

# Budget ratcheting in museums

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## Abstract

**Purpose** – This study focuses on ratcheting and budget behavior in nonprofit museums. Specifically, the authors examine how performance compared with the budget affects future revenue budgets, and how this differs from the extant literature focused on for-profit organizations. The study focuses specifically on the relationship between museums and their sources of public funding and how this affects how museums prepare budgets.

**Design/methodology/approach** – Based on four years of data covering 97 state-subsidized Danish museums, the authors analyze budget ratcheting using least absolute deviation (LAD) estimations in the form of median regressions.

**Findings** – The authors find that when actual revenue from admission charges is below the budget, the decrease in the following year's budget is greater than the increase in the following year's budget when actual revenue from admission charges is above the budget (i.e. the authors find asymmetrical ratcheting).

**Research limitations/implications** – The findings are based on a specific setting (Danish museums), and the results may not be generalizable to other settings.

**Practical implications** – This study provides insights into the museum sector and other sectors with similar characteristics and contributes to understanding the differences between museums and for-profit organizations when it comes to budgeting. As private-sector management practices are gaining ground in the museum sector, it is important to learn more about budgeting-related issues in this sector.

**Originality/value** – The asymmetrical ratcheting the authors find is the opposite of ratcheting typically found in for-profit organizations. The authors attribute the results to the incentive conflict between museums and their public funding sources. The authors point to the museums' dependence on public funding as an explanation for the results and, thereby, extend the knowledge on ratcheting to organizations with different characteristics than traditional, for-profit organizations.

**Keywords** Budgeting, Nonprofit organization, Museum, Ratcheting, Ratchet principle

**Paper type** Research paper

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## 1. Introduction

Budgeting is one of the most important management accounting techniques and a great deal of research has been published on the topic (Covaleski *et al.*, 2003; Kenno *et al.*, 2018). Most of this research has focused on private-sector companies, but papers on budgeting in the public sector have increased significantly since the 1980s (Anessi-Pessina *et al.*, 2016), where “NPM reforms may have been a golden age for the development of public sector accounting” (Steccolini, 2019, p. 258). However, communication between public sector accounting and other accounting disciplines has been scant (Humphrey and Miller, 2012). Steccolini (2019) suggests that the emphasis on NPM may have contributed to “the insulation of public sector accounting research from other disciplines” (p. 258) and that attention should shift from the public sector as a context for public-sector accounting research towards “publicness” because all organizations are public to a certain extent, as argued by Bozeman (1987).

If we consider publicness as a continuum rather than focusing on the public sector, the role and use of accounting techniques may not differ between public and private companies solely due to, for instance, public or private ownership. At the same time, the differences between

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nonprofit and for-profit organizations should not be neglected, and studies of nonprofit organizations in areas already well-researched in for-profit organizations are valuable. This study examines how actual revenue from admission charges in nonprofit museums compared with budgets affects future budgets. Using ratcheting (Indjejikian *et al.*, 2014b; Weitzman, 1980) and agency theory as the theoretical framework, we focus specifically on revenue budgeting in nonprofit museums receiving public funding.

Generally, budget ratcheting occurs when deviances between actual results and budgets are systematically used to determine the following year's budget (Aranda *et al.*, 2014). When budget targets are used for performance evaluation, budget ratcheting is usually termed "target ratcheting". The "ratchet effect" is defined as the adverse effect on incentives that occurs because targets are based on past performance, which leads self-interested managers to limit their effort (Indjejikian *et al.*, 2014b). A stream of research has focused on target ratcheting and the ratchet effect (e.g. Aranda *et al.*, 2014; Bol and Lill, 2015; Casas-Arce *et al.*, 2018; Chow *et al.*, 1991; Leone and Rock, 2002; Indjejikian *et al.*, 2014a). However, earnings targets play a less prominent role in nonprofit organizations, and, in government entities, the primary focus is on expenditure budgeting (Choi *et al.*, 2021; Lee and Plummer, 2007).

Museums are often nonprofit organizations with several sources of revenue. They generally have earned revenue (e.g. from admission charges or a museum-shop sales), but they may also depend on donations and public funding (e.g. municipal and government grants). Generally, public funding is considered the most stable and predictable, whereas revenue from donations can be highly volatile and less controllable (Carroll and Stater, 2009; Duquette, 2017; Lindqvist, 2012). In Denmark, many museums are state-subsidized (Danish Museum Act, 2014). This implies that they receive government grants, which to some degree depend on the museums' budgets. As the revenue budget for the forthcoming year signals funding needs, a conflict of interest arises because the museums are interested in maximizing funding. Although similar, the incentive problem differs from private companies, where incentive problems are typically related to performance contracts (Milgrom and Roberts, 1992; Murphy, 2000).

In general, research on budgeting in the museum sector is scarce despite the evidence (e.g. Gstraunthaler and Piber, 2012; Wei *et al.*, 2008; Frey and Meier, 2006) of budgets as an utterly important element in the control system of museums. We aim to develop new insights into this area by focusing on a major part of museums' revenue – revenue from admission charges. This focus is strategically relevant not only because of the admission charges themselves but also because funding providers are likely to consider the number of visitors (Johnson and Thomas, 1998).

Our overall research question is the following: How does budget ratcheting differ in museums and for-profit companies? To address this research question, we gained access to financial reporting and budget data from approximately 100 state-subsidized Danish museums from 2015 to 2019. We use median regression estimations to test for ratcheting. Danish state-subsidized museums are well-suited for studying this research question as they are obliged to submit annual budgets and financial reports to the Agency for Culture and Palaces. Consequently, Danish museums are a unique opportunity to gain access to financial data of a whole sector where budget ratcheting can be studied. Especially, budgets for organizations across a sector are traditionally difficult to access.

In addressing the research question, this study contributes to the literature on budget ratcheting (Aranda *et al.*, 2014; Bouwens and Kroos, 2011; Leone and Rock, 2002) in nonprofit organizations (Choi *et al.*, 2021; Lee and Plummer, 2007) by testing budget ratcheting on revenue from admission charges in museums. Our finding that budget ratcheting is present in the Danish museum sector extends our understanding of budget ratcheting in public-sector organizations (Choi *et al.*, 2021; Lee and Plummer, 2007) to other forms of nonprofit organizations. In contrast to the asymmetrical ratcheting found in traditional profit-oriented

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organizations where, usually, the degree of ratcheting is largest following a *positive* deviation (Aranda *et al.*, 2014; Bouwens and Kroos, 2011; Leone and Rock, 2002), we find a larger degree of ratcheting following a *negative* deviation in museums.

Furthermore, we contribute to the literature on public spending on cultural organizations (Maddison, 2004; Getzner, 2022) by examining the budgeting behavior of the organization receiving the funding. Maddison (2004) found that increases in museums' non-grant revenue were related to reductions in future government funding for those museums. We extend this finding by hypothesizing and finding that museums receiving public funding are reluctant to significantly increase budgeted revenue from non-grant revenue as they wish to avoid or minimize reductions in public funding. In this connection, the budget has a signaling function towards state and municipalities that provide public funding. From a policy perspective, our findings suggest that the providers of public funding need to evaluate the museums' financial position based on a longer time horizon, as the budget for the individual year might be affected by this signaling.

Finally, this study provides insights into the museum sector and other sectors with similar characteristics by highlighting the difference in revenue budgeting between this sector and for-profit sectors. These insights contribute to our understanding of the differences between museums and for-profit organizations. This is important, as private-sector management practices are gaining ground in the museum sector (Abdullah *et al.*, 2018; Palumbo *et al.*, 2022).

The remainder of the paper is structured as follows. Section 2 discusses prior research on budget ratcheting and revenue budgeting in museums and presents the hypotheses. Section 3 covers the method and provides information on our sample, while the results are provided in Section 4. Finally, Section 5 concludes the paper.

## 2. Prior research and hypothesis development

### 2.1 Budget ratcheting

Budget ratcheting occurs when deviations between actual and budgeted results are systematically used to determine the following year's budget (Aranda *et al.*, 2014). When a budget is used for performance evaluation, it is treated as a target to be achieved. Consequently, target ratcheting implies that past performance (compared to target) affects future targets (Weitzman, 1980). This follows the informativeness principle, which implies the need to use all information that might reduce the variance of the measurement in the next period (Milgrom and Roberts, 1992). If, for example, this year's revenue budget is EUR 2 million above budget, next year's budget might increase by EUR 1 million if the superior believes that 50% of the performance above target is a signal of a *permanent* improvement in performance. Thus, the degree of ratcheting could be interpreted as a reflection of the degree to which performance deviations are regarded as *permanent* instead of *transitory* (Aranda *et al.*, 2014).

In performance evaluation (e.g. in relation to a compensation plan), the use of prior performance for target-setting may trigger strategic responses from the agent because good performance implies more difficult performance targets in future periods (Milgrom and Roberts, 1992; Murphy, 2000). Such dynamic incentive problems, usually referred to as a "ratchet effect", may lead to accounting manipulation (Leone and Rock, 2002; Murphy, 2000) and holding back of effort (Bouwens and Kroos, 2011; Casas-Arce *et al.*, 2018).

Weitzman (1980) originally described a situation in which performance exceeding a target results in a target increase and prior performance is viewed as a lower bound on the future target. However, empirical testing of target ratcheting (e.g. Leone and Rock, 2002) usually defines ratcheting as a situation in which the positive effect of a positive deviation in performance on future performance targets is greater than the negative effect of a negative

deviation in performance. In other words, target ratcheting is typically assumed to be asymmetrical. Some empirical studies have found asymmetries in target ratcheting (Aranda *et al.*, 2014; Bouwens and Kroos, 2011; Leone and Rock, 2002), while others have not (Anderson *et al.*, 2010; Bol and Lill, 2015). Furthermore, some studies have found that information about prior performance is not fully incorporated into the target-revision process (Indjejikian and Nanda, 2002; Indjejikian *et al.*, 2014a) and that the achievability of targets is serially correlated over time (Indjejikian and Matějka, 2006; Indjejikian and Nanda, 2002; Matějka *et al.*, 2022).

Most studies of target ratcheting, and the ratchet effect have focused on private, for-profit organizations. In these organizations, earnings play a dominant role when setting performance targets, e.g. in executive compensation plans (Murphy, 2000). However, target ratcheting has also been studied in relation to output measures, such as sales (Bouwens and Kroos, 2011) and revenue-to-cost ratios (Bol and Lill, 2015). Research on target ratcheting of performance measures in nonprofit organizations is scarce. The few available studies of this issue include Casas-Arce *et al.* (2018), who studied target ratcheting for various performance measures (e.g. customer satisfaction and process quality) in a governmental employment agency.

In the public sector, balancing budgets (i.e. avoiding overspending by adopting costs to available resources) is often more important than generating a surplus, and budgets are used for planning and resource allocation to a higher degree. In the first study of budget ratcheting in the public sector, Lee and Plummer (2007) focused on expenditure budgeting. Whereas for-profit organizations typically take the revenue budgets as the point of departure for budgeting production, purchasing, hiring, and so on, public-sector organizations focus on expenditure budgeting (Lee and Plummer, 2007) and are constrained by available resources as determined by the revenue budget. Moreover, Lee and Plummer (2007) argued that government administrators and employees have incentives and opportunities to expand their budgets, in contrast to for-profit organizations where “increases in spending without corresponding increases in performance” (p. 137–138) are penalized by market constraints. Using data on Texas school districts, Lee and Plummer (2007) found that the increase in expense budgets in response to overspending was larger than the decrease in response to underspending – that is, they found asymmetrical expense-budget ratcheting. Furthermore, a recent study by Choi *et al.* (2021) on expenditure budgeting in South Korean local governments pointed to an asymmetry in expenditure budget ratcheting in the opposite direction (i.e. the decrease when underspending was larger than the increase when overspending). They also found a relationship between ratcheting in expenditure budgets and bargaining power. Notably, we were unable to find any studies of budget ratcheting in museums.

## 2.2 Public sector budgeting

Research on public sector budgeting dates back almost a century ago (Aleksandrov and Mauro, 2023), and budgeting has, as pointed out by Douglas and Overmans (2020, p. 626), “always been front and center in public organizations and understanding its function is key to shaping government”. One of the dominating theories of public sector budgeting is incrementalism (Reddick and Hassan, 2003; Sebók and Berki, 2017), where the point of departure is that policymakers base the future budgets on the historical cost base and only make minor adjustments (Kelly and Rivenbak, 2008). In a public budgeting process, many interests are at stake. Although several possible alternatives could be evaluated, the decision-makers have limited time and resources to spend on decision-making (Reddick, 2003), and must rely on marginal changes from the resource base (Reddick and Hassan, 2003, p. 357). Some researchers regard incrementalism to be most manifest when changes are small

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(Reddick and Hassan, 2003), while others (e.g. Dempster and Wildawsky, 1979; Reddick and Hassan, 2003) find that incrementalism is not restricted to only small changes but occur when changes are regular.

Focusing on the existing resources and the development of the budget from this point of departure (Wildavsky, 1964), incrementalism is similar to the more formal budget ratcheting mechanism, as budget ratcheting also focuses on the development from a historical basis. However, budget ratcheting determines next year's budget compared to this year's budget, specifically focusing on the degree to which historical budget deviations lead to changes in future budgets. Further, in budget ratcheting, there is no assumption regarding the size of the adjustment, and the focus is on adjustments to the budget and not the actual numbers.

Budget maximization is another widely researched topic within public sector budgeting. As noted by Blais and Dion (1991, p. 3), the book by Niskanen (1971) on budget maximization is "one of the most provocative and debated models of bureaucratic behavior". The central part of Niskanen's (1971) model is the *bureau*, which is defined (Niskanen, 1971, p. 15) as a nonprofit organization "which are financed, at least in part, by a periodic appropriation or grant". An important characteristic of the *bureau* is, furthermore, that neither the owner nor the employees get a part of the profit (as personal income).

The basic idea/assumption of budget maximization is that the head of a bureau will attempt to maximize the budget as faster growth of the bureau is associated with increased likelihood of promotion and higher salary (Blais and Dion, 1991, p. 9). The concept of budget maximization has later been adjusted to mainly focus on the discretionary part of the budget (Blais and Dion, 1991). In a broader perspective, the idea of maximizing the budget is also relevant in museum sector research, where Gstraunthaler and Piber (2007, p. 372) conclude that "[b]asically, the management is interested in increasing the budgets . . ."

### *2.3 Revenue budgeting in museums, culture organizations and nonprofits*

Museums base their activities on a mix of revenue, including earned revenue and public or private contributions (Lindqvist, 2012; Romolini *et al.*, 2020). Several researchers have examined what determines the relative importance of specific sources of revenue. Getzner (2022), for instance, studies how municipalities' size and citizens' socioeconomic characteristics influence municipal spending on cultural activities. In a sample of British museums, Maddison (2004) finds that increases in non-grant revenue are related to reductions in future government funding. However, the increases in non-grant revenue are only partly offset by this reduction, still creating an incentive for museums to increase admission charges (Maddison, 2004). As pointed out by Plaček *et al.* (2021), New Public Management thinking has also affected the museum sector, and based on a study of British museums, Abdullah and Khadaroo (2022) find that the government could reduce grants to museums to motivate them to act more like private businesses. Further, in times of austerity, the municipalities' cultural spending competes with "more immediate needs and requirements" (Håkonsen and Løyland, 2016, p. 520).

Johnson and Thomas (1998, p. 76) note that the objective function of museums depends on the stakeholder in question. For some, the extension and conservation of the collection as well as research into that collection are the most important objectives. Others emphasize the education of the public and maximizing access. The different objectives may conflict. For instance, while an access objective could be maximized through free admission, this would reduce revenue and, thus, the funding available to support other objectives [1]. When looking at optimization from the museums' perspective, Frey and Meier (2006) point out that the nonprofit structure of museums means there are other dimensions than profit to maximize. Specifically, Frey and Meier (2006) emphasize that museum's utility is a function of number of visitors and quality of exhibitions. Therefore, higher grants from the government and the

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municipality will enable a museum to increase its utility by attracting more visitors (e.g. by lowering its prices) or by increasing the quality of its exhibitions. On the other hand, if a cut in public grants results in a financial shortage, it could lead to “a curtailment of necessary programs and direct services” (Grizzle *et al.*, 2015, p. 68). In general, revenue volatility may present a difficult challenge for nonprofit organizations (Duquette, 2017, p. 1143; Lindqvist, 2012). Some have argued that a museum’s funding structure affects decisions aimed at cutting costs and generating revenue (Camarero *et al.*, 2011; Frey and Meier, 2002), and that revenue volatility is associated with greater savings intensity (Core *et al.*, 2006; Duquette, 2017; Fisman and Hubbard, 2005) with the goal of maintaining a consistent level of service (Hansmann, 1990).

#### 2.4 Hypothesis development

Our first hypothesis on budget ratcheting in museums reflects a standard hypothesis regarding ratcheting found in previous research (Bol and Lill, 2015; Weitzman, 1980). This mechanism was defined by Weitzman (1980), who, in his description of the phenomenon, only focused on positive deviations, and assumed that a positive deviation from the target in year  $t-1$  would be followed by an increase of the target in year  $t$  (compared to the target in year  $t-1$ ). Subsequent research (e.g. Bol and Lill, 2015) also focused on the possibility of negative deviations from the target in year  $t-1$  being followed by a decrease of the target in year  $t$  (compared to the target in year  $t-1$ ). As emphasized in section 2.1, some studies found that the degree of ratcheting was of the same absolute size for positive and negative deviations, i.e. with no asymmetry between the effect of negative and positive deviations. In contrast, other studies found an asymmetry as positive deviations were followed by an increase larger than the decrease for negative deviations.

In the first hypothesis, we follow a broad definition of ratcheting (Aranda *et al.*, 2014, p. 1198) and include negative and positive deviations with no assumptions regarding asymmetry. Even though the description of ratcheting in Weitzman (1980) only focused on positive deviations, his formula allowed for negative deviations with a symmetric response. Therefore, we include the possibility of a negative budget deviation in year  $t-1$  being followed by a decrease in the budget in year  $t$  (compared to the target in year  $t-1$ ). In this way, our first hypothesis could be regarded as a test of the original ratcheting formula as it was formulated by Weitzman (1980). Accordingly, the basic hypothesis is that museums will use historical performance information to set the budget for revenue from admission charges for the coming year—that is, there will be some degree of ratcheting in their revenue budgets.

*H1.* A positive (negative) deviation in revenue from admission charges this year is followed by an increase (decrease) in the budgeted revenue for next year.

Most museums are nonprofit organizations that, besides earned revenue (e.g. from admission charges), are highly dependent on donations and public funding (e.g. municipal and government grants). Generally, public funding is considered the most stable and predictable, while revenue from donations can be highly volatile and less controllable (Carroll and Stater, 2009; Duquette, 2017). Donations typically come from charitable foundations and are largely based on the museum’s ability to argue for the use and relevance of the funding (e.g. the use of the funding to buy an expensive painting that could complement the museum’s collection). The extent of public funding is based on political decision-makers’ willingness to support the museum’s activities. As always, prioritizing across policy areas and between museums is necessary, and the museums compete for public funding (Johnson and Thomas, 1998; Romolini *et al.*, 2020).

In Denmark, the public funding of museums has been a topic of discussion, and a museum reform has been announced (in December 2022). Discussions on the public funding of



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museums have focused on the balance between the museums' earned revenue and public funding, and whether some museums with high earned revenue are "punished" (i.e. receive less public funding). As pointed out by [Abdullah and Khadaroo \(2022\)](#), the grants to museums could be cut to motivate them to act more like private businesses and increase their earned revenue. Thus, a battle for public funding is part of running a museum and earned revenue from admission charges is part of that battle. From a museum's viewpoint, the fear is that higher earned revenue from admission charges will, to some degree, be offset by lower public funding, in line with [Maddison \(2004\)](#). At the same time, the museum would prefer more revenue from admission charges in order to fund more activities. Thus, the dilemma for the museums is how to increase earnings without public funding being reduced.

One reason for the public funding of museums is that these organizations undertake tasks on behalf of the public and these activities need public funding. Thus, as in [Prieto-Rodriguez and Fernández-Blanco's \(2006\)](#) model, the museums can be seen as agents, and the state and municipalities can be seen as principals. In line with budget maximization theory, we assume that the museum is interested in maximizing public funding and simultaneously increasing earnings from admission charges. Therefore, museums have incentives to signal that a positive budget deviation in admission charges in the current year is transitory so that the need for public funding in the future remains. This signaling is done by adjusting next year's budget by only a small fraction of this year's positive budget deviation. Moreover, if there is a negative budget deviation in revenue from admission charges in the current year, the museum's incentive will be to signal that this is permanent, suggesting that more funding will be needed in the future.

This signaling is done by adjusting next year's budget by a larger fraction (compared to the fraction in the situation with a positive budget deviation) of this year's negative budget deviation. In other words, we propose an asymmetrical ratcheting in which the decrease in budgeted revenue in year  $t$  (following a negative budget deviation in year  $t-1$ ) will be greater than the increase in budgeted revenue when a positive deviation occurs in year  $t-1$ . This leads to the following hypothesis.

- H2.* In a museum receiving public funding, the decrease in next year's budgeted revenue from admission charges when this year's actual revenue from admission charges is below this year's budget is greater than the increase when this year's actual revenue from admission charges is above this year's budget.

When targets are used in performance evaluations, the use of target ratcheting creates dynamic incentive problems ([Milgrom and Roberts, 1992](#); [Murphy, 2000](#)) that may be associated with accounting manipulation ([Leone and Rock, 2002](#); [Murphy, 2000](#)) and the holding back of effort ([Bouwens and Kroos, 2011](#); [Casas-Arce et al., 2018](#)). In this regard, [Bouwens and Kroos \(2011\)](#) show that managers with favorable performance variation reduce their sales efforts to mitigate the increase in next-year sales targets. Such dynamic incentive problems may be less important in our dataset. Even if managers wished to reduce revenue from admission charges at the end of a period, they would have limited possibilities for covert actions. Finally, the number of visitors is considered an important performance measure. It is reported to the Agency of Culture and Palaces and is often included in the non-financial performance reports submitted to the museums' boards. Consequently, we expect revenue-budget ratcheting to be less likely to have an adverse incentive effect in the form of a ratchet effect.

### 3. Research setting and data

#### 3.1 Danish state-subsidized museums

The Danish museum sector comprises various organizations that research, collect, register, conserve, interpret, and exhibit tangible and intangible heritage in the service of society.

Although five Danish museums are state owned, most museums are organized as nonprofit organizations owned by a local authority or an independent institution. In total, 97 “state-subsidized” museums received grants from the state and municipalities under the [Danish Museum Act \(2014\)](#). [Table 1](#) provides an overview of descriptive data for the final sample.

Of the state-subsidized museums, 16 were owned by municipalities and 4 by a museum association. The remaining 77 were organized as self-governing institutions ([Agency of Culture and Palaces, 2018](#)). In terms of focus areas, 58 were cultural-history museums, 27 were art museums, and the rest focused on natural history or a mixture of the above-mentioned categories. The museums varied considerably in size, with the largest and smallest of the museums having 658,000 and 6,500 visitors, respectively, in 2017 (the number of visitors is not available in the dataset). In the dataset, revenue from museum admission charges averaged EUR 616,000 in 2018 but with considerable variation. The highest revenue from admission charges was EUR 5.3 million. A few museums offered free admission and, therefore, had no revenue from admission charges. The lowest reported revenue from a museum with admission charges was around EUR 6,500.

When state-subsidized museums are eligible for government grants, the museum assumes responsibility for a specific area within the national museum network. Furthermore, according to the [Danish Museum Act \(2014\)](#), state-subsidized museums must fulfill several conditions to obtain grants, including a requirement to submit annual budgets and financial reports to the grants’ main contributors and to the Agency for Culture and Palaces.

### 3.2 The dataset

The data is based on reports submitted by the 97 *state-subsidized museums* to the Agency for Culture and Palaces. The dataset contains budgets from 2015 to 2019 and actual figures from 2015 to 2018, giving us four years of data to test the hypotheses. We have five years of revenue budgets (2015–2019) and four years of realized revenues (2015–2018), which gives 388 museum-years in which the ratcheting of revenue budgets can be analyzed (see [Table 2](#)).

Four museums offer free admission and have no revenue from admission charges. We did not include these museums in the dataset for analysis. Furthermore, as the data is reported

**Table 1.**  
Descriptive data for the final sample (data only from 2018 in 1,000 EUR)

	#	Average	Q1	Median	Q3
Total revenue	–	3,798	1,088	1,932	4,803
Revenue from admission charges	–	616	48	135	557
Number of art museums	27	–	–	–	–
Number of cultural-history museums	58	–	–	–	–
Number of mixed/other	12	–	–	–	–
Number of observations	347	–	–	–	–

**Source(s):** Authors’ own creation

**Table 2.**  
Formation of final dataset

	# Museum	# Years	# Museum years
Total number of state-subsidized Museums	97	4	388
No admission fee	4	4	16
Missing data/entry error	8	Between 1 and 3	12
Merger/restructuring, etc.	8	Between 1 and 4	13
Museum years in the final dataset			347

**Source(s):** Authors’ own creation



accounting and budget data, data-entry errors can occur, and some data points are missing. If the actual or budgeted data for a given year was missing or was a clear error, we removed that museum-year, while retaining the museum's data for the remaining years in the dataset. Twelve museum-years were not included in the analysis for these reasons. Furthermore, during the focal years, some museums merged, demerged, rebuilt, expanded or restructured in other ways. As each museum-year consists of budgeted and actual revenue for year  $t-1$  and budgeted revenue for year  $t$ , the museum needed to be substantially the same in year  $t$  as in year  $t-1$  to be included. In line with this principle, 13 museum-years were not included in the dataset. All in all, we had 347 museum-years for analysis.

### 3.3 Measurement of variables

The measures used in this study focus on revenue from admission charges, and our dataset contains both the budgeted and actual figures. Our dependent variable is the change in budgeted revenue (admission charges) from year  $t-1$  to  $t$ . We follow [Aranda et al.'s \(2014\)](#) procedure and measure this change as the relative budget change (dividing the change by the budget in year  $t-1$ ). We calculate the revenue budget deviation in year  $t-1$  by subtracting the actual and budgeted figures as the independent variables. We also measure this variable as the relative deviation by dividing it by the budget in year  $t-1$ . We include a dummy variable, *Fail*, which indicates whether the budget deviation in year  $t-1$  is negative (1) or zero/positive (0). Finally, we model the interaction term by multiplying the relative budget deviation by this dummy variable to test the asymmetry. All these measures are standard ways of measuring these variables in previous studies of ratcheting even though they are not always measured relatively (i.e. by dividing with budgeted revenue) (see [Table 3](#)).

We also include several control variables chosen for this specific setting. The natural logarithm of revenue measures size, as this indicates a museum's activity level. Size is an important control variable due to the heterogeneity of our sample (and is also used by [Indjejkian et al. \(2014a\)](#) who also has a dataset with large heterogeneity). The profit margin is measured as net profit divided by total revenue, and this is included as a control variable as [Indjejkian et al. \(2014a\)](#) found that profitability could have an impact on ratcheting [2]. The importance of revenue from admission charges is measured by taking revenue from admission charges and dividing it by total revenue, and is included as a proxy of financial autonomy. Finally, the type of museum is measured using variables indicating art history, cultural inheritance or others. We also include indicator variables to test for year-fixed effects.

Variable	Description
$(B_t - B_{t-1})/B_{t-1}$	- Relative change in the budgeted revenue from admission charges from year $t-1$ to year $t$
$(A_{t-1} - B_{t-1})/B_{t-1}$	- Relative deviation between actual and budgeted revenue from admission charges in year $t-1$
$Fail_{t-1}$	- Dummy variable (1 if the entity failed to meet the budget in year $t-1$ and 0 otherwise)
$Fail_{t-1} \times (A_{t-1} - B_{t-1})/B_{t-1}$	- Interaction term
Year fixed effects	- Dummy variable indicating year (2015, 2016, 2017 or 2018)
Art/cultural history	- Dummy variable indicating art history, history or other
$\ln Size_{t-1}$	- The natural logarithm of revenue from admission charges
Revenue share $_{t-1}$	- Revenue from admission charges divided by total revenue
Profit margin $_{t-1}$	- Net profit divided by total revenue

**Source(s):** Authors' own creation

**Table 3.**  
Description of  
variables

4. Results and discussion

4.1 Descriptive evidence

Table 4 presents descriptive statistics for the sample of museums. The average share of revenue from admission charges is 11.3% and the average profit margin is -0.1%, indicating that the state-subsidized museums act as nonprofit organizations. The budgeted revenue increases by around 9% per year. Meanwhile, the average deviation of actual revenue from budgeted revenue is approximately 14%, indicating the bias of the museums' budgeting being on the conservative side in general. Furthermore, the mean of the *Fail* variable is 0.35, indicating that a majority of the museums meet or exceed the revenue budget. Alternatively, if we had interpreted the budgeted revenue as a target, these targets would, on average, be relatively easy to achieve, similar to the results based on earnings targets within the private sector, where most studies indicate that earnings targets are generally easy to meet (e.g. Merchant and Manzoni, 1989; Matějka et al., 2022).

Table 5 presents the correlations between the variables. It shows a positive correlation between revenue-budget deviations and future budget revisions ( $p < 0.01$ ), indicating

	Mean	Std. Dev	Q1	Median	Q3
Panel A: Measures in the model					
$(B_t - B_{t-1})/B_{t-1}$	0.09	0.28	-0.01	0.03	0.15
$(A_{t-1} - B_{t-1})/B_{t-1}$	0.14	0.39	-0.06	0.09	0.26
$Fail_{t-1}$	0.35	0.48	0.00	0.00	1.00
$\ln Size_{t-1}$	13.77	1.64	12.58	13.66	15.02
Revenue share $_{t-1}$	11.3%	10.5%	4.1%	7.9%	16.5%
Profit margin $_{t-1}$	-0.1%	15.1%	-0.2%	0.3%	1.8%

**Note(s):** Variable definitions

$(B_t - B_{t-1})/B_{t-1}$  is the budget revision from the previous year to this year scaled by the previous year's budget;  $(A_{t-1} - B_{t-1})/B_{t-1}$  is the deviation from the budget in the previous year scaled by the previous year's budget;  $Fail_{t-1}$  is a dummy variable indicating whether prior year's budget was met (1 if it was not met and 0 otherwise);  $\ln Size_{t-1}$  is the natural logarithm of revenue from admission charges in the previous year; Revenue share $_{t-1}$  is the revenue from admission charges in the previous year; Revenue share $_{t-1}$  is the revenue from admission charges divided by total revenue; Profit margin $_{t-1}$  is the total profit in the previous year; Profit margin $_{t-1}$  is the profit divided by total revenue

**Source(s):** Authors' own creation

**Table 4.**  
Descriptive statistics

	$(B_t - B_{t-1})/B_{t-1}$	$(A_{t-1} - B_{t-1})/B_{t-1}$	$Fail_{t-1}$	$Size_{t-1}$	Revenue share $_{t-1}$	Profit margin $_{t-1}$
$(B_t - B_{t-1})/B_{t-1}$	-					
$(A_{t-1} - B_{t-1})/B_{t-1}$	0.618***	-				
$B_{t-1}$						
$Fail_{t-1}$	-0.361***	-0.567***	-			
$\ln Size_{t-1}$	-0.013	-0.044	-0.066	-		
Revenue share $_{t-1}$	-0.014	-0.012	-0.076	0.743***	-	
Profit margin $_{t-1}$	0.019	0.028	0.005	0.051	0.055	-

**Note(s):** Variable definitions: see note to Table 4

\*, \*\*, and \*\*\* denote significance at the 0.1, 0.05, and 0.01 levels (two sided), respectively

**Source(s):** Authors' own creation

**Table 5.**  
Correlations

possible revenue-budget ratcheting. Moreover, size is positively and significantly correlated with revenue share ( $p < 0.01$ ), indicating that larger (versus smaller) museums have a higher proportion of their revenue from admission charges.

#### 4.2 Ratcheting of budgeted revenue

The point of departure for the analysis is the standard target-ratcheting model (Weitzman, 1980) developed for a revenue target, where a target revision is a linear function of the prior period's actual revenue relative to budgeted revenue:

$$B_{i,t} - B_{i,t-1} = \mu + \beta_1 (A_{i,t-1} - B_{i,t-1}). \quad (1)$$

In Equation (1),  $B_{i,t}$  is the budgeted revenue for museum  $i$  for next year,  $B_{i,t-1}$  is the budgeted revenue for the current year,  $A_{i,t-1}$  is the actual revenue for the current year,  $\mu$  is an independent growth term, and  $\beta_1$  is the ratcheting coefficient, which reflects the extent to which a positive deviation from budgeted revenue is followed by an upward revision the following year.

In line with Aranda *et al.* (2014), we measure the change in budgeted revenue and the deviation in budgeted revenue as the relative budget change and deviation, respectively (i.e. by dividing the change and the deviation by the budget in year  $t-1$ ). Accordingly, Equation (1) can be written as Equation (2) to test H1:

$$(B_{i,t} - B_{i,t-1})/B_{i,t-1} = \mu + \beta_1 (A_{i,t-1} - B_{i,t-1})/B_{i,t-1} + \varepsilon_{i,t}. \quad (2)$$

As we employed four years of data, we followed Bol and Lill (2015) and included three indicator variables,  $\text{Year}_j$  ( $j = 2016, 2017, 2018$ ), to control for year fixed effects. Furthermore, we included control variables for size (the natural logarithm of revenue), profit margin (net profit/total revenue), the type of museum (art history, history or others), and the importance of revenue from admission charges (measured as revenue from admission charges divided by total revenue). Finally,  $\varepsilon_t$  is the zero-mean normally distributed i.i.d. shocks independent of the other variables.

To test H2, we followed Leone and Rock (2002) and Bouwens and Kroos (2011), and modified Equation (2) to allow for asymmetrical budget adjustment depending on the sign of the deviation. Therefore, we included  $\text{Fail}_{i,t-1}$  as a dummy variable indicating whether the entity failed to meet the budgeted revenue [3]. We included an interaction term that multiplied  $\text{Fail}_{i,t-1}$  with the budget deviation in year  $t-1$ . Accordingly, we used the following model to test H2:

$$(B_{i,t} - B_{i,t-1})/B_{i,t-1} = \mu + \beta_1 (A_{i,t-1} - B_{i,t-1})/B_{i,t-1} + \beta_2 \text{Fail}_{i,t-1} + \beta_3 \text{Fail}_{i,t-1} (A_{i,t-1} - B_{i,t-1})/B_{i,t-1} + \varepsilon_{i,t}. \quad (3)$$

In Equation (3),  $\beta_1$  is the ratcheting coefficient that indicates the sensitivity of upward budget revisions to performance exceeding the budget in the previous year. Simultaneously,  $\beta_1 + \beta_3$  is the sensitivity of downward budget revisions to performance falling short of the budget in the previous year.

When studying ratcheting in earnings targets in for-profit organizations, it is usually expected that  $\beta_1 > \beta_1 + \beta_3$  (i.e. the ratcheting is larger upward than downward) because of a negative coefficient for the interaction term, that is,  $\beta_3 < 0$  (Bol and Lill, 2015; Leone and Rock, 2002). If the museums act as proposed in H2, we expect the opposite (i.e.  $\beta_3 > 0$  and  $\beta_1 < \beta_1 + \beta_3$ ).

While one strength of the study lies in the fact that the whole industry is analyzed, the comprehensiveness of the dataset implies that the museums vary considerably in size, as

explained in [section 3](#). For instance, some museums are very small, such that when budget deviations are measured relatively (i.e. in percent), smaller museums might have substantial deviations owing to a single successful exhibition. As in the study by [Indjejikian et al. \(2014a\)](#), the heterogeneity creates some influential outliers that can make ordinary least squares inappropriate to use ([Greene, 2020](#)). Therefore, we follow the procedure in [Indjejikian et al. \(2014a\)](#) and use least absolute deviation (LAD) estimation in the form of a median regression, as this method is more robust to outliers ([Greene, 2020](#)). The results of this regression are shown in [Table 6](#). The first column shows the results for [H1](#) and the second column for [H2](#).

As shown in the first column in [Table 6](#), the pseudo-R-squared is 0.167 and we find support for [H1](#). Thus, we find evidence of budget ratcheting in museums, as  $\beta_1$  is positive and significant ( $p < 0.01$ ). In the next column in [Table 6](#), we show the test of [H2](#). We have a pseudo-R-squared of 0.174 and we find evidence of ratcheting, as  $\beta_1$  is positive and significant ( $p < 0.01$ ). The coefficient of 0.31 indicates that a 10% positive deviation from budgeted revenue in year  $t-1$  leads, on average, to a 3.1% increase in year  $t$ . In testing [H2](#), we look at the interaction term to determine whether the budget ratcheting is asymmetrical. The interaction term's coefficient ( $\beta_3$ ) is positive and significant ( $p < 0.01$ ), which supports [H2](#). Thus, we find support for museums having a special kind of asymmetry, as budget ratcheting is more pronounced for museums that failed to achieve their budgeted revenue in the previous year. The coefficient of the interaction term is 0.30. This indicates that a negative deviation of 10% decreases next year's budget by 6.1% (3.1% and 3.0% based on  $\beta_1$  and  $\beta_3$ , respectively).

#### 4.3 Robustness check

Despite the highly significant results, a few critical remarks are warranted. First, it should be noted that the pseudo-R-square is around 0.17 in [Table 6](#), which is acceptable compared to other papers on ratcheting using a similar approach and having a heterogeneous dataset (e.g. [Indjejikian et al., 2014a](#)). It should also be noted that the coefficients represent “average budget behaviour”. Individual museums base their budgets on many parameters besides historical performance. This could, e.g. be planned exhibitions (or a year without any major exhibitions) or other activities initiated in the coming year to raise the number of visitors. This may also explain why the R-square is not higher than it is. Furthermore, due to the heterogeneity of the dataset, it cannot be ruled out that there are museum characteristics that should be included in the analysis but are left out as we simply do not have the data. We elaborate further on these issues in the concluding section, and below, we make an additional robustness check of our results.

	$(B_t - B_{t-1})/B_{t-1}$	$(B_t - B_{t-1})/B_{t-1}$
Constant	0.014	-0.032
$(A_{t-1} - B_{t-1})/B_{t-1}$	0.331***	0.312***
Fail $_{t-1}$		0.034
Fail $_{t-1}$ x $(A_{t-1} - B_{t-1})/B_{t-1}$		0.301***
Year fixed effects	Included	Included
Art/cultural history	Included	Included
$\ln\text{Size}_{t-1}$	-0.001	0.003
Revenue share $_{t-1}$	0.001	0.000
Profit margin $_{t-1}$	0.000	0.000
Pseudo $R^2$	0.167	0.174
Number of observations	347	347

**Table 6.**  
Test of target  
ratcheting

**Note(s):** Variable definitions: see note to [Table 4](#)

\*, \*\*, and \*\*\* denote significance at the 0.1, 0.05, and 0.01 levels (two sided), respectively

**Source(s):** Authors' own creation

We also ran an ordinary least squares regression (OLS) instead of LAD estimation as a robustness check. As OLS is less robust to outliers, we removed the largest budget deviations and budget adjustments, by deleting museum-years with budget deviations or budget adjustments larger than 75% (in both the positive and negative directions). The rationale for this procedure is that large deviations and adjustments can be due to unusual circumstances or errors.

A negative budget change or deviation has a maximum of 100%, whereas there is no maximum for a positive deviation or adjustment. Therefore, we chose a 75% deviation as the criterion, as it is large enough to include a major part of the museums in the analysis. After deleting the outliers, we had 326 museum-years in the dataset (instead of 347). When running the OLS regression (not tabulated), we obtained nearly the same results as our median regression estimation in Table 6. To test the cut-off point's robustness, we also ran the OLS regression with a cut-off of 50% and found that all conclusions remained robust.

#### 4.4 Additional analysis

It cannot be expected that the degree of ratcheting of the budgeted revenue from admission charges is equal across museums. Some museums are large, with many visitors; some are smaller, with fewer visitors. In some cases, smaller museums also have a lower entrance fee due to differences in the attractiveness of their exhibitions. Thus, the balance between different revenue streams might differ among museums. Further, some museums are highly autonomous from a financial perspective and have a high proportion of revenue from admission charges compared to their total revenue, and some have only small revenue from admission charges compared to their total revenue.

When the proportion of revenue from admission charges is high (a proxy for being highly financially independent), we expect that the focus on this revenue stream will be higher also from state and municipality. Therefore, the awareness of the museum regarding the signal of the budget is expected to be higher when the proportion of revenue from admission charges is high and, accordingly, the asymmetric ratcheting, proposed in hypothesis 2 is expected to be more pronounced for museums with a high proportion of revenue from admission charges compared to museums with a low proportion of this.

We have examined the effect of the revenue share by splitting the dataset in two around the median of the revenue share measure and running the regression (Equation 3) for the two groups separately. The two groups are presented in Table 7, labeled as low and high revenue share, respectively. The results show that for the low revenue share group,  $\beta_1$  is positive and

	High	Low
Constant	-0.068	0.265
$(A_{t-1}-B_{t-1})/B_{t-1}$	0.311***	0.402***
$Fail_{t-1}$	0.015	0.044
$Fail_{t-1} \times (A_{t-1}-B_{t-1})/B_{t-1}$	0.323***	0.104
Year fixed effects	Included	Included
Art/cultural history	Included	Included
$\ln Size_{t-1}$	0.003	-0.007
Revenue share $_{t-1}$	0.000	-0.009
Profit margin $_{t-1}$	-0.002	0.000
Pseudo $R^2$	0.224	0.163
Number of observations	173	174

**Note(s):** Variable definitions: see note to Table 4

\*, \*\*, and \*\*\* denote significance at the 0.1, 0.05, and 0.01 levels (two sided), respectively

**Source(s):** Authors' own creation

**Table 7.**  
Test of target  
ratcheting in high/low  
revenue share group

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significant ( $p < 0.01$ ), but  $\beta_3$  (the interaction term) is insignificant. For the high revenue share group,  $\beta_1$  is positive and significant ( $p < 0.01$ ), and  $\beta_3$  (the interaction term) is positive and significant ( $p < 0.01$ ). This indicates that the asymmetric ratcheting appears significant only in the “high revenue share” group. Meanwhile, for the “low revenue share” group, the symmetry implies that the negative/positive budget deviations affect the change in next year’s budget with the same negative/positive amount. This additional test should, however, be interpreted with caution as the power of the test lowers when we split the dataset.

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## 5. Conclusions

This study examined revenue budgeting in nonprofit museums. The empirical part of the paper was based on four years of data on budgeted and actual revenue from admission charges for Danish museums. We tested for revenue-budget ratcheting, focusing on the asymmetry between organizations reaching their budgeted revenue from admission charges and those failing to achieve the budget. All in all, we had 347 data points and we found support for the two hypotheses. First, we tested for and found budget ratcheting. Moreover, when testing for asymmetry, we found that the ratcheting was higher for organizations that failed to reach their budgeted revenue from admission charges. Notably, this asymmetry is opposite to that typically found in studies of incentive contracts in for-profit organizations.

To our knowledge, this study is the first to test budget ratcheting in museums; thus, we contribute by enhancing our understanding of budget ratcheting in public-sector organizations (Choi *et al.*, 2021; Lee and Plummer, 2007) to other types of nonprofit organizations. We find a different asymmetry in museums than in more traditional profit-oriented organizations (Aranda *et al.*, 2014; Bouwens and Kroos, 2011; Leone and Rock, 2002; Matějka *et al.*, 2022). Furthermore, additional analysis shows that this asymmetric ratcheting is only significant in museums that are more financially autonomous (measured by the proportion of their revenue from admission charges). Thus, we extend previous knowledge on budget ratcheting to organizations with characteristics different from those of traditional for-profit organizations. This contribution is of value to these organizations (i.e. museums and similar organizations). It also suggests that the mixed evidence on asymmetry found in the literature (Bol and Lill, 2015) could result from sector-specific characteristics. Thus, future research on target ratcheting (including asymmetry) could add value by focusing on different industries with various characteristics. As the ratcheting literature is limited regarding the public sector and in types of other nonprofit organizations, future research could focus more on ratcheting in these organizations. Also, qualitative studies (e.g. comparative case studies) of ratcheting could be of value to gain a deeper understanding of the effect of sector-specific characteristics.

In addition, this study contributes to the literature on public spending on cultural organizations (Maddison, 2004; Getzner, 2022) by looking at budgeting behavior among organizations receiving those funds. Maddison (2004) found that increases in museums’ non-grant revenue were related to a reduction in future government funding. This reduction only partly offset the increased non-grant revenue, thus still leaving incentives to increase non-grant revenue. However, at the time of budgeting, the receiving organizations will be motivated to try to avoid a cut in public funding. We extend Maddison’s (2004) finding by showing that museums receiving public funding will be reluctant to indicate a too large increase in budgeted revenue from non-grant revenue. In this way, we suggest that budgets can also function as a signaling instrument towards those allocating grants to museum/nonprofit organizations in addition to the functions of budgeting normally mentioned in the literature on public sector budgeting (Douglas and Overmans, 2020). Following this line of reasoning, we suggest that future research should focus on ratcheting in cost budgets. Nonprofit organizations could have an incentive not to signal a surplus profit as a surplus



could be seen as a sign of their income from grants being too high. To maximize future budgets, museums could have an incentive to incur extra costs at the end of the year to spend any additional income to avoid a cut in their public funding.

The study offers insights into budgeting in the museum sector (and other sectors with similar characteristics) by pointing out the differences in revenue budgeting between this sector and those usually researched. We argue that the characteristics of organizations in this sector—that is, nonprofits with public funding—creates an agency problem, as the budgeting of revenue is influenced by the desire to avoid a cut in public funding. This insight contributes to the understanding of the differences between the museum sector and for-profit organizations. This is important because typical for-profit management practices are gaining more ground in arts organizations (Abdullah *et al.*, 2018; Palumbo *et al.*, 2022). Thus, the insights we provide into how the museum sector differs from or is similar to other industries represent a practical contribution. From a policy perspective, this also indicates that decisions regarding public funding of museums need to be based on financial performance at a longer time horizon than the individual year.

Future research could also examine the factors behind the effect we observe in this study. Could it be that the effect is (partly) dependent on the power of the municipal finance department? How about the background of the management and board of the museums? Will a board with a majority of members with a background from traditional for-profit organizations be more likely to have a budget behavior like the one traditionally seen in the ratcheting literature (i.e. a positive coefficient for the interaction term)?

The results are subject to certain limitations. First, our empirical findings are based on a specific setting, such that our results may not be generalizable to other settings. While we argue that the results can primarily be explained by the museums' characteristics of being nonprofit while obtaining revenue from municipal and government grants as well as more commercial activities (e.g. admission charges, cafés, museum shops), future research could test similar hypotheses in nonprofit organizations outside the museum sector. However, we expect our findings to at least be generalizable to other cultural organizations receiving public funding while having revenue from ticket sales, such as other art organizations (e.g. concert halls and venues). Swimming pools and sports halls receiving public funding could also be examples of organizations with similar characteristics.

Moreover, the analysis is based on the financial reports submitted by the museums to the Danish Agency for Culture and Palaces. As such, another limitation could be possible reporting errors in the dataset. Some erroneous data may have been removed as outliers, but we cannot ensure that all remaining data was reported correctly. Furthermore, budgets are prepared and reported at the end of the year but before year-end. The museums have an indication of the actual revenue and budget balancing for the current year when they prepare their budgets. However, they do not know the exact deviation for the year, which will create noise when determining the effect of ratcheting. A final limitation regarding the dataset should also be mentioned. Even though our dataset contains more than 300 data points, the statistical power lowers when we split the dataset into different subcategories. This limits our ability to test our hypotheses on different subgroups of our dataset, e.g. cultural museums vs. history museums, to gain a deeper understanding of the generalizability of our findings.

## Notes

1. The [Danish Museum Act \(2014\)](#) describes the government's expectations. Thus, in principle, it specifies the objective function for the state's funding. See [section 3.1](#) for more information on state-subsidized Danish museums.
2. The authors are aware that profit margin is normally measured as EBIT divided by net sales, but in a non-profit museum, the authors find it more appropriate to use net profit.

3. Even though some studies leave out the main effect regarding the Fail-variable, the authors have followed [Hartmann and Moers \(1999\)](#) who argue that it is a common mistake in moderated regression analysis to leave out this variable as there will be a risk that the regression will show the presence of an interaction effect even though this is caused by the main effect. The authors therefore include the main effect regarding the Fail-variable.

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