdoelen voor business units. Dit hoofdstuk levert een bijdrage aan de empirische literatuur door expliciet aandacht te geven aan de rol van controllers bij het opstellen van budgetdoelen. Door het benadrukken van de functionele verantwoordelijkheden van BU-controllers kan top management de informatieasymmetrie tussen top- en BU-niveaus verminderen. Dit moet tot 'scherpere' budgetdoelen leiden. De bevindingen tonen aan dat er inderdaad een positieve

relatie tussen controllerautonomie en 'budget slack' bestaat. Aan de andere kant vermindert het benadrukken van financiële verantwoordelijkheden van BU-controllers ook hun capaciteit om het BU-managementteam te ondersteunen. Deze verwachting komt overeen met de bevinding dat de participatie van controllers in BU-beslissingen en de evaluatie van de controllingdiensten door BU-managers lager zijn wanneer controllerautonomie verminderd is.

De bevindingen ondersteunen de theorie dat BU-controllers waarde toevoegen aan organisatieontwerp door het verminderen van controlkosten. Ze zijn ook consistent met de theorie dat privéinformatie een noodzakelijke voorwaarde voor budget slack is. Bovendien verklaart de studie waarom het optimaal is om BU-controllers te laten samenwerken met BU-managers in het opstellen van budgetdoelen. Een nauwe samenwerking tussen de BU-controller en de manager heeft voordelen. Deze voordelen kunnen groter zijn dan de controlkosten veroorzaakt door minder 'scherpe' budgetdoelen. Daardoor is het mogelijk dat budget slack bestaat, ook al zijn BU-controllers in principe in staat budget slack tegen te gaan.

Hoofdstuk 3 laat zien waarom de adoptie en implementatie van veranderingen in management accounting systemen verschilt tussen bedrijven. Deze verschillen kunnen verklaard worden door verschillen in de afstand tussen de manager met de bevoegdheid om de verandering door te voeren en degenen die daardoor beïnvloed worden. Binnen gecentraliseerde organisaties is deze afstand groot en daardoor is het optimaal dat deze organisaties (i) alleen grote veranderingen adopteren en de adoptie van kleine veranderingen afwijzen en (ii) vaker top-down implementeren zonder naar lokale informatie te kijken. Recente empirische bevindingen over veranderingen in management accounting systemen ondersteunen deze verwachtingen.