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Ewens, H.; Voet, J. van der

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Organizational complexity and participatory innovation: participatory budgeting in local government

Hendrik Ewens and Joris van der Voet

Institute of Public Administration, Leiden University, Den Haag, Netherlands

ABSTRACT

In this study, we examined the relationship between organizational complexity and the adoption of participatory innovation in German municipal government. We proposed that organizations with more complex organizational structures are more likely to adopt participatory innovation. We investigated municipalities (N = 394) of the German state of North Rhine-Westphalia and used participatory budgeting as an indicator for innovation. Our results indicate that organizational complexity expressed by functional differentiation has a positive relationship with the occurrence of participatory innovation. The results inform a debate about the value trade-offs that are inherent to the structural design of public organizations.

KEYWORDS Innovation; organizational complexity; functional differentiation; participatory budgeting; local government

Introduction

Scholars and practitioners of public management have a growing interest in innovative public services that consist of the collaboration between public organizations and external actors (Crosby, 't Hart, and Torfing 2017; Torfing 2018; Wegrich 2019). This interest especially concerns the participation of citizens in the innovation process (Voorberg, Bekkers, and Tummers 2015). Not only might the outcome of such participation be innovative, this participatory process is in itself a new way for public organizations to execute their tasks. However, the view of an innovative public organization contradicts the general opinion that the public sector is slow, rigid, and less innovative compared to the private sector (Raadschelders and Vigoda-Gadot 2015). The view that public organizations are incapable of generating and adopting innovations has been explained by the absence of competition and economic incentives for innovation, the political plurality that characterizes public organizations, and the bureaucratic organizational structures that typically characterize public organizations (Damanpour 1991; Wynen, Verhoest, and Kleizen 2017). Indeed, authors of reviews of the empirical literature have identified the organizational structure as a central antecedent of the occurrence of innovation in public organizations (Jakobsen and Thrane 2016). This is in accordance with findings from authors of research in the private sector (Damanpour 1991). However, scholars have debated whether the elaborate organizational structure of public organizations enable or

CONTACT Joris van der Voet j.van.der.voet@fgga.leidenuniv.nl

constrain innovation (Jakobsen and Thrane 2016). On the one hand, public organizations are recognized as bureaucratic organizational structures with high degrees of standardization and formalization, which harm the adoption of innovation. This is contrasted by findings of scholars who have stated that complex organizational structures can facilitate innovation, because they increase specialization within organizational units and cross-fertilization between those units (Aiken and Hage 1971; Damanpour 1991, 1996). In their literature review, Jakobsen and Thrane (2016) discussed how several elements of organizational structure are related to innovation in public organizations. However, according to the authors, organizational complexity has not been empirically examined as an antecedent of innovation in the public sector. The main focus of authors in the reviewed studies is on centralization, formalization, and specialization (Jakobsen and Thrane 2016), whereas authors of management studies about private sector organizations also include organizational complexity as a relevant antecedent of innovation (Aiken and Hage 1971; Damanpour 1991). Thus, authors of public management research on the structure-innovation relationship seem to have overlooked organizational complexity as an explanatory factor for the adoption of innovation.

Organizational complexity consists of two dimensions: functional differentiation and organizational size (Damanpour 1996). From prior research, one could expect that a more complex organizational structure leads to a higher likelihood of innovation adoption. First, complex organizations are often larger and thus have more resources that can be used for the creation and adoption of innovation (Damanpour 1992, 1996). Second, they tend to be more differentiated, which promotes expert knowledge and cross-fertilization of this knowledge among experts (Aiken, Bacharach, and French 1980; Damanpour 1996). Empirical findings from Damanpour (1996) in a private sector context indicate a positive relationship between organizational complexity and innovation. Nevertheless, empirical evidence of this relationship is limited in a public context and further investigations are needed in order to support this argument. The empirical evidence is limited concerning participatory innovation, a type of innovation that has been increasingly prevalent in the public sector in recent years (Geissel 2009; Schneider and Busse 2018). Therefore, we investigated how organizational complexity is related to the occurrence of participatory innovation in public organizations. The main research question is to what extent does organizational complexity affect the adoption of participatory innovation in public organizations?

We aimed to contribute to the literature in several ways. First, we generated empirical evidence regarding the relationship between organizational complexity and innovation. In doing so, we used a disaggregated approach in which the effects of functional differentiation and organizational size are disentangled. The relationships of both dimensions with innovation rely on different mechanisms. Organizational size is expected to enhance innovation because larger organizations possess a greater amount of resources, whereas functionally differentiated organizations are innovative because they have a greater variety as well as cross-fertilization of different resources and ideas. Although the two dimensions are distinguishable and affect innovation through different mechanisms, organizational size and functional differentiation are not independent. Earlier researchers on this topic have therefore proposed that the relationship between organizational size and innovation should be understood as an indirect relationship that is mediated by functional differentiation (Blau 1970; Damanpour 1992). Our disaggregated approach enables us to empirically examine this proposition. A second

contribution of the study is that we explicitly examine participatory innovation in the public sector. The public sector innovation literature has increasingly highlighted collaborative and participatory innovations (Voorberg, Bekkers, and Tummers 2015). This study contributes toexplaining the adoption of participatory innovations with a focus on organizational structure as an explanatory variable. A third contribution is that the empirical analysis relies on administrative data, as the literature on public sector innovation is dominated by qualitative research and quantitative research that relies on perceptive measures (De Vries, Bekkers, and Tummers 2016; Torfing and Triantafillou 2016). In doing so, we went beyond measuring perceptions regarding innovation in public organizations (Demircioglu and Audretsch 2017; Walker 2006). As is explained more elaborately in the methods section, this approach offers methodological advantages and disadvantages that may inform future research on public sector innovation. We used a regression analysis to examine the relationship between organizational complexity and participatory innovation while controlling for economic and political characteristics of municipalities.

We focused on participatory innovation in local German government by investigating the state of North Rhine-Westphalia. The introduction of participatory budgeting was used as an indicator of participatory innovation. For the sake of resolving problems of democratic deficits and to increase legitimacy, municipalities create new ways to deal with citizens. As a result, participatory budgeting initiatives have been implemented in municipalities. In comparison to the traditional budgeting, the additional involvement of citizens makes participatory budgeting an innovation. In a regular budgeting process, citizens are not actively involved (Lee, Johnson, and Joyce 2013). Decisions about how to spend the budget are mainly made by civil servants and politicians. In a budgeting process with participatory elements, citizens are involved, because they can bring in their proposals for the budget plan (Ebdon and Franklin 2006; Geissel 2009). Participatory budgeting is thus a participatory innovation, because the implementation of this innovation is dependent on actors outside the boundaries of the organization. In the next section, we discuss the literature on organizational structure and innovation in the public sector, and we formulate our hypotheses. In the third section, we give more information about participatory budgeting in German local government and introduce the design, methods, and measures of the study. We present the empirical analysis in section four. Section five consists of a discussion of our results and a conclusion.

Theory

Innovation in the public sector

The public sector uses innovation to improve its services, to be prepared for future challenges, and as an effective means to respond to environmental demands (Bekkers, Edelenbos, and Steijn 2011). Although the need for public organizations to be innovative is virtually undisputed, the question is to what extent public organizations are capable of being innovative. The bureaucratic structure and high levels of red tape might be an impediment to generating and adopting innovations (Jakobsen and Thrane 2016). In recent years, academic interest in studying public sector innovation has increased, and from the existing research it can be concluded that the public

sector is a place where innovation can occur (De Vries, Bekkers, and Tummers 2016; Jakobsen and Thrane 2016; Wynen, Verhoest, and Kleizen 2017).

Walker (2006, 592) defined innovation as 'a process through which new ideas, objects and practices are created, developed or reinvented and which are new and novel to the unit of adoption.' The concept of innovation can be narrowed down to three main types: process innovation, product or service innovation, and ancillary innovation. Process innovations aim to change the management or organization of processes (Damanpour 1991). Often they are subdivided into administrative process innovations or technological process innovations (Walker 2006). Product or service innovation aims to create new products or services or to deliver existing products and services to new users (Damanpour 1991). According to Walker (2006), ancillary innovations are forms of collaboration, where the success depends on individuals or organizations from outside the organization.

We focused on participatory budgeting in municipalities. Participatory budgeting can be defined as the involvement of citizens in the decision-making process of the public budget (Geissel 2009; Hong 2015; Rossmann and Shanahan 2011). It is used to increase the quality of democracy and, hence, gives citizens the opportunity to be part of political decisions (Cabannes 2004). In traditional budgeting systems, citizens are mainly excluded from the budgeting cycle, whereas in participatory budgeting the involvement of citizens is compulsory. This involvement makes the budgeting innovative, because it includes additional actors who are basically excluded from traditional budgeting systems (Ebdon and Franklin 2006). One might argue that adopting participatory budgeting is not an innovation for the population of municipal governments, because some municipalities adopted this practice several years ago. From an organizational rather than a population perspective, however, the adoption of participatory budgeting can be seen as an innovation. In line with the definition by Walker (2006, 592) the adoption of participatory budgeting is seen as an innovation when the introduction of this practice is novel to the unit of adoption. We thus assign participatory budgeting as a participatory innovation, which can be considered a subtype of ancillary innovation that focuses on the participation of citizens in processes of public organizations. Open and collaborative innovations that transcend organizational boundaries by involving external actors such as users, clients, or citizens have become increasingly central to the innovation cycle of organizations in the private sector as well as in the public sector (Torfing and Triantafillou 2016; Chesbrough, Vanhaverbeke, and West 2006; Von Hippel 2005). Despite this, empirical research on the antecedents of ancillary innovation in the public sector is scarce. An empirical examination of 120 local authorities in England revealed no statistically significant relationships between organizational characteristics and perceived adoption of ancillary innovation (Walker 2006). Researchers of participatory budgeting and 'citizensourcing' have similarly identified electoral cycles, socioeconomic factors, and financial conditions as antecedents (Spada 2014; Schneider and Busse 2018), but insight into organizational determinants is limited.

Organizational structure and innovation

Organizational structure is one of several organizational antecedents to the occurrence of innovation. Organizational structure expresses how an organization distributes its work into tasks and achieves coordination among those tasks (Mintzberg 1979). In their classic

study, Burns and Stalker (1961) distinguished between mechanistic and organic organizations. Mechanistic organizations consist of an elaborate formal structure, whereas organic organizations are built of a looser structure. Mechanistic organizations are characterized by a clear chain of command, vertical and horizontal specialization, specific and formalized job descriptions, and vertical communication (Burns and Stalker 1961). In comparison, organic organizations contain less hierarchy and decentralized decision making and rely more on collaboration and mutual adjustment between organizational members (Burns and Stalker 1961). It is generally posited that organic organizations are better suited to dynamic organizational environments than mechanistic organizations, because they are better able to adapt by means of implementing innovations (Burns and Stalker 1961).

In more recent research, scholars have focused on specific parameters of organizational structure to explain the adoption of innovation. In the literature on organizational structure and innovation, the specific variables of organizational structure are predominantly specialization, formalization, and centralization (Damanpour 1991; Walker 2008; Camisón-Zornoza et al. 2004). Specialization reflects the amount of specific knowledge and skills which are needed to perform tasks in the organization (Damanpour 1991). It can be expected that specialization is positively related to innovation, because it allows employees to focus on a specific field and enables them to acquire expert knowledge (Jones 2007). Formalization concerns the degree of regulation by written rules that activities in the organization are subject to. Employees have less leeway for the execution of a task if the degree of formalization is high, which is generally believed to increased routine rather than innovation (Walker 2008). Centralization expresses to which extent decisions are made on the top levels in the hierarchy (Jakobsen and Thrane 2016). Centralized organizations might be less innovative, because fewer people are involved in processes and potential ideas of others are excluded (Damanpour 1991).

Specialization, formalization, and centralization are parameters of the structure that determines the nature of tasks that are performed by organizational members. In contrast, parameters of an organization's superstructure concern the grouping and size of organizational units (Mintzberg 1979). Organizational complexity is a concept that is used to describe the superstructure of an organization. Organizational complexity consists of two dimensions: functional differentiation and organizational size (Damanpour 1996). Below, hypotheses are formulated for the direct and indirect relationships between functional differentiation, organizational size, and participatory innovation.

The relationship between organizational complexity and innovation

Although the relationship between innovation and structural parameters such as formalization, centralization, and specialization has been examined in research of private and public sector organizations (e.g. Damanpour 1991; Jakobsen and Thrane 2016), there is limited evidence regarding the relationships between organizational complexity and innovation.

The first dimension of organizational complexity, functional differentiation, is expected to be positively related to the occurrence of innovation. The more an organization is functionally differentiated, the more separate departments with distinct tasks it has. As a result, in these departments, employees with specific knowledge emerge (Aiken and Hage 1971; Baldridge and Burnham 1975). Due to their narrowed focus, these experts can come up with new ideas in their specific fields

(Aiken and Hage 1971). In addition, the collaboration of experts in or across departments leads to cross-fertilization (Aiken and Hage 1971; Baldridge and Burnham 1975). In their meta-analyses, Damanpour (1991) and Camisón-Zornoza et al. (2004) found empirical evidence for a positive relationship between functional differentiation and the occurrence of innovation. We expect that this positive relationship also applies to participatory innovation, because scholars who have focused on this type have argued that the organizational structure is a relevant predictor for participatory innovation (Ebdon and Franklin 2006; Voorberg, Bekkers, and Tummers 2015).

From the theoretical reasoning and empirical findings, the following hypothesis is formulated.

Hypothesis 1: Functional differentiation is positively related to the occurrence of participatory innovation.

The second dimension of organizational complexity is organizational size. The size of an organization can be determined by the number of employees or the size of the budget of an organization (Aiken and Hage 1971). In the literature, authors have shown mixed results for the direction of the size-innovation relationship (Camisón-Zornoza et al. 2004; Damanpour 1992).

Some authors have indicated that organizational size has a negative influence on the occurrence and adoption of innovations. One main argument is that larger organizations are less flexible than smaller organizations and consequently change is less likely (Damanpour 1996). A second main argument is that more formalization is needed to control a larger organization, which in turn results in a lower degree of innovation (Hitt, Hoskisson, and Ireland 1990). Some authors have indicated that organizational size has a positive relationship with innovation. Larger organizations tend to have larger pools of resources, especially in terms of personnel (Nord and Tucker 1987). Thus, they have a larger pool of potential expertise, knowledge, and viewpoints, as well as more financial resources. In addition, due to their size and the additional resources, large organizations can take more risks and be innovative (Audia and Greve 2006; Damanpour 1992; Latham and Braun 2009). In this study, we expect that organizational size is positively related to innovation, because empirical evidence from two meta-analyses supports a positive relationship between organizational size and innovation (Camisón-Zornoza et al. 2004; Damanpour 1992). Hence, the following hypothesis will be tested.

Hypothesis 2: Organizational size is positively related to the occurrence of participatory innovation.

Functional differentiation and organizational size are both expected to affect innovation positively, but through different mechanisms. Although researchers of organizational complexity have empirically examined the two concepts as equivalent dimensions, it has been suggested that there may be a hierarchical ordering in their relationship to innovation. Authors of previous studies have proposed that the positive relationship between organizational size and innovation can partly be understood as an indirect relationship through functional differentiation (Blau 1970; Damanpour 1992). Damanpour (1992) argued theoretically that the relationship

between organizational size and innovation is mediated by functional differentiation and concluded that further empirical research is needed to prove these assumptions. Such a view is also supported by contingency theory. For instance, Mintzberg proposed that empirical evidence overwhelmingly indicates that 'the larger the organization, the more elaborate its structure, that is, the more specialized its tasks, the more differentiated its units, and the more developed its administrative component' (1979, 230). Contingency theory thus suggests that organizational size and functional differentiation are not independent, because increased organizational size causes greater functional differentiation. In this study, we therefore examine this issue by testing the following hypothesis.

Hypothesis 3: The relationship of organizational size and participatory innovation is mediated by functional differentiation.

Methodology

Design and case selection

To test our hypotheses, we followed a quantitative approach. The cases for this study are municipalities, which ensured that the investigated organizations have an equal mission and similar tasks. In this study, we tested our hypotheses in municipalities in the German state of North Rhine-Westphalia due to three reasons. First, we focused on Germany because participatory budgeting is not common there yet and can still be seen as an innovation (Schneider and Busse 2018). Out of 396 examined municipalities, 64 have adopted participatory budgeting. Second, we narrowed the focus down to one state, because not all of the states have significant numbers to test our assumptions. North Rhine-Westphalia has enough municipalities with participatory budgeting to analyse in a large-N design. Third, we also expected that municipalities in North Rhine-Westphalia differ among the explanatory variables, which allows us to test our assumptions in this population. North Rhine-Westphalia consists of 396 municipalities, and all of them were investigated.

Measures

All variables were measured using administrative information. As compared to research based on questionnaires, the use of administrative data can have several advantages as well as disadvantages for research on social entities such as municipal governments (Dunleavy 2010, 255). An advantage of the use of administrative data is that the population of organizations can more readily be examined, rather than a statistically representative sample. This makes it possible to avoid technical problems with survey-based research such as small sample sizes, extensive nonresponse, and missing data on key variables among respondents of the survey. Because data collection through administrative data is based on nonreactive researcher-subject interactions, organizations need not be alerted that a study is being conducted. Unobtrusive measurement of variables therefore precludes subjects to misrepresent or edit responses (Dunleavy 2010). A disadvantage of the use of administrative data is that some relevant characteristics of organizations may not be registered in a reliable

or valid manner and therefore cannot be included in a study. Researchers must thus be attentive to accidental or purposive misrepresentation of data in administrative sources. The use of administrative data also enables the combination of different data sources, thereby avoiding common-source bias that is a possible threat to single-informant, survey-based investigations of public sector innovation (George and Pandey 2017; De Vries, Bekkers, and Tummers 2016). We obtained the measures for the variables for the year 2015, and we measured functional differentiation using data obtained in 2017. The control variables of political support and voter turnout were measured for the election year 2014.

Participatory innovation

Data regarding the occurrence of participatory budgeting was exclusively gathered by using an existing statistic. In a joint project, *Bundeszentrale für politische Bildung* (bpb) and *Servicestelle Kommunen in der Einen Welt* (SKEW) offered statistics online on buergerhaushalt.org about the usage of participatory budgeting in German municipalities (bpb and SKEW 2015). *Bundeszentrale für politische Bildung* is an organization of the Federal Ministry of the Interior and *Servicestelle Kommunen in der Einen Welt* was founded by the Federal Ministry of Economic Cooperation and Development. The use of participatory budgeting in the municipalities that we studied ranged across seven different possibilities: decision, early form, introduction, continuation, cancellation, discussion, and no status. Moreover, the different categories are unevenly represented in the sample of municipalities, with the introduction phase present only seven times and the decision phase present only in three municipalities. The outcome variable was therefore coded as binary, and it expressed whether participatory budgeting had been adopted in the municipality. The existence of participatory budgeting was represented by five status options: decision, early form, introduction, continuation, and cancellation.

First, participatory budgeting was present if a council decided to start participatory budgeting ('decision') and the decision was not older than 2 years, but participatory budgeting had not been introduced yet (bpb and SKEW 2015). Second, participatory budgeting was present if a municipality used an early form of participatory budgeting that lacked formal consultation ('early form'). An example is that citizens can send their ideas to the municipality through an online form, but no public discussion about these ideas occurs (bpb and SKEW 2015). Third, the introduction of participatory budgeting counts as the presence of this innovation ('introduction'). For the introduction stage, it is necessary that citizens are informed about the budget and that a public consultation occurs (bpb and SKEW 2015). Citizens can evaluate proposals from the municipality, but they also can bring in their proposals, and afterwards the municipality has to inform the public what it has done with the citizens' proposals (bpb and SKEW 2015). Fourth, if the municipality had used participatory budgeting continuously, then participatory budgeting was present ('continuation'). A continuation stage was present if participatory budgeting had been used three or more times (bpb and SKEW 2015). Additionally, we counted participatory budgeting as present if the municipalities had used this innovation, but it was no longer applied ('cancellation'). The main reason for counting this stage as present was that we were interested in the occurrence of innovation and not about its sustainability.

The two classifications of 'discussion' and 'no status' illustrate the absence of participatory budgeting. *Discussion* means that the introduction of participatory budgeting was discussed within the municipality by a political party or nongovernmental organization (bpb and SKEW 2015). The claim was not older than 2 years and no decision by the municipal council had been made (bpb and SKEW 2015). *No status* means that the introduction of participatory budgeting is not an issue in this municipality and no participatory budgeting was observable (bpb and SKEW 2015).

Functional differentiation

Functional differentiation is usually measured by the total number of departments under the top management (Aiken, Bacharach, and French 1980; Blau and McKinley 1979; Damanpour 1991). We followed the operationalization of Aiken, Bacharach, and French (1980) where all departments that reported directly to the mayor or an alderman (i.e. political level) and consisted of more than two persons were measured. For gathering the organizational variables, the organizational charts of municipalities that are published on their webpages were analysed. This measure was obtained in 2017, because a measure from 2015 was unavailable. We saw this a valid measure, given that the departmental structure of German municipalities is highly stable over time. For instance, Naschold (1996) concluded that the internal structures of municipalities in Germany are characterized by decades of stability. A recent publication from Bogumil (2018) supports this argument, because he shows that in general the internal organizational structure of municipalities remains stable over time. This general stability might change through systemwide administrative reform, but between 2015 and 2017 no such reforms of administrative structures in North Rhine-Westphalia occurred. We therefore relied on the measure from 2017, and we return to this issue in the limitation section of this article.

Organizational size

Size can be measured in different ways, which can lead to different results (Kimberly 1976). It can be operationalised by the number of employees, the budget, input and output volume, or physical capacity (Damanpour 1996). In this research, the number of employees was measured by using full-time equivalent employment. The measure is expressed per 1,000 employees to ease interpretation of regression coefficients.

Control variables

It is assumed that the availability of financial resources, political support, size of the population, and characteristics of the citizens (i.e. income and political activity) also have an influence on the occurrence of innovation. It has been argued that organizations that have additional available resources are more likely to be innovative (Aiken and Hage 1971; De Vries, Bekkers, and Tummers 2016). They have more financial resources to invest in ideas and can take the risk of failure, because they have a greater financial leeway compared to less solvent organizations (Damanpour 1991). Reasoning alternatively, it has also been argued that financial stress rather than leeway can function as an incentive for greater innovativeness in organizations, thereby predicting a negative relationship between financial resources and the adoption of innovation (Singla, Stritch, and Feeney 2018; Rutherford and Van Der Voet 2018). Due to unavailability of data for the wealth of municipalities, financial resources were measured negatively by the municipalities' debt in a 1,000-euros-per-

citizen ratio. Authors of previous studies have also illustrated the importance of political support for participatory innovation (Röcke 2014; Schneider and Busse 2018). Röcke (2014) argued that political support for participatory innovation influences the adoption and success of participatory budgeting due to the dominant position of politicians in the policy system. The *Christlich Demokratische Union* (CDU) is the only major German party that is not in favour of direct democracy (Mehr Demokratie e.V. 2017). Political support was estimated negatively by the percentage of votes for the CDU in a municipal legislation body. The size of the population could have an effect on the organizational structure of the municipality and on the adaption of participatory budgeting (Ebdon and Franklin 2006). The reason for this is because larger cities also have more diverse populations, and municipalities might want to mediate conflicting claims by allowing participation (Protasel 1988). Moreover, citizens of larger cities have been found to steer more political participation (Nalbandian 1991). This variable was measured by the number of citizens who have a primary or secondary residence in a municipality, expressed in units of 1,000 citizens. We also controlled for the socioeconomic environment of the municipality. Authors of research on participation of citizens in policy processes have shown that not all groups are represented equally (Michels and De Graaf 2010). People's incomes might affect whether they want to engage in participatory models (Irvin and Stansbury 2004). People with higher incomes might generally be more likely to request participation in the budgeting process, whereas low-income families are less likely to be connected the political arena within a municipality (Irvin and Stansbury 2004). Citizen's incomes were measured by the average available income that citizens can use for saving or consumption. Another socioeconomic variable is political activity. Citizens who are more active in politics might steer more participatory models (Geissel 2009). However, it can also be argued that municipalities with fewer politically active citizens seek to use participatory innovation to revitalize the political activity of citizens through new channels. The involvement of citizens in politics can be operationalised by the voter turnout. All control variables were derived from data of the statistical office of the state of North Rhine-Westphalia and the Federal Statistical Office.

Analysis strategy

For the analysis, we only took into account cases with complete data on the variables in the study. For two out of 396 municipal governments (Uedem and Wettringen), no data concerning functional differentiation could be obtained. The analyses in the next section were therefore based on the 394 cases for which complete data was available. In order to estimate the extent to which the relationship between organizational size and participatory innovation is mediated by functional differentiation (Hypothesis 3), we conducted regression analyses following the recommendations by Baron and Kenny (1986). Because the measure for the dependent variable (participatory innovation) is a binary variable, steps A, C, and D of the Baron and Kenny approach were conducted using binary logistic regression analysis. Step B examines the relationship between the independent variable (organizational size) and the mediator variable (functional differentiation) and was conducted using a linear regression analysis. The range of variation for the variables organizational size, debt ratio, population, and

Table 1. Means, standard deviation and range (N = 394).

Variable	Mean	Standard Deviation	Range
Participatory innovation	.16	.37	0–1
Functional differentiation	8.98	7.95	2–49
Organizational size	.51	1.35	.03–15.87
Debt ratio	2.19	1.65	0–10.28
Vote percentage CDU	42.1	9.46	17.8–76.3
Population size	45.30	89.58	4.26–1,060.58
Average income	22.02	2.75	15.31–36.38
Voter turnout	53.9	6.1	39.0–71.9

average income was very large (see Table 1). Therefore, we used log variables for these variables in the regression analyses.

Analysis and results

Table 1 contains the descriptive statistics of the variables in the study. The mean value of participatory innovation indicates that 63 out of 394 municipal governments in our sample had adopted participatory budgeting. The number of functional departments within municipal governments ranged between two and 49, with an average number of nine departments. The organizational size of municipal governments in the sample also varied substantially. The smallest municipal government had 25 employees, whereas the largest had 16,300 employees. The average debt of the municipal governments amounted to 2,194 euros per citizen, and the average income of citizens per municipality was 22,016 euros. The vote share of the CDU was on average 42.1%, with a range of 17.8–76.3%. The average size of municipalities in our sample was 45,302 residents. The standard deviation of the average population size was substantial, because the largest municipality in the sample had more than 1,000,000 inhabitants, whereas the smallest municipality only had 4,236 inhabitants. Finally, voter turnout was 53.8% on average in the latest national elections.

Table 2 shows the correlations between the variables in the study. The coefficients indicate that the correlations between participatory innovation, functional differentiation, and organizational size are statistically significant. Both functional differentiation and organizational size are positively related to participatory innovation. The correlation between functional differentiation and organizational size is strong, indicating that municipal organizations with a high number of employees are more likely to have a larger number of distinct, functional departments. A positive correlation exists

Table 2. Correlation coefficients (N = 394) .

	1	2	3	4	5	6	7
1 Participatory innovation	-						
2 Functional differentiation	.401***	-					
3 Organizational size	.318***	.686***	-				
4 Debt ratio	.179***	.404***	.331***	-			
5 Vote percentage CDU	−.197***	−.342***	−.296***	−.380***	-		
6 Population size	.324***	.717***	.991***	.350***	−.304***	-	
7 Average income	−.045	−.102*	−.120*	−.139**	−.025	−.125*	-
8 Voter turnout	−.167**	−.423***	−.289***	−.287***	.319***	−.325***	.230***

*indicates statistical significance with p < .05; **indicates statistical significance with p < .01, ***indicates statistical significance with p < .001.

Table 3. Variance inflation factor analysis of independent variables (N = 394).

	Model 1	Model 2
Functional differentiation	2.45	2.22
Organizational size	62.36	1.92
Debt ratio	1.34	1.33
Vote percentage CDU	1.31	1.30
Population size	68.18	
Average income	1.09	1.09
Voter turnout	1.40	1.35

between debt ratio and participatory innovation, suggesting that municipal governments with a lower amount of financial resources may be more likely to engage in the adoption of participatory innovations (cf. McKinley, Latham, and Braun 2014). This result is in line with wider observations that citizen participation in budgeting on the local level is primarily used in times of financial hardship and fiscal retrenchment (Jimenez 2013). Table 2 indicates that the larger the share of votes for the CDU party, the lower the likelihood that the municipality has adopted participatory budgeting. Voter turnout is also negatively correlated to participatory innovation. Similar to organizational size, the correlation matrix indicates that population size is positively related to the introduction of participatory innovation. The correlation coefficient between population size and organizational size almost indicated a perfect correlation between the two variables. In order to test for multicollinearity, we conducted a variance inflation factor analysis and reported it in Table 3. The values for organizational size (62,36) and population size (68,18) indicated that issues of multicollinearity were highly likely. In the multivariate regression analyses, population size was therefore excluded from the models.

Table 4 reports regression analyses in accordance with the four steps to test for mediation by Baron and Kenny (1986). Our hypotheses were tested in accordance with these procedures rather than according to their numerical order. Model 1 concerns Step A of the model, in which the direct relationship between organizational size and participatory innovation is examined, controlling for debt ratio, vote percentage for the CDU, average income of citizens, and voter turnout. In this model, the positive relationship between organizational size and participatory innovation expressed through participatory budgeting was statistically significant, providing support for Hypothesis 2. Step B of the Baron and Kenny approach was used to show that the independent variable was related to the mediator variable. In Model 2, a linear regression analysis with functional differentiation as the dependent variable is shown. The regression analysis indicated a strong, statistically significant relationship between organizational size and functional differentiation. In all, the model accounted for 54.4% of the variation in functional differentiation. Model 3 shows steps C and D of the Baron and Kenny approach, in which the mediator variable is related to the dependent variable while controlling for the independent variable. In comparison to Model 1, Model 3 shows an increase in the Nagelkerke R-square value. Model 3 shows a statistically significant relationship between functional differentiation and participatory innovation, providing support for Hypothesis 1. The unstandardized regression coefficient for organizational size decreased in magnitude from .419 to .047 and is no longer statistically significant. This indicates that the relationship between

Table 4. Regression analyses (N = 394).

	Model 1 Step A		*Model 2 Step B*		*Model 3 Step C & D*	
	Participatory innovation		Functional differentiation		Participatory innovation	
	b (s.e.)	Wald statistic	b (s.e.)	Beta	b (s.e.)	Wald statistic
Constant	*.305 (1.826)*	*0.28*	*20.276 (3.451)*		*−1.760 (1.970)*	*.799*
Functional differentiation					.094*** (.024)	14.806***
Organizational size	.419*** (.138)	9.157***	3.337*** (.220)	.568***	.047 (.133)	.126
Debt ratio	.057 (.094)	.362	.674 (.186)	.140	−.006 (.098)	.004
Vote percentage CDU	−0.29 (0.18)	2.519	−.045 (.033)	−.053	−.027 (.019)	1.970
Average income	.014 (0.53)	.067	.093 (.103)	.032	.001 (.056)	.000
Voter turnout	−2.772 (2.764)	1.006	−27.201*** (4.946)	−.209***	.316 (2.964)	.011
Nagelkerke R-square	*.153*				*.213*	
Adjusted R-square			*.544*			

*indicates statistical significance with p < .05; **indicates statistical significance with p < .01, ***indicates statistical significance with p < .001. As a robustness check, the analyses have been repeated in a sample that excludes 15 outliers (municipalities with an employee size of over 4000 or functional differentiation of over 35). This analysis indicates that the substantive effect sizes and statistical significance of the reported findings are robust. Results from this robustness check can be obtained by contacting the corresponding author.

organizational size and participatory innovation is mediated by functional differentiation, as specified in Hypothesis 3. Hypothesis 3 is thus supported by the analysis.

Discussion and conclusion

Discussion

We examined the relationship between organizational complexity and the adoption of participatory innovation in the drafting of municipal budgets. We provided further evidence that organizational complexity expressed through functional departments is positively related to the occurrence of participatory innovation. The more functional departments a municipality has, the higher the likelihood is that participatory innovation expressed through participatory budgeting can be detected. In addition to research that has highlighted behavioural and cultural antecedents of public sector innovation (Salge 2011; Salge and Vera 2012), our findings resonate with management research that highlights the importance of functional differentiation for innovation (e.g. Aiken and Hage 1971; Baldridge and Burnham 1975; Damanpour 1991, 1996). However, in the meta-analysis of organizational structure and public innovation by Jakobsen and Thrane (2016), functional differentiation was not included and it seems that the public administration research overlooks one relevant explanatory factor.

The second conclusion is that organizational size has no direct relationship with participatory innovation expressed through participatory budgeting but that this relationship is mediated by functional differentiation. Scholars have discussed whether the influence of organizational size is positive or negative on innovation (Camisón-Zornoza et al. 2004; Damanpour 1992). We followed arguments that the relationship of organizational size and innovation is positive. The correlation between the variables reveals a positive relationship. Nevertheless, a conclusion cannot be drawn from this, because the findings were not statistically significant after

introducing functional differentiation to the model. This result is in line with Wynen, Verhoest, and Kleizen (2017), who investigated Belgian public organizations in a quantitative study and also did not find a statistically significant relationship between organizational size and an innovation-related culture.

In Hypothesis 3, we tested a potential mediation of functional differentiation in the size-innovation relationship. In a multivariate model, only functional differentiation had a statistically significant relationship with participatory innovation that we measured by participatory budgeting, whereas organizational size is no longer statistically significant related to innovation. We provided empirical evidence for theoretical arguments from Damanpour (1992), who assumed a potential mediation of the size-innovation-relationship by functional differentiation. Although in the analysis we provided evidence that the relationship of organizational size and participatory innovation was mediated by functional differentiation, the effect size of organizational size was not reduced to zero. The analysis thus indicated that functional differentiation only partly mediates the relationship between organizational size and participatory innovation.

This study also has some relevance for research that deals exclusively with participatory budgeting. Ebdon and Franklin's (2006) impact model of citizen participation in budgeting consists of environmental variables, among others, that affect the process of participatory budgeting. Their study was mainly based on qualitative measurements such as case studies or surveys (Ebdon and Franklin 2006). Our quantitative findings from this study do not support their choice of environmental variables as a key element for participatory budgeting. We found no evidence that environmental variables have a statistically significant relationship with the occurrence of participatory budgeting when controlling for variables related to the organizational structure. The classical study by Burns and Stalker (1961) supports our argument about the importance of internal factors, because they have already argued that the innovative capabilities of organizations are determined by their organizational structure. Further support is provided by a more recent meta-analysis on antecedents of innovation in local governments by Walker (2014), who concluded that internal, structural factors are more relevant explanatory variables than external, environmental factors. Therefore, future studies of participatory budgeting should include internal factors such as organizational structure variables to reach a more comprehensive view of the interplay of public actors and citizens.

Due to our reliance on objective measures, our study has methodological implications for public administration researchers who investigate organizational structure and innovation. Organizational structure in general, and especially the predominantly used variables centralization, formalization, and specialization, are commonly measured through interviews or surveys (e.g. Greenhalgh et al. 2004; Jansen, Van Den Bosch, and Volberda 2006; Walker 2008). The same applies to the measurement of innovation that is frequently based on perceptions (e.g. Damanpour and Schneider 2009; Moon and Bretschneiber 2002; Walker 2008). In our study, we relied on administrative data for our organizational structure and innovation variables. Typical problems of subjective measurements, such as a low response rate, subjective perceptions, social desirability bias, and leniency bias (Neuman 2014) can be avoided by using objective measurements. That being said, administrative data can also have disadvantages with regards to accuracy, availability, and accessibility of information. A recommendation for future research on public sector innovation is to combine the use of administrative and perceptive data to a greater extent and to cross-check

administrative and perceptive measures in order to improve the reliability of research findings. The combined use of administrative and perceptive data can also function to preclude threats of common-source bias (George and Pandey 2017).

Our findings are also practically relevant for political decision makers and managers in public organizations. Awareness of the positive relationship of functional differentiation and participatory innovation might help them in designing functionally differentiated organizational structures on the municipal level that are well suited toward innovation. This might be counterintuitive, because the contemporary trend is to keep the functional structure of municipalities as lean as possible. For instance, the oversight agency for municipalities in North Rhine-Westphalia advises a lean structure for municipalities. This approach follows New Public Management developments that emphasize an efficient and disaggregated structuring of government (Osborne and Gaebler 1992). However, we demonstrated that more complex organizational structures may be better suited toward addressing contemporary societal challenges through the introduction of participatory innovation. Efficient organizational structures might thus be at odds with structures that are conducive to innovation, and the design of public organizations is thus one of the domains in which political decision makers and public managers must balancea value trade-off between parsimony and innovativeness. Public managers should thus be aware of the potential positive effect of a differentiated organizational structure on innovation capacity, and managers should cultivate and stimulate the cross-departmental communication and collaboration of experts to enhance this effect.

Limitations and directions for future research

The use of objective measurements also has limitations. We only allowed for the examination of general relationships. As a result, it can be stated that functional differentiation is positively related to the occurrence of participatory innovation, but we added no insights into the mechanisms that are at play and offered no evidence of causal relationships. Scholars have argued that functional differentiation creates expert knowledge in departments and collaboration across departments leads to cross-fertilization (Aiken, Bacharach, and French 1980; Damanpour 1996). Those mechanisms could be detected in a single-case study, in which future researchers focus on the departmental and individual levels, because our study investigated the organizational level. By the means of interviews and observations they could uncover how expert knowledge emerges in functional departments and how ideas rise through the collaboration of experts across departments. To make statements about causality, future quantitative researchers could make use of longitudinal data and instrumental variables.

A limitation regarding the internal validity is that the analysis was cross-sectional. Furthermore, a measure for functional differentiation was not available for 2015. Given the high levels of stability in the internal structure of municipalities (Naschold 1996; Bogumil 2018), we have used a measure for functional differentiation obtained in 2017. Notwithstanding data constraints, future researchers could examine the relationships in a longitudinal manner. In addition, authors of a longitudinal and quantitative study could deliver interesting results that show how participatory budgeting emerges and diffuses. Such authors can aim to examine how the organizational structure matters for early adopters of participatory innovation as compared to

later adopters. A study by Lampe (2017) about process innovation in North Rhine-Westphalia indicated that innovation diffuses in several waves over time.

Because we excluded the size of each population due to multicollinearity, we have only examined bivariate relationships between population size, functional differentiation, and participatory budgeting. These results indicate that, similar to organizational size, the size of a municipality in terms of the number of inhabitants can potentially increase functional differentiation and participatory innovation. Although conceptually and operationally distinct, a difficulty is that population size and employee size of municipalities are strongly interlinked empirically, making it difficult to distinguish between the effects of both variables. Nonetheless, future researchers in a different empirical setting might fruitfully examine the relationships between population size, organizational size, functional differentiation, and participatory innovation in municipal government. Given that we have examined linear relationships between these variables, a particularly relevant avenue could be to test for nonlinear relationships between size and participatory innovation (e.g. Andrews and Boyne 2011).

Conclusion

In this paper we examined the relationship between organizational complexity and participatory innovation among German municipalities by focusing on the state of North Rhine-Westphalia. First, we concluded that the results highlight the importance of functional differentiation for a municipality, because it is positively and statistically significant in its relation to participatory innovation that we measured by participatory budgeting. This is especially interesting due to the claim that reforms are needed to keep the organizational structure of public organizations as simple as possible, whereas our study highlights positive outcomes of complexity regarding the occurrence of innovation. Second, organizational size has no statistically significant relationship with participatory innovation when controlling for functional differentiation. One interpretation of our empirical findings is that it is not the number of people in an organization that matters, but the functional expert knowledge they can bring to the organization. However, our results indicate that the size has an indirect rather than a direct relationship with innovation. Although more functionally differentiated structures are associated with participatory innovation, size contributes to innovation because organizational size increases functional differentiation.

Disclosure statement

No potential conflict of interest was reported by the authors.

Notes on contributors

Hendrik Ewens is a graduate from the Institute of Public Administration at Leiden University (The Netherlands). His research focuses on organizational structure and innovative capability of public organizations. He works as a consultant in the area of public administration.

Joris van der Voet is assistant professor of public management at the Institute of Public Administration at Leiden University (The Netherlands). His research and teaching interests include leadership, organizational change, financial decline and innovation in public organizations.

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