

Decentralisation or patronage: what determines the government's allocation of development spending in a unitary country? Evidence from Bangladesh

MANCHESTER
1824
The University of Manchester
Global Development Institute

Working Paper Series

Amin Masud Ali &

Antonio Savoia

2023-063 | April 2023



ISBN: 978-1-912607-21-1

Amin Masud Ali¹

Antonio Savoia²

Department of Economics, Jahangirnagar University, Bangladesh

aminmasudali@juniv.edu

ORCID: 0000-0001-5736-0013

Global Development Institute, The University of Manchester, UK

antonio.savoia@manchester.ac.uk

ORCID: 0000-0003-0639-9705

Cite this paper as

Ali, Amin Masud., and Savoia, Antonio. (2023) Decentralisation or patronage: what determines the government's allocation of development spending in a unitary country? Evidence from Bangladesh. GDI Working Paper 2023-063. Manchester: The University of Manchester.

Abstract

This paper contributes to the decentralisation and distributive politics literature by empirically investigating the determinants of public expenditure at the sub-national level in Bangladesh. We argue that fragmentation in a unitary developing country may not channel higher resources to local areas. However, in such countries, political motives may play a significant role in the allocation process. Using panel data methods and a novel dataset on the government's district-wise allocation of annual development expenditure in Bangladesh, covering the period from 2005 to 2009, the analysis focuses on the impact of local government fragmentation and tests key political distribution models (the *core voter hypothesis*, the *swing voter hypothesis* and *political alignment theory*). The results show that local government fragmentation does not have any significant impact on public spending at the district level. However, the core vote share, political alignment of the local elected representative with the ruling party, and the raw number of ministers from a district are all significantly associated with higher expenditure allocations, supporting the idea that political patronage matters for resource allocation. No evidence was found in support of the swing voter hypothesis. Overall, the study's findings suggest that political motives matter and that the allocation of development spending is significantly influenced by political patronage. This may be a significant obstacle to SDGs progress, as development spending may not be governed by resource delivery mechanisms that effectively target the poor.

Keywords

Decentralisation, fragmentation, local government, distributive politics, development expenditure, Bangladesh

JEL Codes

H70, H72, H77, D72

Acknowledgements

Amin Masud Ali is grateful for the scholarship received from the Global development Institute

Image source

Photo of Jatiya Sangsad Bhaban (Parliament Building), Dhaka, Bangladesh by fotofritz16 from Canva Pro.

1. Introduction

What determines the allocation of public spending? Traditional public finance theories suggest that the principles of efficiency, equity and stabilisation decide the allocation pattern, with the central government playing a ‘benevolent role’ and trying to maximise social welfare (Rodríguez-Pose et al, 2016). Conversely, political distribution and political settlement theories argue that, as politicians are the ultimate policy makers, political motive plays the major role in influencing the growth of aggregate and different categories of public spending (Golden & Min, 2013; Persson, 2007). This paper contributes to this debate by investigating the determinants of public spending allocation at the sub-national level for a unitary developing country, Bangladesh. We analyse the impact of various types of local government fragmentation – a particular aspect of local decentralisation – and of distributive politics on the government’s district-wise allocation of total development expenditure. This is especially relevant to the context of developing economies, as the empirical literature on the impact of various types of fragmentation and political patronage on total public spending at the sub-national level of unitary developing countries is rather thin. In particular, to the best of our knowledge, no previous studies have empirically investigated the core voter versus swing voter debate or the

impact of local government fragmentation on the national government's spatial allocation of total development spending in the context of Bangladesh.

Bangladesh represents a very interesting case to study the impact of both fragmentation and distributive politics on public spending. The country has made remarkable progress in a number of development outcomes. Nevertheless, the explanation of its progress is still unclear (see, for example, Asadullah et al, 2014; Sen, 2016). In answering the question, a focus on decentralisation is crucial as it has become a central feature of the country's development programme, adopted during its period of success. Both political and administrative decentralisation is promoted in the country in the form of the political fragmentation of local government (LG) units, to create the scope for local participation and representation (Faguet & Ali, 2009). Therefore, understanding whether local government decentralisation or political motives determine the geographical allocation of public spending in Bangladesh could feed into the national effort to pursue the UN Sustainable Development Goals (SDGs). In particular, SDGs 16 and 17 have emphasised the need to develop effective, accountable and transparent institutions to ensure responsive, inclusive and participatory decision making and to strengthen domestic resource mobilisation at all levels (UN, 2015). Investigating the impact of fragmentation on a government's development expenditure allocation will help us to understand how much the fiscal authority of Bangladesh's LG units contributes to the SDGs.

The existing literature suggests that the theories that explain the determinants of public spending growth can all be classified into three groups: 1) demand models (in which citizens' preferences are reflected in the size of the spending); supply models (in which politicians and bureaucrats are seen as having the power to impose their interests over citizens' interests); and 3) constitutional models (in which constitutional design and rules constrain the state from using its power in a discretionary manner) (Facchini, 2018; Mueller, 2003). The demand models are historically the most discussed and empirically tested theories, focusing on determinants capturing the broad demographic and socioeconomic condition, ethnic diversity and political ideology of the population. A growing body of literature now investigates supply models, focusing especially on distributive politics. Conversely, constitutional explanations have seen less discussion, although they have been present in very recent literature (Facchini, 2018). In this study, by taking demand model variables as controls, we investigate the impact of distributive politics (a supply model factor) and local government fragmentation (a constitutional model factor, as it may create constitutional obligations and constraints) on public spending. This is important, as whether fragmentation favours or disfavors a more efficient and balanced spatial pattern of public spending is still unclear and, moreover, fragmentation itself can create scope for political patronage in resource allocation (Gottlieb et al, 2019; Lessmann, 2012; Livert et al, 2019). Therefore, one should take patronage and fragmentation together, as we do here.

Regarding the relationship between decentralisation and the size of public spending, there is a long-standing theoretical disagreement. Decentralisation theorists argue that decentralisation may increase budgetary growth because local demands will be better served (Oates, 1972). Conversely, the Leviathan theory suggests that, with decentralisation, the size of total government spending declines as greater competition enhances efficiency and restricts expenditure growth (Brennan & Buchanan, 1980). Testing these theories, empirical studies

have provided conflicting results and have eventually concluded that the relationship is rather conditional (Hendrick et al, 2011; Qiao et al, 2019; Choudhury & Sahu, 2022). However, the literature is biased towards federal countries, and has paid little attention to the impact of decentralisation on resource allocation in the context of unitary developing countries (Faguet, 2014; Bardhan & Mookherjee, 2010). Moreover, studies have often failed to measure decentralisation properly, as they have concentrated only at the national level, whereas most of the unitary countries have implemented a horizontal dispersion dimension of decentralisation at the sub-national level, rather than the vertical dispersion dimension (Boex & Edwards, 2016; Bardhan & Mookherjee, 2012). Furthermore, most of the comparative studies have relied heavily on the conventional indicators of fiscal decentralisation, which capture it only partially, as unitary countries have shown more affinity towards implementing political and administrative decentralisation (Smoke, 2013). Further, the comparative studies have the limitation of not capturing the difference in the institutional settings (eg the type, objective or design of the programme) across the countries studied (Bardhan & Mookherjee, 2010). Therefore, more empirical investigations, using appropriate indicators, should be carried out in the developing country context.¹

Similarly, the literature has offered several theories of distributive politics. It has been suggested that politicians may target core voters (Cox & McCubbins, 1986), swing voters (Dixit & Londregan, 1996), core (or swing) constituencies rather than voters (Cox, 2010), voter turnout (Nichter, 2008; Casas, 2018), opposition abstention voters (Kaba, 2022), marginally winning constituencies (Persson et al, 2000), opposition strongholds (Casas, 2020), politically aligned constituencies or leaders (Wong, 2022; Baron, 1993), or hometown favouritism (Kung & Zhou, 2021). A vast body of research has provided empirical evidence supporting these theories. A review of the literature, however, confirms that most of the empirical studies are confined to the OECD and Latin American countries, with few exceptions, for instance Callen et al (2020) on Pakistan, Das and Maiorano (2019) and Bardhan and Mookherjee (2012) on India, and Kung and Zhou (2021), Wong (2022) and Jiang and Zhang (2020) on China. Furthermore, these studies have mainly focused on electorally relevant aspects of taxes and transfers (Golden & Min, 2013). Investigating the impact of distributive politics on total public spending in the context of a developing country is remarkably scant and rarely based on a credible research design (Manacorda et al, 2011). Such investigations are also challenging to conduct, as targeting certain areas with certain political features does not necessarily confirm politically motivated spending; rather, it can be an attempt to mitigate interregional inequality (Banful, 2011). There is also the issue of reverse causality (between allocation and voting behaviour) and omitted variable bias (caused by not considering regional heterogeneity), which are often not carefully handled. In addition, studies have used a wide range of variables as a proxy to test the conventional models of distributive politics, and it is therefore important to test these in different settings. Overall, more country-specific and methodologically sound investigations are needed, and this current study intends to bridge these gaps. To our knowledge, this is the first attempt to empirically investigate the impact of distributive politics and fragmentation on a

¹This study used local government fragmentation indicators to measure local decentralisation, following the work of Stansel (2005, 2006). These indicators can capture administrative, political and fiscal decentralisation simultaneously (for details, see Lewis, 2017; Stansel, 2006; Feld et al, 2010).

government's total development spending at the sub-national level of a unitary developing country, using a panel data analysis.

We construct a unique panel dataset on public spending at the district level, using the Bangladesh government's district-wise allocation of the Annual Development Programme (ADP) funds over the period 2005–09. We include a range of local government fragmentation and distributive politics measures. Our regression specification includes a large set of controls (the socioeconomic and demographic variables) and, for robustness, uses a range of panel method accounting for unobserved heterogeneity and dynamic effects. The results suggest that local government fragmentation (either total, horizontal or vertical) has no significant impact on the per capita development expenditure allocated by the government at the sub-national level in Bangladesh. Conversely, distributive politics plays a significant determining role, as the study found that a district's share of core vote for the ruling party, number of ministers and the political alignment of the local representative with the ruling party had a significant positive impact on the per capita development expenditure. However, the results also show that the impact of political motive on the resource allocation does not vary with the level of fragmentation. The study's findings have vital policy implications. First, the study confirms that local government fragmentation does not ensure higher resource mobilisation to an area, irrespective of the fact that, over the years, several local units have been created. Therefore, to ensure an effective, inclusive and participatory local government system, the local units should be strengthened fiscally, either by channelling more resources to them or by boosting their fiscal capacity. Second, the results confirm that public spending is significantly influenced by political motives. Therefore, policy makers should place more emphasis on the equity and needs-based criteria of public resource allocation.

The rest of the paper is organised as follows: Section 2 reviews the literature on fragmentation and distributive politics; Section 3 describes the methodology of the empirical analysis; Sections 4 and 5 present and discuss the results and Section 6 concludes.

2 Review of the literature

This section offers a brief survey of the literature on the impact of fragmentation and distributive politics on a government's allocation of public spending at the local level. We argue that neither the empirical literature on fragmentation nor that on distributive politics has produced persuasive evidence on developing economies. Finally, we end this review section by presenting a discussion of the nature of public spending in Bangladesh.

2.1 Local government fragmentation and size of the public sector

The literature suggests that local government fragmentation reallocates government fiscal, personnel and administrative resources, and may help develop the local area (Faguet, 2014; Grossman et al, 2017). The theoretical connection between fragmentation and public spending or size of the public sector has mainly been established by two different theories with contrasting views: decentralisation theory and the Leviathan theory. Decentralisation theory (Oates, 1972, 1985) claims that a decentralised system of public output delivery will be more welfare-enhancing than a centralised system (if there is no cost advantage associated with the centralised provision), as it is more capable of reflecting the differences in demand for public

goods across jurisdictions. Therefore, from a purely budgetary perspective, increased decentralisation will cause a higher level of government spending. A contrasting argument is provided by the Leviathan theory (Brennan & Buchanan, 1980) which asserts that the higher competition and greater mobility of residents within the local units caused by decentralisation increases the efficiency of the local bureaucracies, which in turn constricts total government spending (Schneider, 1989). In addition, however, it is argued that, if the degree of revenue decentralisation is smaller than expenditure decentralisation, the constraining effect will disappear.

Empirical studies testing the relationship between decentralisation and the size of the public sector have provided conflicting results. Several studies (eg Boyne, 1992; Grisorio & Prota, 2015; Prohl & Schneider, 2009) have claimed that a higher level of decentralisation reduces the size of the public sector. Contradictorily, another strand of studies (eg Berry, 2008; Forbes & Zampelli, 1989) have found a positive relationship, while a few studies (eg Campbell, 2004; Stansel, 2006) have also found mixed results. The contemporary literature investigating the reason for such conflicting evidence suggests that the impact of fragmentation on public spending is conditional upon multiple factors, such as the type of fragmentation (horizontal, vertical or total), type of local government unit (general or special-purpose), 'spending relationship' between different units (Hendrick et al, 2011), level of democracy (Qiao et al, 2019) and ethnic heterogeneity (Choudhury & Sahu, 2022).² For instance, horizontal fragmentation creates more competitiveness among the units of the same tier, making them more efficient and cost-effective in providing public goods. As a result, the size of the public sector shrinks. Conversely, vertical fragmentation creates a complementary relationship among units of different tiers and therefore increases both local and total public spending (Campbell, 2004; Turnbull & Djoundourian, 1993).

Horizontal fragmentation, however, does not always create competitiveness. The fragmentation of general-purpose units will enhance competition among them and eventually reduce the size of public spending. The opposite will happen in the case of special-purpose units, as they, rather, have a complementary relationship (Goodman, 2015; Stansel, 2006; Zax, 1989). Studies have also investigated the relationship between total fragmentation and government expenditure and provided conflicting evidence. For instance, Campbell (2004) and Craw (2015) found that, with a higher level of total fragmentation, per capita expenditure in a local area decreases. Conversely, Feld et al (2010) and Goodman (2015) have found the opposite impact.

However, empirical studies on unitary countries are scarce. Among the few exceptions, Faguet (2004, 2014) on Bolivia and Bangladesh; Rondinelli I (1983) on Papua New Guinea; Manor (1999) on the Philippines and Cote d'Ivoire; and Kis-Katos and Sjahrir (2017) on Indonesia found that local decentralisation had a positive impact on public expenditure and social services in rural areas. In contrast, Akin et al (2005) found that the government's total expenditure decreased with decentralisation in Uganda. However, most of these studies are either descriptive or sector- and context-specific or did not measure local decentralisation at the sub-national level

² As a result of limited scope and data unavailability, this study could not investigate the impact of democracy and ethnic heterogeneity on the size of public spending. The paper focuses chiefly on the impact of different types of fragmentation.

in a comprehensive manner.³ Overall, the evidence regarding how fragmentation affects public spending allocation in unitary countries is scarce and inconsistent and, to our knowledge, no earlier study has empirically investigated this relationship in the context of Bangladesh.

2.2 Political distribution theories of resource allocation

Theories of distributive politics suggest that, as government spending decisions are ultimately determined through a political process, the political parties in power often allocate public funds based on electoral motives and without considering efficiency or equity (Besley et al, 2004; Bardhan & Mookherjee, 2012; Gervasoni, 2010). Numerous studies have investigated the impact of electoral competition and political motives on private and public resource distribution and have developed several theories on distributive politics. However, this paper mainly focuses on the core voter hypothesis, swing voter hypothesis and partisan alignment theory, and tests these theories in the Bangladesh context. A brief description of these theories with supporting empirical evidence is presented in this section.

The debate between the core voter hypothesis and swing voter hypothesis has gained wide attention among political scientists over the years. The core voter hypothesis asserts that politicians tend to spend more in the areas that contain a larger percentage of their core support (Cox & McCubbins, 1986). The main argument here is that political parties know their core supporters' preferences and desires; therefore, spending is the most cost-effective way of vote buying, whereas other options are riskier (Diaz-Cayeros et al, 2016). A large body of studies has found supporting evidence in favour of this hypothesis (eg Das & Maiorano, 2019; Arulampalam et al, 2009; Calvo & Murillo, 2004; Larcinese et al, 2013; Luca & Rodríguez-Pose, 2015).

In contrast, the swing voter hypothesis posits that more resources should be allocated to those groups or regions that contain a large percentage of voters who are ideologically uncommitted to particular political parties, known as 'swing voters' (Lindbeck & Weibull, 1987). The argument in favour of this hypothesis is that politicians should not waste their efforts on voters who will vote for them no matter what. Rather, by targeting swing voters, such favour may make the difference between the latter supporting or opposing said politicians (Stokes, 2005). Again several empirical studies, for instance Lindbeck and Weibull (1987), Nichter (2008), Snyder (1989), Strömberg (2008), and Stokes (2005) have found supporting empirical evidence. These two alternative hypotheses, however, are not incompatible, as evidence suggests that, over the long term, parties maintain their electoral coalition with their core voters but, in the short run, during election years, try to expand their electoral base by targeting swing voters (Ahmad, 2021; Calvo & Murillo, 2004; Stokes, 2005). Moreover, political parties may diversify their electoral investment in both core and swing voters by using cash transfers (a quicker and easier method) to target swing voters, and public goods (which are a long-term and slow moving investment) to target core voters (Tribin, 2020).

³ The early studies (eg Manor, 1999; Rondinelli, 1983) were mostly descriptive in nature. Several studies are sector-specific (eg Akin et al, 2005; Kis-Katos & Sjahrir, 2014; Faguet, 2014). Faguet's (2004) study on Bolivia used a dummy variable to indicate the post- and pre-decentralisation era. Therefore, the level of decentralisation was not directly captured.

Conversely, the partisan alignment theory asserts that the upper-tier government allocates more funds to lower-tier governments or to constituencies which it controls, ie which are aligned with the upper-tier government (Arulampalam et al, 2009; Strömberg, 2008). The argument is that, if citizens have a special social preference for a particular political party, independent of whether the incumbent political party in power has helped them or not, then the redistribution policy may not show any evidence of partisan alignment (Kartik & Preston McAfee, 2007; Dey & Sen, 2016). Empirical studies have, however, provided inconsistent results. For instance, Livert et al (2019), Ansolabehere et al (2002), Knight (2002), Solé-Ollé and Sorribas-Navarro (2008) and Wong (2022) found supporting evidence, whereas Callen et al (2020), Erikson et al (1989) and Plotnick and Winters (1985) failed to find any unambiguous effect of partisan alignment on resource allocation or voter welfare.

2.3 The nature of development spending in Bangladesh

In this sub-section, we discuss the nature of the Bangladesh government's development spending. A review of the literature indicates that such spending in Bangladesh is centrally controlled and biased towards non-poor and advanced regions. Regarding the fiscal authority of the local units, studies have noted that local government institutes (LGIs) are highly dependent on central allocation but the share of the public spending they receive is nominal.

The Bangladesh government's annual development spending is organised through its ADP, which is a list of projects and allocations in various sectors for one year out of a five-year plan period (MoF, 2022a).⁴ The major share of the ADP is channelled through vertically driven sector programmes and projects implemented by ministries and their line agencies (17 agencies of 12 ministries operate at the local level). Only a minor share of the ADP is channelled through block allocations, of which an even smaller portion is assigned to LGIs through transfers. Hence, the amount of transfer is nominal compared to the public expenditure incurred at the same level through separate government agencies (Kabir, 2015; Aminuzzaman, 2011; Ahmed et al, 2014). Recent budget data confirm that, in 2022, the total ADP allocation for the Local Government and Rural Development Ministry (which consists of the Local Government Division – LGD, the Rural Development and Cooperative Division and the Ministry of Chattogram Hill Tracts Affairs) was only 15% out of the total development spending (MoF, 2022b). The local government units (city corporations, municipalities, district councils, sub-district councils and union councils) are under the LGD and the latter's budget for the LGIs is also comparatively small, around 13% to 15% (MoF, 2022b; Kabir, 2017). During our study period, the budget share was even lower, around 2.5% to 6.5% (BBS, 2015; Fox & Menon, 2008). The urban LGIs (city corporations and municipalities) usually receive a relatively higher allocation. However, all the city corporations together received 553 crore (5,530 million) taka in 2007–08, which was only 2.45% of the year's total ADP allocation (BBS, 2015).

⁴ The public expenditure data do not come in the form of regional disaggregation. The list shows sectoral and project-wise allocations which cannot be properly disaggregated at the local level. The Ministry of Finance has, however, published the district and division-wise disaggregation of the public expenditure data for some years and this is what is used in the current study.

Several studies investigating the nature of the government's development spending have argued that it is biased towards advanced regions and the non-poor (eg Chowdhury & Sen, 1998; Khondker & Mahzab, 2015; World Bank, 2010; Sen & Ali, 2009). Studies have also found that public spending funded by foreign grants mostly finances non-productive civil expenditure, whereas foreign loans are generally utilised for human capital-building programmes (Quazi, 2005). The literature has further found that the Bangladeshi LGIs possess a poor level of fiscal authority in the resource mobilisation channels. The LGIs are highly dependent on central transfers, which, however, are determined by *ad hoc* decisions within the Ministry of Finance; local representatives have almost no involvement in the design or implementation of the development projects (Talukder, 2019; Sarker, 2006; Fox & Mennon, 2008; Panday, 2014). The government also exercises a considerable degree of control by increasing or decreasing the allocation or by making the release subject to the fulfilment of certain conditions (Siddique, 2005). Furthermore, the various functions and legal rights of the LGIs are determined by act of parliament, and through such acts the central government still holds a dominant position and the legal provision to control the LGIs (Ehsan, 2021; Panday, 2011). Moreover, the central government has appointed an administrator at each tier of the local government system and the LGIs are accountable to those field officers through different legal procedures and requirements for approval. For instance, the budget of the union council (lowest tier LG unit) requires final approval from the Union Nirbahi Officers (UNOs). UNOs are also the chief executive of the Upazila or sub-district. Similarly, sub-district councils (middle-tier LG units) have to plan local development in consultation with the local MP, whose advice often turns into an executive order. The central government can also remove the elected representatives of any LGI from his/her office on certain grounds (Ehsan, 2021; Huque & Panday, 2018; Ahmed, 2015).

Nevertheless, several studies have argued that, despite having limitations, the local units have played a positive role in local development by ensuring local representation and participation, enhancing the efficiency of public service provision (especially in health and education) and by expanding the government's social assistance programmes, as these are implemented through the local units (Galasso & Ravallion, 2005; Faguet, 2017). It has been observed that, if the local unit representatives are aligned with the ruling political party, higher fiscal and administrative resources are mobilised to the local area (Panday, 2014; Lewis & Hossain, 2017). Therefore, fragmentation or local unit creation may ensure higher resource mobilisation through indirect channels.

However, empirical studies testing the distributive political models on public resource allocation are limited. Among the handful that exist, Mahmoud et al (2008) found that a local MP's affiliation with the ruling party played a significant role in attracting more public investment (thereby supporting the political alignment theory) but their study was only able to disaggregate ADP expenditure partially (about 40% to 60%) and did not cover the whole country. Similarly, Lewis and Hossain's (2017) and Panday's (2014) qualitative investigations at the sub-district level claimed that the central government allocates more grants to those local bodies which are administered by party allies (supporting the partisan alignment theory). Nevertheless, the findings of these descriptive studies are yet to be empirically tested. In particular, to the best of our knowledge, no previous study has investigated the core voter and swing voter hypothesis on public spending in the context of Bangladesh, which is a very interesting issue to explore.

Furthermore, over the years the government has promoted local government decentralisation by increasing the number of horizontal local units in each tier; therefore, its overall impact on the resource-delivery mechanism needs to be systematically investigated.

Overall, our review of the literature shows that most of the studies on fragmentation and distributive politics were either conducted in federal countries or examined the allocation of only specific grants and transfers. Investigations into whether the electoral motive is also evident in total public spending in the context of unitary developing countries are still limited. Moreover, methodological issues – like reverse causality between spending and voting behaviour and the omitted variable bias caused by spatial heterogeneity – are often not properly considered. Further, a wide range of political variables is used in empirical studies to proxy the theoretical variables while testing those distributive theories, and it is therefore important to test them in different settings. For such reasons, more empirical investigations are required to explore the key determinants of public spending. Hence this study examines three dominant theories of distributive politics – the core voter hypothesis, swing voter hypothesis and alignment theory – in the context of Bangladesh to find out whether central government development spending is influenced by political motives.⁵

Informed by the foregoing discussion on fragmentation and distributive politics, we test a set of four hypotheses:

- *Hypothesis I: Fragmentation has a significant impact on a central government's (CG) annual development expenditure allocation at the sub-national level. We expect that total fragmentation, vertical fragmentation and horizontal fragmentation of a special-purpose unit will have a positive impact on public spending, whereas horizontal fragmentation of general-purpose units will have the opposite effect.*
- *Hypothesis II: A higher share of the core vote for the ruling party has a positive impact on the CG's annual development expenditure allocation at the sub-national level.*
- *Hypothesis III: A higher share of the swing vote has a positive impact on the CG's annual development expenditure allocation at the sub-national level.*
- *Hypothesis IV: The local elected representative's political alignment with the ruling party in the government has a positive impact on the CG's annual development expenditure allocation at the sub-national level.*

While the first hypothesis is fragmentation, Hypotheses II and III are a test of the core voter and swing voter hypothesis, respectively. Hypothesis IV deals with partisan alignment in resource allocation.

3 Methodology and data

⁵ There is a vast literature examining different forms of vote buying (see, for example, Diaz-Cayeros et al, 2016; Bardhan & Mookherjee, 2016). As this study deals with the total development expenditure allocation of the government and detailed knowledge about the type of expenditure is not available, it does not consider the issue of different forms of vote buying and their impact in the current analysis. Besides, data unavailability at the local level has been a major constraint in selecting the distributive models to test.

3.1 Data and variables

We construct a unique dataset, which is a balanced panel of 61 districts (out of a total of 64 districts) covering the period from 2005 to 2009.⁶ This period covers three different political regimes and district boundaries remained fixed over these years. Our dependent variable is the district-wise allocation of per capita ADP spending. The data were provided by the government's Ministry of Finance. We use a range of fragmentation indicators and the political variables as key independent variables.

To capture different types of fragmentation, we construct five indicators. *Total units per density* is the number of total LG units (ie aggregate of the number of union councils, municipalities, sub-district councils and district councils) in a district per population density. It is constructed to capture the degree of total fragmentation, following Campbell (2004) and Oates (1993). *Local self-government units per density* measures horizontal fragmentation. It is the number of local self-government units at the lowest tier of the LG structure. The number of union councils and municipalities in a district are added to construct this indicator, as only they can be considered self-government units in Bangladesh (Siddique, 2005; Panday, 2011). Furthermore, as general and special-purpose local units have different effects on public spending, separate indicators are constructed (following the studies by Hendrick et al (2011) and Stansel (2006)). In Bangladesh, unions may be labelled general-purpose units and municipalities may be labelled special-purpose units (Ahmed, 2015). Therefore, in this study, horizontal fragmentation of general-purpose units is measured by the indicator *unions per density*, which shows the number of union councils in a district.⁷ Horizontal fragmentation of special-purpose government is measured by the indicator *municipalities per density*, which displays the number of municipalities in a district. Finally, following the studies by Boyne (1992) and Goodman (2015), the indicator *vertical fragmentation* is constructed. It shows the share (%) of local government units in the lowest tier (total number of unions and municipalities) out of the total number of units (considering all the three tiers) in the district. All the fragmentation indicators are standardised by the population density of the district.⁸

We constructed the political variables using the national election results of 2008, 2001, 1996 and 1991. Constituency-based election results are aggregated to make them representative at the district level following the work of Asfaw et al (2008) and Imai and Sato (2012).⁹ The literature shows that using the short-run indicator to test the impact of voting on the government's

⁶ Three hill districts – Rangamati, Bandarban and Khagrachari – were not included, as they come under the Special Affairs Division, with a separate local government act and land administrative law.

⁷ The Upazila or sub-district councils (in the middle tier) and Zila or district councils (in the top tier of the local government system) had no elected representatives during the entire study period. Therefore, they are not included as self-governing units.

⁸ Land area and population are often used for standardisation purposes (see Stansel, 2006; Zax, 1989). However, population density incorporates the effect of both land and population and also effectively helps to downsize the impact of population on the value of the indicator. Population density is calculated by dividing the district population by the district land area and is expressed in 1,000 km² of land area.

⁹ The local elections (union and sub-district) were held without party banners and were irregular, which does not allow us to construct the political variables at that level. In addition, as the ADP data do not come in the form of spatial disaggregation (except for a few interim years), we had to rely on constituency-based election results and conducted the study at district level.

spending decisions suffers from endogeneity problems (Larcinese et al, 2013). Moreover, core or swing voter measurement should not be based on the vote returns of a single election, as core supporters are those voters who show partisan loyalty over a long period (Diaz-Cayeros et al, 2016). To tackle this issue, we constructed the core vote and swing vote indicators using the previous three election results. The timespan of the investigation covers three different political regimes: the years 2005 and 2006 fall into the Bangladesh Nationalist Party (BNP) government regime; during 2007 and 2008 the country was under a state of emergency. National elections were held in 2008, and the last year, 2009, falls under the Awami League (AL) government regime. Therefore, for the first two years of the panel, the national election results of 2001, 1996 and 1991 are used to construct the political variables. For the last year (2009), the election results of 2008, 2001 and 1996 are considered. For the middle two years (2007 and 2008), when the country was under a state of emergency, a zero value is assigned to the core and swing voter indicator.

To test the core and swing voter hypothesis, the core and swing vote share of each district was measured following Larcinese et al (2006, 2013). The variable *Vote share_long* is the share of the core vote in a district for the ruling party considering the past three national elections. The variable is constructed as follows. First, for each constituency, the vote share for the ruling party (core vote) is obtained from the election result. Then, to make the variable representative at the district level, a weighted average of the entire constituency core vote share in a district is computed, and the new variable is denoted as *District vote_share*. Each constituency's share of the total vote cast in the district is considered as the weight. Finally, the indicator *Vote share_long* is constructed by computing the average of the last three elections' *District vote_share* for the ruling party. Therefore, $District\ vote_share = \sum_{i=1}^n w_i \times$ constituency vote share for the ruling party, where, $w_i =$ total vote cast in a constituency/total vote cast in the district, and $i= 1, 2, 3, \dots, n$, is the number of constituencies in a district. Thus, $Vote\ share_long = \sum_{t=1}^3 District\ vote_share / 3$; where, $t =$ the number of elections. The second indicator, *Swing vote_long*, represents the share of the swing vote for the ruling party in a district. This variable is constructed by computing the standard deviation of the last three elections' *District vote_share*. A higher indicator value, ie a higher standard deviation of the core vote shows more swing votes in the district.

We use two separate variables to test the partisan alignment theory. *Partisanship* is the share of elected representatives from the ruling party out of the total elected representatives in a district (following Arulampalam et al, 2009). If all a district's constituency representatives are from the ruling party, the variable takes the value '1' and it takes '0' if none of them is from the ruling party. For the caretaker-government period (2007 and 2008), the study assigned the value '0' to this variable, as the advisors to the caretaker government were neither elected nor from any political party.¹⁰ The second variable, *Number of ministers*, is constructed, following Golden and Picci (2008), by taking the number of elected representatives from a district who served in the government as a minister, state or deputy minister, or special advisor to the prime minister

¹⁰ For further confirmation, the study tested all the hypotheses excluding these years from the panel and compared the outcomes with the original results as a part of a robustness check.

(enjoying the status of a minister). For the caretaker period, the number of advisors (equivalent to ministers) from each district is considered.

Finally, we use a set of control variables on the demographic and socioeconomic features of the district (ie the *demand model* variables), which are widely used in the literature. District population (as a proxy of district size to capture the scale effect), population growth rate (to capture the change effect), the district’s GDP, its share of the school-going population, extreme poverty level (incidence, headcount), and the unemployment rate are all incorporated, as governments usually have an equalising objective in their expenditure programme. In addition to this, access to a paved road (length of paved road as a percentage of the total) and access to electricity (percentage of households having access) are included to capture the level of infrastructural development, which also determines public investment decisions. [Table 1](#) presents the descriptive statistics for all the variables described above. A detailed description of the construction method and sources of the variables is presented in Appendix [Table A1](#).

Table 1: Descriptive statistics

Variable	Obs	Mean	Std Dev	Min	Max
Per capita total development expenditure*	305	1.396902	0.5756836	0.467	4.37
<i>Fragmentation indicators</i>					
Total units per density	305	92.84803	43.39401	15.02996	214.5772
Local self-govt units per density	305	83.6966	39.30866	12.96291	190.1934

Unions per density	305	78.47316	37.59966	11.62695	182.8783
Municipalities per density	305	5.255726	2.767083	0.5761295	14.14711
Vertical fragmentation	305	89.69323	3.72958	65.69343	96.15384
Political variables					
Vote share_long	305	0.234614	0.2086297	0	0.8989944
Swing vote_long	305	0.051791	0.0553214	0	0.3483487
Number of ministers	305	0.606557	1.077257	0	6
Partisanship	305	0.45773	0.4448158	0	1
Controls					
Population	305	2181752	1417206	619915	9498383
Growth in log of population	305	1.256263	0.6249336	0.1639787	1.567708
Growth in log of per capita nominal GDP	305	0.085974	0.3941987	-1.486533	0.7364016
Share of school-going population (%)	305	2.189597	0.3761045	1.315572	3.204907
Unemployment rate (%)	305	4.137082	3.056841	0.4504505	23.10797
Extreme poverty (%)	305	22.00407	10.70516	-2.26	55
Access to electricity (%)	305	44.87336	18.84913	7.44	98.69
Access to paved roads (%)	305	77.35321	14.35828	33.69026	100

(T=5, n=61)

Note:

* The per capita development expenditure is in a nominal term. During our study period, the variable showed a fluctuating trend. Using the national Consumer Price Index (CPI), we have converted the variable into a real term. We find that the mean per capita real development expenditure was 0.019 thousand taka during our study period and it also had a fluctuating trend. However, as regional CPI is not available and we are only interested in the spatial inequality, we have refrained from using the real per capita spending in our investigation.

3.2 Empirical strategy

The estimation strategy involves two steps. First, the study designs the following static linear panel model to test the hypotheses:

$$\ln_Exp_{it} = \alpha F_{it} + \beta P_{it} + \delta X_{it} + \mu_t + \gamma_i + u_{it} \dots\dots (1)$$

Where, \ln_Exp_{it} is the log of per capita development expenditure of the central government allocated to district i in year t ; F_{it} is a vector of fragmentation indicators and P_{it} is the vector of political variables.¹¹ The vector X_{it} represents control variables; γ_i denotes the district-specific time-invariant fixed effect, μ_t is the time effect, and u_{it} is the idiosyncratic error term. Following the studies by Arulampalam et al (2009), Hauk and Wacziarg (2007) and Livert et al (2019) this log-linear model is constructed, which provides a better fit.¹²

¹¹ Political and fragmentation variables are incorporated together in a single model specification, although there is a high correlation among them. As various hypotheses regarding these variables are not logically incompatible with each other, regressing separately at a time might cause an omitted variable bias (Larcinese et al, 2013). Moreover, by incorporating the variables together, it is possible to examine whether any of them offset the effects of the other variables in determining or influencing the development spending allocation. However, all the indicators are also separately regressed against the dependent variable, and the results are analysed as a part of the robustness check.

¹² As the study used a log-linear model, the slope coefficient measures the relative change in per capita development spending for a given absolute change in the value of the regressor. Therefore, the dependent variable shows the rate of growth of per capita ADP allocation.

In the next step, a dynamic panel model is constructed by including the lag of the dependent variable on the right side of equation (1). The dynamic model corresponds to the typical specifications of empirical models found in the existing political distribution literature. The rationale for considering the autoregressive model is to capture the incremental nature of government development spending. Former allocations usually have a substantial impact on current allocation, as governments accumulate experience from the past. Moreover, if allocations are administrated through formulas or the government shows limited responsiveness to the different changes in characteristics in the country, inertia in the budgetary allocation is observed (Larcinese et al, 2013). To incorporate these issues, and to control the presence of a first-order autoregressive process in the panel, the study constructed this dynamic model following the specification used by Larcinese et al (2013) and Hauk and Wacziarg (2007). In addition, estimating both static and dynamic panel models is useful, as the impact of the political variables may vary significantly over time. Therefore, by analysing the static and dynamic panel estimates, we can identify such variations, as the former shows the long-term impact, the latter the short-term impact on the dependent variable.¹³

Regarding the estimation strategy, for the static panel model, this study relies on a two-way fixed- effect estimation,¹⁴ with district and year time effect, as it has the advantage of controlling all the time-invariant variables that are idiosyncratic to the districts (Greene, 2003). To control serial and spatial correlation, robust standard errors were estimated, clustering them at the district level.¹⁵ For the dynamic panel, the study applied a bootstrap-based, bias-corrected, fixed-effects estimation technique. The econometric literature suggests that, if the cross-sectional variation is larger than the within variation in the panel, which is the case in our investigation, the bias-corrected fixed-effects estimation technique provides better estimates than the Generalised Method of Moments (GMM) estimators in terms of accuracy and efficiency (Everaert & Pozzi, 2007; Kotschy & Sunde, 2017; De Vos et al, 2015).¹⁶ However, several alternative techniques were also applied and compared with the main results as part of the robustness test. The bootstrap-based, bias-corrected, fixed-effects estimation is conducted by using the *xtbcfe* command in STATA.

4 Results

¹³ A unit root test was applied to all the core variables and confirmed that the dependent and the fragmentation variables are not stationary. In such a situation, dynamic panel models are appropriate. However, as this study deals with micro panel data (T=5 and N=61), stationarity is not a crucial issue. Nevertheless, to get robust estimates, both static and dynamic panel models are constructed.

¹⁴ The pre-diagnostic test Pesaran test (Pesaran, 2021) confirms that there is no cross-sectional dependence in the panel dataset, which obviates the need to conduct spatial econometric analysis. The Hausman and Brusch–Pagan LM tests (Hausman, 1978; Brusch & Pagan, 1979) were applied to identify the appropriate estimator. Tests confirm that the estimates provided by the fixed-effect estimation are preferable compared to random effect and pooled OLS.

¹⁵ The modified Wald test (Baum, 2001) confirms the presence of group-wise heteroscedasticity. The Wooldridge test (2002) confirms the presence of serial correlation of AR (1) in the dataset.

¹⁶ A detailed discussion regarding the selection of the dynamic estimation technique is provided in the Appendix (see the further [note to Table A1](#)).

In this section, we discuss the econometric results obtained from both the static and dynamic panel model estimations. The fixed-effects estimates of the static panel model are reported in [Table 2](#). Fragmentation and political variables are separately regressed against the dependent variable as a baseline model, and the results are shown in columns 1 and 2, respectively. Finally, in column 3, the full specification model is used. For every specification, a linear restriction test was applied to the explanatory variables and reported in each column.

Table 2 confirms that none of the fragmentation indicators (except *Local units per density*) show any statistically significant association with the dependent variable, either in the baseline or the full specification model. The indicator *Local units per density* showed a weak association with the dependent variables in the baseline specification; however, it became insignificant in the full specification. A linear restriction test applied to all the specifications confirms that the fragmentation variables are not significantly different from zero. Therefore, the fixed-effects result rejects the hypothesis that fragmentation (either total, horizontal or vertical) has a significant impact on the CG's annual development expenditure allocation at the sub-national level.

[Table 2: Determinants of development expenditure: fixed-effects estimates](#)

Variables	Dependent variable: log of per capita development expenditure		
	(1)	(2)	(3)
Fragmentation indicators			
Total units per density	-0.0225 (0.0260)		-0.0247 (0.0213)
Local self-govt units per density	0.0939* (0.0560)		0.0175 (0.0473)
Unions per density	-0.0627 (0.0490)		0.0382 (0.0436)
Municipalities per density	0.0727 (0.0864)		0.0850 (0.0674)
Vertical fragmentation	-0.01793 (0.0265)		-0.0255 (0.0217)
Political variables			
Vote share_long		0.793*** (0.297)	0.747*** (0.273)
Swing vote_long		-1.298** (0.627)	-1.564*** (0.550)
Number of ministers		0.0681*** (0.0172)	0.0694*** (0.0165)
Partisanship		0.190* (0.111)	0.234** (0.105)
Controls	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
District dummies	Yes	Yes	Yes
Constant	1.909 (3.009)	0.0748 (1.147)	-0.466 (2.428)
Observations	305	305	305
R-squared	0.514	0.651	0.668
Number of districts	61	61	61
Linear restriction test* (p-value)	1.22 (0.3121)	20.46 (0.000)	14.13 (0.000)

Note: Robust standard errors in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Among the political variables, the coefficient of *Vote share_long* is positive and statistically significant. This indicates that the district’s core vote share for the ruling party in government ensures a higher development expenditure allocation in the area, which is in line with the core vote hypothesis. However, the coefficient of *Swing vote_long* is negative and statistically significant, thereby rejecting the swing voter hypothesis, as it indicates that a higher share of the swing vote will lower the allocation of development expenditure.

The other two variables – *Number of ministers* and *Partisanship* were constructed to test partisanship alignment in the resource allocation process. *Number of ministers* holds a positive and statistically significant association with the dependent variable, indicating that having a higher number of ministers from a district ensures a higher development expenditure allocation. The variable *Partisanship* does not show a statistically significant association in the baseline estimation (column 1), although in the full specification model the coefficient of the variable becomes statistically significant. Therefore, the fixed-effects results confirm our hypothesis that local elected representatives’ political alignment with the ruling party in government has a positive impact on the CG’s annual development expenditure allocation at the sub-national level. A linear restriction test applied to all the specifications also confirms that the political variables are significantly different from zero. Further investigation is conducted to see whether the political variables are individually significant in the robustness checks section.

[Table 3](#) reports the regression results of the (bootstrap-based) bias-corrected, fixed-effects estimation technique applied to the dynamic panel model. A similar specification is used in the estimation method, apart from including the lag of the dependent variable in the model. The results again confirm that the fragmentation indicators have no significant association with per capita development expenditure. Among the political variables, the variable *Vote share_long* shows a positive and statistically significant association with the dependent variable in all the specifications. However, the rest of the political variables – *Swing vote_long*, *Partisanship* and *Number of ministers* failed to show any significant association with the dependent variable (see columns 2 and 3). This might have occurred because the variable *Vote share_long* is either capturing the effect of the other political variables or because those political variables do not have any short-run impact on the dependent variable. This is an issue which the study will further investigate in the robustness checks section.

Table 3: Determinants of development expenditure – dynamic fixed-effects estimates

Variables	Dependent variable: log of per capita development expenditure		
	(1)	(2)	(3)

L log of per capita dev expenditure	0.687*** (0.115)	0.632*** (0.0920)	0.447*** (0.121)
Fragmentation indicators			
Total units per density	-0.0505 (0.0798)		-0.0334 (0.0711)
Local self-govt units per density	0.0944 (220.5)		-0.0516 (0.220)
Unions per density	-0.0293 (220.5)		0.122 (0.236)
Municipalities per density	0.186 (220.5)		0.222 (0.284)
Vertical fragmentation	-0.0946 (0.0774)		-0.0623 (0.0691)
Political factors			
Vote share_long		0.853*** (0.317)	0.812*** (0.271)
Swing vote_long		-0.835 (0.664)	-1.258* (0.638)
Number of ministers		0.0331 (0.0220)	0.0463* (0.0240)
Partisanship		0.0555 (0.113)	0.143 (0.108)
Controls	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Observations	244	244	244
Number of districts	61	61	61
Linear restriction test	0.95	11.89	11.02
p-value	0.4488	0.00000	0.00000

Note: Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

A linear restriction test again confirms that none of the fragmentation variables is different from zero, whereas the political variables are jointly significantly different from zero. Table 3 also shows that the coefficient of the lagged dependent variable is positive and statistically significant, which confirms that the previous year's allocation has a significant impact on the current year's development spending.

For further illustration, the study makes a comparison between the static panel estimates (of Table 2) and dynamic panel estimates (of Table 3). However, the estimated coefficients of the dynamic panel regression are short-run multipliers. Therefore, we have calculated the long-run multipliers by dividing each short-run multiplier with $(1 - \alpha)$ where α is the coefficient of the lag dependent variable. Table 4 shows the long-run effects of all fragmentation and political variables on per capita development expenditure.

Table 4: A comparison of the long-run effects from static and dynamic panel estimates

	Dependent variable: log of per capita development expenditure	
	Static model estimation (fixed-effects results)	Dynamic model estimation (Bias-corrected fixed-effects results)
Fragmentation indicators		
Total units per density	-0.0247	-0.0604
Local units per density	0.0175	-0.0933

Unions per density	0.0382	0.2206
Municipalities per density	0.0850	0.4014
Vertical fragmentation	0.0255	-0.1127
Political factors		
Vote share_long	0.747***	1.4684**
Swing vote_long	-1.564***	-2.2749*
Number of ministers	0.0694***	0.0837*
Partisanship	0.234**	0.273

Note: *** p<0.01, ** p<0.05, * p<0.1.

Table 4 reveals that a variation is observed in the direction and magnitude of the coefficients of some of the fragmentation variables. However, in both the alternative techniques, none of the fragmentation indicators showed any significant association with the dependent variable. In contrast, both the estimation techniques produced similar estimates of the long-run effects of the political variables. The only difference is that in dynamic panel estimations, the partisanship (*number of ministers* and *partisanship*) and *swing vote* variables showed no significant association with the dependent variable, although the sign and magnitude were more-or-less are the same.

4.1 Robustness checks

A series of robustness checks were applied to explore the sensitivity of both the static and dynamic panel results. The first set replicates the original analysis but using alternative estimation techniques and then compares the estimates. We applied the random effect, first difference, and pooled ordinary least square (OLS) estimation methods to the static panel model, and bias-corrected least square dummy variable (LSDV) estimators, ie LSDV internalising Anderson & Hsiao (1982), Arellano & Bond (1991) and Blundell & Bond (1998), and IV-GMM (two-step difference GMM and system GMM) estimators to the dynamic panel model. The results are provided in [Table A2 in the Appendix](#). Most of the alternative estimation techniques confirm our main results (except for 1st difference and pooled OLS estimates in the static panel estimation and system GMM estimates in the dynamic panel).¹⁷ All the alternative techniques (except the difference GMM estimation¹⁸) validate the finding that the previous year's allocation has a significant impact on the current year's development spending.

Next, the study applies an alternative specification to the model. The study constructs separate specifications for each variable to avoid the issue of correlation among the variables and to investigate how they are associated with the dependent variable individually. [Table A3](#) shows the fixed-effects regression results of the alternative specification. Again, the results validate the

¹⁷ Pooled OLS and 1st difference are weaker techniques among all the alternatives, as pooled OLS fails to capture the unobserved time-invariant heterogeneity across the districts, and in 1st difference the degrees of freedom reduced significantly. In the system GMM estimation, the coefficient of *core vote_share* is statistically insignificant (see column 8, [Table A2](#)). However, some restrictive measures were taken in the system GMM estimation, which yielded such an outcome. Relaxing them, the coefficient again becomes significant at the 5% level. For details, see the note attached to Table A2.

¹⁸ The coefficient of the lag dependent variable in difference GMM is statistically insignificant (see column 7, Table A2). However, the literature suggests that IV estimates (applied in GMM) of the autoregressive coefficients are often unreliable, as the method is sensitive to the presence of unobservable heterogeneity and serially correlated errors, where the instruments become invalid (Dang et al, 2015).

main fixed-effects results (of [Table 2](#)) except for the variable *swing vote_long*, which now fails to show any significant association with the dependent variable (see column 7 in Table A3). The same process was repeated for the dynamic panel model, and a similar result was obtained (results can be provided on request). Therefore, the results indicate that swing vote share does not have any significant association with the dependent variable. However, for further confirmation, we constructed an interaction term between *swing vote_long* and *core vote_long* to check whether the impact of core vote share on the dependent variable varies with the different level of swing vote share. This will give us a robust confirmation regarding the impact of the swing vote. The static and dynamic panel estimates are provided in Table A4. The results show that the coefficient of the interaction term (*vote share*swing vote*) is negative but not statistically significant. This confirms that the impact of vote share (ie core vote share) on the dependent variable does not vary with the level of the swing vote share in the district.

In the third set of robustness checks, the study uses different measures of the fragmentation and political variables. As an alternative, all fragmentation indicators are standardised in terms of district land area (units per 1,000 km² of land area in the district) instead of population density, following the work of Stansel (2005, 2006) and Zax (1989). For vertical fragmentation, following the study by Hendrick et al (2011), our study constructs a new indicator which shows the number of special-purpose units per general-purpose unit (ie the number of municipalities per union for the Bangladesh context). Regarding political variables, *vote share_short* is constructed and shows the share of the core vote for the ruling party in the last national election (rather than considering the average of the previous three elections). Using the same technique, *swing vote_short* is constructed. Finally, the new variable *Num_minister* is constructed by assigning the value '0' for the years 2007 and 2008. During this period, the country was under a caretaker government and a state of emergency. Therefore, by assigning the value '0', the study holds the assumption that caretaker government advisors showed no element of partisanship, as they had no intention of being elected in the next election.

Both the static and dynamic panel estimates are reported in Table A5. The fixed-effects estimates (column 1) are similar to our main results in Table 2. In the dynamic panel model (column 2), a similar result is obtained (compared to Table 3) except for the variable *total units per 1,000 km² of land*, which now shows a significant association with the dependent variable. However, separately regressing against the dependent variable, the coefficient again becomes insignificant (the result can be provided on request), thereby confirming no robust association with the dependent variable.

It is often argued that caretaker or interim governments usually follow the previous government's allocation pattern and restrain themselves from implementing any radical change. Therefore, the previous government's share of the core vote and swing vote may also influence a caretaker government's allocation pattern. The study conducts a further robustness test by assigning the previous government's core and swing vote share values for 2007 and 2008 to address this issue (instead of assigning 'zero' to those variables). The regression results are provided in [Table A6](#). Fixed-effects regression results again confirm the initial results of [Table 2](#). The dynamic panel estimates were also consistent with the results of Table 3 but are not shown here (the results can be provided on request).

In addition, we also tested the hypotheses on different sets of data, as it can be argued that districts with metropolitan cities and city corporations might drag in more public resources for themselves. We therefore ran the regression on two separate sets of data: first, only considering those districts with city corporations (Dhaka, Chittagong, Comilla, Barishal, Khulna, Mymensing, Rajshahi, Rangpur, Sylhet, Gazipur and Narayanganj – all these 11 districts have a city corporation, except Dhaka, which has two city corporations); and second, taking the remaining districts. The fixed-effects regression results are presented in Table A7. The results again confirm that, in both cases, fragmentation does not have any robust impact on the ADP allocation. For further confirmation, we regressed the fragmentation variables separately against the dependent variable and found a similar result. In contrast, among the political variables, only *Number of ministers* and *Partisanship* show a significant association with development allocation in these selected districts (see column 1). However, for the remaining districts, *Core vote share* also shows a significant association with the dependent variable, along with *Number of ministers* and *Partisanship* (see column 2). The dynamic panel estimation also offers the same conclusion (the results can be provided on request).

The last set of robustness checks was conducted to investigate whether the impact of distributive politics on the dependent variable varies according to the level of fragmentation. We investigated such a possibility by including some interaction variables in the model. First, five new variables were created by interacting the variable *vote share_long* with all the fragmentation indicators to test whether the impact of core vote share varies with the level of fragmentation. The results of [Table A8](#) confirm that the impact of core vote share on the dependent variables does not vary with the level of fragmentation, as in none of the cases are the coefficients of the interaction terms statistically significant (see columns 2–6 of Table A8). Similar techniques were repeated for the other political variables, and the regression results again confirm that the impact of *swing vote_long*, *Number of ministers* and *Partisanship* also does not vary with the level of fragmentation (regression results can be provided on request).

Besides the above tests, the study also performs some additional robustness tests, eg modifying the panel dataset by including all the 64 districts in the analysis, excluding the caretaker government period (2007–08) from the panel, and using an alternative dependent variable—expenditure share for each district (following the study by Ansolabehere et al, 2002). In all cases, the results were similar to our main findings; they can be provided on request.

5 Discussion

The empirical findings can be summarised as follows. First, fragmentation of local government units (either total, horizontal or vertical) does not have any significant impact on a government's per capita development expenditure allocated at the sub-national level in Bangladesh. Second, distributive politics plays a significant determining role in the allocation of development expenditure, as the results show that the share of the core vote for the ruling party has a positive impact on the per capita development expenditure in the district. However, the results cancel out the swing voter hypothesis. In contrast, both the 'partisan alignment' variables – *Number of ministers* and *Partisanship* – show a significant positive association with the dependent variable in the static panel regression. In the dynamic regression, they do not show any significant association; however, when individually regressed against the dependent variable, the

coefficients again become significant. This indicates that, plausibly, in the short run, the impact of these political variables is rather captured by the *vote share_long* variable. This implies that the government mainly concentrates on core vote share in the short run. However, in the long run, the number of ministers and percentage of representatives aligned with the ruling party also influence the spending allocation. The final finding is that the impact of the political variables on public spending does not vary with the level of fragmentation.

Now, based on the bias-corrected fixed-effects results (of Table 4), the study offers the following interpretation. The results show that one standard deviation increase in the share of core vote for the ruling party within a district (ie over the time), will increase the growth of per capita development expenditure by 30.63%, other factors remaining the same (where one standard deviation increase within a district is equivalent to a 20.86% increase in the core vote share). To put this in perspective, the investigation considers two representative districts: Faridpur and Kurigram (as they are close to the fitted regression line), which had an average per capita development expenditure of 1,420.8 taka and 1,210.8 taka, respectively, during the study period. This result suggests that per capita development expenditure would have grown by an extra 503.25 taka per capita for Faridpur and by 415 taka per capita for Kurigram if the core vote share had increased by one standard deviation. The coefficient of *Partisanship* shows that one standard deviation increase in the share of an elected local representative from the ruling party (standard deviation is 0.444) within a district contributes a 3.72% increase in the growth rate of per capita development expenditure. This would have caused the per capita expenditure for Faridpur and Kurigram to increase by an extra 61.12 and 50.46 taka, respectively. Regarding the variable *Number of ministers*, the study finds that one standard deviation increase in this variable (standard deviation is 1.077) within a district would have caused per capita growth to increase by 29.4%. This implies that, for Faridpur, per capita expenditure would have increased by an extra 483.04 taka, while for Kurigram the amount would stand at 398 taka. Therefore, this study confirms that partisanship variables play a vital role in influencing development expenditure allocation, although their impact is partly reduced by the district's share of the core vote.

It is a challenge to compare these results with past studies, as distributive politics and fragmentation theories have hardly been empirically tested in Bangladesh, especially at the sub-national level. Mahmoud et al's (2008) empirical study shows that political alignment (using the same variable *Partisanship*) has a significant impact on development expenditure in the transportation sector. Several descriptive studies have also suggested that public resource allocation has become more vulnerable to patronage and political division in Bangladesh (Lewis & Hossain, 2017; World Bank, 2010; Rahman, 2013). Therefore, the findings of the current study are in line with the descriptive literature. Comparing these results with the studies conducted in similar settings also provides some validation. For instance, Besley et al's (2004) study on Indian villages was carried out in a more-or-less similar socioeconomic and political environment. Their study finds that the allocation of public goods is higher in the Gram Panchayat pradhan's (head of a village council) village. Rodden and Wilkinson's (2004) study on India claimed that the political party in power had targeted resources to its core supporters and directed resources away from those states where the opposition controlled the state government. The findings of our study are further consistent with the current political

distributive literature, eg Larcinese et al, (2013) on the US; Bracco et al (2015) and Golden and Picci (2008) on Italy; Rodriguez-Pose et al (2016) on Greece; and Livert et al (2019) on Chile. This investigation found no robust evidence in favour of regarding the *swing voter hypothesis*. However, the literature finds that the swing voter hypothesis is more often observed in mature democratic voting behaviour (Lindberg & Morrison, 2005). In Bangladesh, therefore, it can be assumed that elected representatives are still reluctant to spend more on swing voters.

Regarding the impact of fragmentation, the literature suggests that, in the developing country context, the standard arguments and theories regarding the relationship between fragmentation and public sector size may not hold, as the functions of the local units are not well defined and, in most cases, the local units are not fully devolved (Mohammed, 2016). In the context of Bangladesh, country-level studies have argued that, from a fiscal decentralisation perspective, Bangladesh is a highly centralised country. The central government usually channels the major share of the ADP allocations through various vertically driven sector programmes implemented directly by ministries and their line agencies (Fox & Menon, 2008; World Bank, 2010; CPD, 2013). Therefore, even though the number of unions and municipalities has increased rapidly across the country, our findings show that they have failed to attract more resources from the central government. Overall, limited expenditure and revenue authority and the absence of any significant spending relationship among the local units (Ahmed, 2015; Sarker, 2006) are a plausible explanation for why both horizontal fragmentation (of general or special purpose units) and vertical fragmentation failed to display any significant impact on public resource allocation.

6 Conclusion

This study has investigated the impact of local government fragmentation and distributive politics on the central government's per capita development spending at the district levels in Bangladesh by conducting a panel data analysis, covering the period from 2005 to 2009. Multiple fragmentation indicators were constructed to capture different aspects of local government fragmentation (total, horizontal and vertical) and their impact on resource allocation. In addition, to investigate the possible role of political or electoral motives in resource allocation, the study empirically tested the core voter hypothesis, the swing voter hypothesis and political partisanship or alignment theory in the context of Bangladesh.

The paper contributes to both the fragmentation and distributive politics literature in several ways. First, it suggests that local government fragmentation does not have any robust significant impact on the government's per capita development spending at the district level in Bangladesh. Therefore, the fragmentation (whether total, horizontal or vertical) of semi-devolved local government units in a unitary country may not influence the allocation of public spending. This finding has significant implications for Bangladesh. The study shows that local participation is missing in the resource delivery mechanism, as the resources are generally delivered by centrally controlled government agents. Researchers have argued that this institutional vacuum at the local level diverts the resources which are meant for the poor (Chowdhury & Sen, 1998). Therefore, to develop effective, inclusive and participatory decision making at all levels (as recommended by the SDG Goals 16 and 17) and to ensure domestic resource mobilisation, local institutions should be strengthened. Moreover, this finding also indicates that the resource

mobilisation channel of decentralisation does not work here. Therefore, other transmission channels of decentralisation need to be tested to understand their impact on different socioeconomic variables.

Second, the study has provided new evidence on the ‘core vs swing voter hypothesis’ debate, by testing both of these on a unitary developing country’s total annual development spending, which is relatively rare in the literature. The results show that ruling parties target a district’s core vote share rather than its swing vote share when allocating development spending. This finding is in line with Tribin (2020), Das and Maiorano (2019), Rodriguez-Pose et al (2016), Larcinese et al (2013), Arulampalam et al (2009) and Calvo and Murillo (2004). The regression results reveal that one standard deviation increase in the share of core vote for the ruling party (equivalent to a 20.5% increase in the core vote share) within a district will increase the growth of per capita development expenditure by 30.6%, *ceteris paribus*. The spending growth rate, however, is not significantly associated with the share of a district’s swing vote, something which seems to reject the swing voter hypothesis. The literature suggests that politicians use public goods to target core voters and cash transfers to target swing voters (Tribin, 2020). In Bangladesh, the major share of development spending is utilised to provide public goods, which might be the possible reason for obtaining the significant association between core vote share and development spending.

Third, we find that an elected representative’s political alignment with the ruling party (ie whether the local Member of Parliament is politically aligned with the party in government) and the number of ministers from a district both play a significant role in ensuring a higher per capita development expenditure allocation in that district. This provides evidence in favour of the partisan alignment theory and again fits with various other studies, eg Wong (2022), Ansolabehere et al (2002), Banful (2011), Livert et al (2019) and Solé-Ollé and Sorribas-Navarro (2008).

Fourth, dynamic panel estimates confirm that, in the short run, political parties in power put more emphasis on core vote share than on other political factors in their spending decisions, as this investigation found that the core vote share partly offsets the impact of other political variables. However, in the long run, along with core vote share, partisan alignment also starts to play a role, as shown by the static panel estimates. Finally, as part of a robustness check, the paper also investigated whether the impact of the political variables varies with the level of fragmentation by constructing multiple interaction variables between political and fragmentation indicators. The results, however, confirm that the impact of core vote share and partisan alignment on the resource allocation does not vary with the level of fragmentation at the district level.

Overall, the paper’s findings suggest that political motives tend to divert the allocation of development spending in Bangladesh. Past studies have claimed that development expenditure is biased towards non-poor and developed districts, despite the fact that several districts in the country are lagging behind in terms of poverty reduction and other socioeconomic indicators (Zohir, 2011; Sen and Ali, 2009; Chowdhury & Sen, 1998). However, the paper provides empirical evidence that the allocation of development spending is significantly influenced by

political patronage. This may be a significant obstacle to poverty reduction, as resource mobilisation mechanisms may not effectively target and reach the poor.

References

- Ahmad, M. (2021). 'Intergovernmental transfers as tactical instrument: empirical evidence from fourteen major Indian states'. *Journal of the Asia Pacific Economy* 26, 748–765. <https://doi.org/10.1080/13547860.2020.1840960>.
- Ahmed, N., Boex, J., Monem, M. and Panday, K. (2014). *Policy Study on the Local Government System in Bangladesh: A Comparative Analysis of Perspectives and Practices*. Local Government Division, Ministry of Local Government, Rural Development and Co-operatives, Government of People's Republic of Bangladesh, Dhaka.
- Ahmed, T. (2015). *Bangladesh: Reform Agenda for Local Governance*. Dhaka: BRAC Institute of Governance and Development.
- Akin, J., Hutchinson, P. and Strumpf, K. (2005). 'Decentralisation and government provision of public goods: the public health sector in Uganda'. *Journal of Development Studies* 41, 1417–1443.
- Aminuzzaman, S. M. (2010). Local government and development in Bangladesh lessons learned and challenges for improving service delivery of union parishad (UP). *Local Governance Support Project-Learning and Innovation Component (LGSP-LIC)*, 1-18. <http://doi.org/10.13140/RG.2.2.24539.92967> (2010), Accessed 22nd Feb 2019.
- Anderson, T.W. and Hsiao, C. (1982). 'Formulation and estimation of dynamic models using panel data'. *Journal of Econometrics* 18, 47–82.
- Ansolabehere, S., Gerber, A. and Snyder, J.M. (2002). 'Equal votes, equal money: court-ordered redistricting and public expenditures in the American states'. *American Political Science Review* 96, 767–777.
- Arellano, M. and Bond, S. (1991). 'Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations'. *Review of Economic Studies* 58, 277–297.
- Arulampalam, W., Dasgupta, S., Dhillon, A. and Dutta, B. (2009). 'Electoral goals and center-state transfers: a theoretical model and empirical evidence from India'. *Journal of Development Economics* 88, 103–119.
- Asadullah M.N., A. Savoia, W. Mahmud (2014) Paths to Development: Is there a Bangladesh Surprise? *World Development*, 62 (2014), pp. 138-154, [10.1016/j.worlddev.2014.05.013](https://doi.org/10.1016/j.worlddev.2014.05.013)
- Asfaw, A., Frohberg, K., James, K.S. and Jütting, J. (2008). 'Fiscal decentralization and infant mortality: empirical evidence from rural India'. *Journal of Developing Areas* 41, 17–35.
- Banful, A.B. (2011). 'Do formula-based intergovernmental transfer mechanisms eliminate politically motivated targeting? Evidence from Ghana'. *Journal of Development Economics* 96, 380–390.

- BBS (2015). *Statistical Yearbook of Bangladesh 2015*. Bangladesh Bureau of Statistics, Ministry of Planning [available at <http://www.bbs.gov.bd/site/page/29855dc1-f2b4-4dc0-9073-f692361112da/->].
- Bardhan, P. and Mookherjee, D. (2010). ‘Determinants of redistributive politics: an empirical analysis of land reforms in West Bengal, India’. *American Economic Review* 100, 1572–1600.
- Bardhan, P. and Mookherjee, D. (2012). *Political Clientelism and Capture: Theory and Evidence from West Bengal, India*. World Institute for Development Economic Research (WIDER) Working Paper 097. Helsinki: United Nations University-WIDER [available at <https://www.wider.unu.edu/publication/political-clientelism-and-capture>].
- Baron, D.P. (1993). ‘Government formation and endogenous parties’. *American Political Science Review* 87, 34–47.
- Baum, C.F. (2001). ‘XTTEST3: State module to compute Modified Wald Statistic for groupwise heteroskedasticity, Statistical Software Components S414801’. Boston College Department of Economics, revised 5 July 2001 [available at <https://econpapers.repec.org/software/bocbocode/s414801.htm>]. Accessed: 01/09/2021.
- Berry, C. (2008). ‘Piling on: multilevel government and the fiscal common-pool’. *American Journal of Political Science* 52, 802–820.
- Besley, T., Pande, R., Rahman, L. and Rao, V. (2004). ‘The politics of public good provision: evidence from Indian local governments’. *Journal of the European Economic Association* 2, 416–426.
- Blundell, R. and Bond, S. (1998). ‘Initial conditions and moment restrictions in dynamic panel data models’. *Journal of Econometrics* 87, 115–143.
- Boex, J. and Edwards, B. (2016). ‘The (mis-)measurement of fiscal decentralization in developing and transition countries: accounting for devolved and nondevolved local public sector spending’. *Public Finance Review* 44, 788–810.
- Boyne, G.A. (1992). ‘Local government structure and performance: lessons from America?’. *Public Administration* 70, 333–357.
- Bracco, E., Lockwood, B., Porcelli, F. and Redoano, M. (2015). ‘Intergovernmental grants as signals and the alignment effect: theory and evidence’. *Journal of Public Economics* 123, 78–91.
- Brennan, G. and Buchanan, J.M. (1980). *The Power to Tax: Analytical Foundations of a Fiscal Constitution*. Cambridge: Cambridge University Press.
- [Breusch, T.S.](#) and [Pagan, A.R.](#) (1979). ‘A simple test for heteroskedasticity and random coefficient variation’. *Econometrica* 47, 1287–1294 [available at <https://econpapers.repec.org/RePEc:ecm:emetrp:v:47:y:1979:i:5:p:1287-94>].
- Bruno, G.S.F. (2005). ‘Estimation and inference in dynamic unbalanced panel-data models with a small number of individuals’. *Stata Journal* 5, 473–500.

- Bun, M.J.G. and Carree, M.A. (2006). ‘Bias-corrected estimation in dynamic panel data models with heteroscedasticity’. *Economics Letters* 92, 220–227.
- Callen, M., Gulzar, S. and Rezaee, A. (2020). ‘Can political alignment be costly?’. *Journal of Politics* 82, 612–626. <https://doi.org/10.1086/706890>.
- Calvo, E. and Murillo, M.V. (2004). ‘Who delivers? Partisan clients in the Argentine electoral market’. *American Journal of Political Science* 48, 742–757.
- Campbell, R.J. (2004). ‘Leviathan and fiscal illusion in local government overlapping jurisdictions’. *Public Choice*. [Vol. 120, No. 3/4 \(Sep., 2004\)](#), pp. 301-329.
- Casas, A. (2018). ‘Distributive politics with vote and turnout buying’. *American Political Science Association* 112, 1–9.
- Casas, A. (2020). ‘The electoral benefits of unemployment, clientelism and distributive politics’. *World Development* 129, 104908. <https://doi.org/10.1016/j.worlddev.2020.104908>.
- Choudhury, A. and Sahu, S. (2022). ‘Revisiting the nexus between fiscal decentralization and government size – the role of ethnic fragmentation’. *European Journal of Political Economy* 75, 102193. <https://doi.org/10.1016/J.EJPOLECO.2022.102193>.
- Chowdhury, O.H. and Sen, B. (1998). *Public Expenditure and Social Development in Bangladesh*. Dhaka: Centre on Integrated Rural Development for Asia and the Pacific . Dhaka.
- Cox, G.W. (2010). ‘Swing voters, core voters, and distributive politics’. In: *Political Representation*, edited by Ian Shapiro, Susan C. Stokes, Elisabeth Jean Wood, Alexander S. Kirshner, chapter 13, (pp. 342–357). Cambridge University Press, Cambridge UK.
- Cox, G.W. and McCubbins, M.D. (1986). ‘Electoral politics as a redistributive game’. *Journal of Politics* 48, 370–389.
- Centre for Policy Dialogue (CPD) (2013). *Finance for Local Government of Bangladesh: An Elusive Agenda*. CPD-CMI Working Paper 6 [available at <https://cpd.org.bd/cpd-cmi-paper-6-finance-for-local-government-in-bangladesh-an-elusive-agenda/>].
- Craw, M. (2015). ‘The effect of fragmentation and second-order devolution on efficacy of local public welfare policy’. *Publius* 45, 270–296.
- Dang, V.A., Kim, M. and Shin, Y. (2015). ‘In search of robust methods for dynamic panel data models in empirical corporate finance’. *Journal of Banking and Finance* 53, 84–98.
- Das, U. and Maiorano, D. (2019). ‘Post-clientelistic initiatives in a patronage democracy: the distributive politics of India’s MGNREGA’. *World Development* 117, 239–252.
- De Vos, I., Everaert, G. and Ruysen, I. (2015). ‘Bootstrap-based bias correction and inference for dynamic panels with fixed effects’. *Stata Journal* 15, 986–1018.
- Dey, S. and Sen, K. (2016). *Is Partisan Alignment Electorally Rewarding? Evidence from Village Council Elections in India*. Global Development Institute (GDI) Working Paper ESID-063-16: Manchester: GDI, The University of Manchester.

- Diaz-Cayeros, A., Estévez, F. and Magaloni, B. (2016). *The Political Logic of Poverty Relief: Electoral Strategies and Social Policy in Mexico*. Cambridge: Cambridge University Press.
- Dixit, A. and Londregan, J. (1996). 'The determinants of success of special interests in redistributive politics'. *Journal of Politics* 58, 1132–1155.
- Ehsan, S.M.A. (2021). 'The local government system in Bangladesh: an anatomy of perspectives & practices'. *South Asian Journal of Policy and Governance* 44, 1-22
- Erikson, R.S., Wright, G.C. and McIver, J.P. (1989). 'Political parties, public opinion, and state policy in the United States'. *American Political Science Review* 83, 729–750.
- Everaert, G. and Pozzi, L. (2007). 'Bootstrap-based bias correction for dynamic panels'. *Journal of Economic Dynamics and Control* 31, 1160–1184.
- Facchini, F. (2018). 'What are the determinants of public spending? An overview of the literature'. *Atlantic Economic Journal* 46, 419–439.
- Faguet J.P. (2017) Transformation from Below in Bangladesh: Decentralization, local governance, and systemic change. *Modern Asian Studies*, 51 (2017), pp. 1668-1694.
- Faguet, J.P. (2004). 'Does decentralization increase government responsiveness to local needs? Evidence from Bolivia'. *Journal of Public Economics* 88, 867–893.
- Faguet, J.P. (2014). 'Decentralization and governance'. *World Development* 53, 2–13.
- Faguet, J.P. and Ali, Z. (2009). 'Making reform work: institutions, dispositions, and the improving health of Bangladesh'. *World Development* 37, 208–218.
- Feld, L.P., Kirchgässner, G. and Schaltegger, C.A. (2010). 'Decentralized taxation and the size of government: evidence from Swiss state and local governments'. *Southern Economic Journal* 77, 27–48.
- Forbes, K. and Zampelli, E. (1989). 'Is Leviathan a mythical beast?'. *American Economic Review* 79, 568–577.
- Fox, W.F. and Menon, B. (2008). *Decentralization in Bangladesh: Change has been Illusive*. International Studies Program Working Paper 08-29. Atlanta GA: Andrew Young School of Policy Studies, Georgia State University [available at <https://ideas.repec.org/p/ayis/ispwps/paper0829.html>].
- Galasso E. and M. Ravallion (2017) Decentralized targeting of an antipoverty program. *Journal of Public Economics*, 89 (4) (2005), pp. 705-727.
- Gervasoni, C. (2010). 'A rentier theory of subnational regimes: fiscal federalism, democracy, and authoritarianism in the Argentine provinces'. *World Politics* 62, 302–340.
- Golden, M. and Min, B. (2013). 'Distributive politics around the world'. *Annual Review of Political Science* 16, 73–99.

- Golden, M.A. and Picci, L. (2008). 'Pork-barrel politics in postwar Italy, 1953–94'. *American Journal of Political Science* 52, 268–289.
- Goodman, C.B. (2015). 'Local government fragmentation and the local public sector: a panel data analysis'. *Public Finance Review* 43, 82–107.
- Gottlieb, J., Grossman, G., Larreguy, H. and Marx, B. (2019). 'A signaling theory of distributive policy choice: evidence from Senegal'. *Journal of Politics* 81, 631–647.
- Greene, W.H. (2003). *Econometric Analysis*. Englewood Cliffs NJ: Prentice Hall.
- Grisorio, M.J. and Prota, F. (2015). 'The impact of fiscal decentralization on the composition of public expenditure: panel data evidence from Italy'. *Regional Studies* 49, 1941–1956.
- Grossman, G., Pierskalla, J.H. and Dean, E.B. (2017). 'Government fragmentation and public goods provision'. *Journal of Politics* 79, 823–840.
- Huque, A. and Panday, P. (2018). 'Local government institutions and governance in Bangladesh'. *South Asian Survey* Vol.3 127-131
- Hauk, W. and Wacziarg R. (2007). 'Small states, big pork'. *Quarterly Journal of Political Science* 2, 95–106.
- Hausman, J.A. (1978). 'Specification tests in econometrics'. *Econometrica* 46, 1251–1271.
- Hendrick, R.M., Jimenez, B.S. and Lal, K. (2011). 'Does local government fragmentation reduce local spending?'. *Urban Affairs Review* 47, 467–510.
- Imai, K.S. and Sato, T. (2012). 'Decentralization, democracy and allocation of poverty alleviation programmes in Rural India'. *European Journal of Development Research* 24, 125–143.
- Integrated Public Use Microdata Series (IPUMS) (2018). 'Minnesota Population Center. Integrated Public Use Micro Data Series, International: Version 7.1 [dataset]'. Minneapolis MN: IPUMS, 2018.
- Jiang, J. and Zhang, M. (2020). 'Friends with benefits: patronage networks and distributive politics in China'. *Journal of Public Economics* 1 [Volume 184](#), April 2020, 104143.
- Kaba, M. (2022). 'Who buys vote-buying? How, how much, and at what cost?'. *Journal of Economic Behavior and Organization* 193, 98–124.
<https://doi.org/10.1016/j.jebo.2021.11.004>.
- Kabir, M. (2015). 'Mapping of fiscal flow and local government financing in Bangladesh'. Local Government Division, Upazila Governance Project and Union Parishad Governance Project [available at <https://issuu.com/zillahaidar/docs/book>]. Accessed: 15/09/2021.
- Kartik, N. and Preston McAfee, R. (2007). 'Signaling character in electoral competition'. *American Economic Review* 97, 852–870.
- Khondker, B.H. and Mahzab, M.M. (2015). 'Lagging districts development'. Background Study Paper. Seventh Five-Year Plan of the Ministry of Planning, Government of Bangladesh.

Dhaka [available at [https://www.researchgate.net/publication/332567169 Lagging Districts Development Background Study Paper for Preparation of the Seventh Five-Year Plan](https://www.researchgate.net/publication/332567169_Lagging_Districts_Development_Background_Study_Paper_for_Preparation_of_the_Seventh_Five-Year_Plan)]. Accessed: 15/09/2021.

- Kis-Katos, K. and Sjahrir, B.S. (2017). 'The impact of fiscal and political decentralization on local public investment in Indonesia'. *Journal of Comparative Economics* 45, 344–365.
- Kiviet, J.F. (1995). 'On bias, inconsistency, and efficiency of various estimators in dynamic panel data models'. *Journal of Econometrics* 68, 53–78.
- Knight, B. (2002). 'Endogenous federal grants and crowd-out of state government spending: theory and evidence from the federal highway aid program'. *American Economic Review* 92, 71–92.
- Kotschy, R. and Sunde, U. (2017). 'Democracy, inequality, and institutional quality'. *European Economic Review* 91, 209–228.
- Kung, J.K. and Zhou, T. (2021). '[Political elites and hometown favoritism in famine-stricken China](#)'. *Journal of Comparative Economics* 49, 22–37
- Larcinese, V., Rizzo, L. and Testa, C. (2006). 'Allocating the US federal budget to the states: the impact of the president'. *Journal of Politics* 68, 447–456.
- Larcinese, V., Rizzo, L. and Testa, C. (2013). 'Why do small states receive more federal money? US senate representation and the allocation of federal budget'. *Economics and Politics* 25, 257–282.
- Lessmann, C. (2012). 'Regional inequality and decentralization: an empirical analysis'. *Environment and Planning A* 44, 1363–1388.
- Lewis, D. and Hossain, A. (2017). 'Revisiting the local power structure in Bangladesh: economic gain or political pain'. T. Dhaka. London School of Economics and Political Science; 2017 Sep 1. ISBN 9781909890404. Available at: <https://eprints.lse.ac.uk/82224/>.
- Lindbeck, A. and Weibull, J.W. (1987). 'Balanced-budget redistribution as the outcome of political competition'. *Public Choice* 52, 273–297.
- Lindberg, S.I. and Morrison, M.K.C. (2005). 'Exploring voter alignments in Africa: core and swing voters in Ghana'. *Journal of Modern African Studies* 43, 565–586.
- Livert, F., Gainza, X. and Acuña, J. (2019). 'Paving the electoral way: urban infrastructure, partisan politics and civic engagement'. *World Development volume 124*. Pp.1-14. Available at: <https://doi.org/10.1016/j.worlddev.2019.104628>
- Luca, D. and Rodríguez-Pose, A. (2015). 'Distributive politics and regional development: assessing the territorial distribution of Turkey's public investment'. *Journal of Development Studies* 51, 1518–1540.

- Mahmoud, C.S., Naimul Wadood, S. and Ahmed, K.S. (2008). *Addressing Regional Inequality Issues in Bangladesh Public Expenditure*. Centre for Policy Dialogue (CPD) Occasional Paper [available at <http://mpa.ub.uni-muenchen.de/14568/>].
- Manacorda, M., Miguel, E. and Vigorito, A. (2011). 'Government transfers and political support'. *American Economic Journal: Applied Economics* 3, 1–28. doi: 10.1257/app.3.3.1.
- Manor, J. (1999). *The Political Economy of Democratic Decentralization*. Washington DC: World Bank Publications.
- Mohammed, A.K. (2016). 'An assessment of the impact of local government fragmentation in Ghana'. *Public Organization Review* 16, 117–138.
- Ministry of Finance (MoF) (2022a). *Operating and Development Expenditure, Budget 2021–22*. Dhaka: MoF, Government of Bangladesh.
- MoF (2022b). *Bangladesh Economic Review*. Dhaka: MoF, Government of Bangladesh.
- Mueller, D.C. (2003). *Public Choice*. Cambridge: Cambridge University Press.
- Nickell, S.J. (1981). 'Biases in dynamic models with fixed effects'. *Econometrica* 49, 1417–1426.
- Nichter, S. (2008). 'Vote buying or turnout buying? Machine politics and the secret ballot'. *American Political Science Review* 102, 19–31.
- Oates, W.E. (1972). *Fiscal Federalism*. New York: Harcourt Brace Jovanovich.
- Oates, W.E. (1985). 'Searching for leviathan: an empirical study'. *American Economic Review* 75, 748–757.
- Oates, W.E. (1993). 'Fiscal decentralization and economic development'. *National Tax Journal* 46, 237–243.
- Panday, P.K. (2011). 'Local government system in Bangladesh: how far is it decentralised?'. *Lex Localis* 9, 205–230.
- Panday, P.K. (2014). 'Central–local relations, inter-organisational coordination and policy implementation in urban Bangladesh'. *Asia Pacific Journal of Public Administration* 28, 41–58.
- Persson, T. (2007). 'Electoral rules and government spending in parliamentary democracies'. *Quarterly Journal of Political Science* 2, 155–188.
- Persson, T., Roland, G. and Tabellini, G. (2000). 'Comparative politics and public finance'. *Journal of Political Economy* 108, 1121–1161.
- Pesaran, M.H. (2021). 'General diagnostic tests for cross-sectional dependence in panels'. *Empirical Economics* 60, 13–50.
- Plotnick, R.D. and Winters, R.F. (1985). 'A politico-economic theory of income redistribution'. *American Political Science Review* 79, 458–473.

- Prohl, S. and Schneider, F. (2009). 'Does decentralization reduce government size? A quantitative study of the decentralization hypothesis'. *Public Finance Review* 37, 639–664.
- Qiao, M., Ding, S. and Liu, Y. (2019). 'Fiscal decentralization and government size: the role of democracy'. *European Journal of Political Economy* 59, 316–330.
<https://doi.org/10.1016/j.ejpoleco.2019.04.002>.
- Quazi, R.M. (2005). 'Effects of foreign aid on GDP growth and fiscal behavior: an econometric case study of Bangladesh'. *Journal of Developing Areas* 38, 95–117.
<https://doi.org/10.1353/jda.2005.0027>.
- Rahman, M.S. (2013). 'Role of the Members of Parliament in the local government of Bangladesh: views and perceptions of grassroots in the case of Upazila administration'. *Public Organization Review* 13, 71–88.
- Rodden J. and S. Wilkinson (2004) The shifting political economy of redistribution in the Indian federation (Unpublished manuscript) Massachusetts Institute of Technology, Boston, MA (2004). URL: <https://dspace.mit.edu/handle/1721.1/18135>, Accessed 10th Oct 2020.
- Rodríguez-Pose, A., Psycharis, Y. and Tselios, V. (2016). Politics and investment: examining the territorial allocation of public investment in Greece'. *Regional Studies* 50, 1097–1112.
- Rondinelli, D.A. (1983). 'Implementing decentralization programmes in Asia: a comparative analysis'. *Public Administration and Development* 3, 181–207.
- Roodman, D. (2009). 'Practitioners' corner: a note on the theme of too many instruments'. *Oxford Bulletin of Economics and Statistics* 71, 135–158.
- Sarker, A. E. (2006). 'The political economy of decentralized governance: an assessment of rural local government reforms in Bangladesh'. *International Journal of Public Administration* 29, 1285–1309.
- Sen, A. (2016). 'Tales of the unexpected: gender equality and social progress in Bangladesh'. Lecture at the London School of Economics [available at <http://www.lse.ac.uk/lse-player?id=3522>]. Accessed: 08/08/2020.
- Sen B. and Ali, Z. (2009). 'Spatial inequality in social progress in Bangladesh'. *Bangladesh Development Studies* 32, 53–78.
- Schneider, M. (1989). 'Intercity competition and the size of the local public work force'. *Public Choice* 63, 253–265.
- Siddique, K. (2005). *Local Government in Bangladesh*. Dhaka: University Press.
- Smoke, P. (2013). *The Role of Decentralisation/Devolution in Improving Development Outcomes at the Local Level: Review of the Literature and Selected Cases*. New York: Local Development International.
- Snyder, J.M. (1989). 'Election goals and the allocation of campaign resources'. *Econometrica*, 637. [Vol. 57, No. 3 \(May, 1989\)](#), pp. 637-660.

- Solé-Ollé, A. and Sorribas-Navarro, P. (2008). 'The effects of partisan alignment on the allocation of intergovernmental transfers: differences-in-differences estimates for Spain'. *Journal of Public Economics* 92, 2302–2319.
- Stansel, D. (2005). 'Local decentralization and local economic growth: a cross-sectional examination of US metropolitan areas'. *Journal of Urban Economics* 57, 55–72.
- Stansel, D. (2006). Interjurisdictional competition and local government spending in US metropolitan areas'. *Public Finance Review* 34, 173–194.
- Stokes, S.C. (2005). 'Perverse accountability: a formal model of machine politics with evidence from Argentina'. *American Political Science Review* 99, 315–325.
- Strömberg, D. (2008). 'How the electoral college influences campaigns and policy: the probability of being Florida'. *American Economic Review* 98, 769–807.
- Talukdar, M.R.I. (2019). 'National and local governments' relationship in Bangladesh'. In Farazmand, A. (Ed.), *Global Encyclopedia of Public Administration, Public Policy, and Governance*. Urbana–Champaign IL: Springer. https://doi.org/10.1007/978-3-319-31816-5_3737-.
- Tribin, A. (2020). 'Chasing votes with the public budget'. *European Journal of Political Economy* 63, 101875. <https://doi.org/10.1016/j.ejpoleco.2020.101875>.
- Turnbull, G.K. and Djoundourian, S.S. (1993). 'Overlapping jurisdictions: substitutes or complements?'. *Public Choice* 75, 231–245.
- United Nations (2015). *Transforming our World: The 2030 Agenda for Sustainable Development* [available at <https://sdgs.un.org/2030agenda>].
- Windmeijer, F. (2005). 'A finite sample correction for the variance of linear efficient two-step GMM estimators'. *Journal of Econometrics* 126, 25–51.
- Wong, M.Y.H. (2022). 'Performance, factions, and promotion in China: the role of provincial transfers'. *Journal of Chinese Political Science*. <https://doi.org/10.1007/s11366-021-09764-1>.
- World Bank (2010). *Bangladesh Public Expenditure and Institutional Review: Towards a Better Quality of Public Expenditure*. Report No 47767-BD [available at <http://documents.worldbank.org/curated/en/755161467998255113/Main-report>]. Accessed: 15/12/2020.
- Wooldridge, J.M. (2002). *Econometric Analysis of Cross Section and Panel Data*. Cambridge MA: MIT Press.
- Zax J. (1989) Is there a Leviathan in your neighborhood? *American Economic Review*, 79 (1989), pp. 560-567
- Zohir, S. (2011). *Regional Differences in Poverty Levels and Trends in Bangladesh: Are we asking the Right Questions?*. Dhaka: Economic Research Group [available at [http://www.Ergonline.Org/Documents/Sajjad% 20regpov% 2010july11](http://www.Ergonline.Org/Documents/Sajjad%20regpov%2010july11)].

Appendix

Table A1: Description of all variables

Variable	Variable description, measurement technique and data source
<i>ln_pc_exp*</i>	Log of per capita annual total development expenditure of the central government allocated to a district. The variable is in nominal terms Data source: Comparative Statement of per capita expenditure (Districts & Divisions). Ministry of Finance website (www.mof.gov.bd), Government of Bangladesh.
<i>Total units per density</i>	Total number of local government units per population density in a district. The total number is obtained by summing the number of unions, municipalities and city corporations, sub-district councils and district councils that exist in a district. The indicator is standardised by the population density of the district. Population density is expressed in terms of district population per 1,000 km ² of district land area. Data source: <i>Statistical Year Book</i> (2001, 2005, 2010, 2015). Bangladesh Bureau of Statistics (BBS) (www.bbs.gov.bd).
<i>Local self-govt units per density</i>	Number of local govt units (unions and municipalities) at the lowest tier of the local government structure per population density. Data source: <i>Statistical Yearbook</i> , BBS (multiple years).
<i>Unions per density</i>	Number of union councils per population density. Data source: <i>Statistical Year Book</i> , BBS. 2021.
<i>Municipalities per density</i>	Number of municipalities per population density. Data source: <i>Statistical Year Book</i> , BBS. 2021.
<i>Vertical fragmentation</i>	Share of local government units (unions and municipalities) at the lowest tier out of total units (considering all tiers) in a district. Data source: <i>Statistical Year Book</i> , BBS (multiple years)
<i>Vote share_long</i>	Share of vote for the ruling party considering the last three national elections. Constituency election results are aggregated (taking the weighted average of the vote share where total share of vote in each constituency out of total votes cast in the district is used as the weight) and presented at district level. The national election results for 1991, 1996 and 2001 were used for the first two waves of the panel (2005 and 2006) and the election results for 1996, 2001 and 2008 were used for the last wave of the panel (2009). The middle two years were during a caretaker period (2007 and 2008). For these two waves the variable is assigned the value '0' as the country was in a state

	of emergency. Data source: National Election Reports for several years. Obtained from the Election Commission's website (www.ecs.gov.bd).
<i>Swing vote_long</i>	The ruling party's swing vote share considering the previous three national elections. Constituency election results were aggregated (taking the weighted average of the vote share where total share of the vote in each constituency out of total votes cast in the district was used as the weight) to calculate the vote share of the ruling party and present it at district level. Finally, standard deviation of the vote share was computed to construct this variable. The variable is assigned the value '0' for the caretaker govt period (2007 and 2008). Data source: National Election Reports for several years. Obtained from the Election Commission's website (www.ecs.gov.bd).
<i>Number of ministers</i>	Raw number of ministers from a district. The list of ministers was obtained from the Cabinet Division's website, then the election report was used to track down which constituency they represented in the last election (in most cases their home district). For the caretaker government period an advisor's home district was used to construct the variable. Data source: Cabinet Division's website.
<i>Partisanship</i>	Percentage of constituencies with representatives from the ruling party. The variable is constructed by identifying the party from which the elected representatives were nominated. Data source: National Election Reports for several years. Obtained from the Election Commission's website: http://www.ecs.gov.bd/?lang=en .
<i>Population</i>	Total population of the district. Data source: Census data for 2001 and 2011 were used to project each year's population. Census data were obtained from the BBS <i>Statistical Year Book</i> , 2010 and 2015.
<i>Growth in log of population</i>	Growth in log of population. Own construction using district population data. Data source: <i>Statistical Year Book</i> , BBS.
<i>Growth in log of pc nominal GDP*</i>	Average annual growth rate per capita nominal GDP of the district. We constructed the variable by dividing the nominal GDP by the district population. Then the natural log of the variable was taken, and the average annual growth calculated. Real GDP data are not available at district level in Bangladesh. Data source: Nominal GDP data obtained from <i>Statistical Year Book</i> , 2005 and the Planning Commission's background study report of the seventh Five Year Plan (2015).
<i>Unemployment rate</i>	Unemployment rate data for 2005 and 2010 (for 2009) are used directly. Unemployment rate figures for the middle years were obtained by calculating the average annual growth rate using the data from 2005 to 2010. Data source: Planning Commission, 2005; Labour Force Survey, 2010.
<i>Incidence of poverty</i>	Incidence of extreme poverty shows the percentage of people living below the extreme poverty line. Data were obtained from: 1) Poverty Mapping report provided by the World Bank and BBS (2005 and 2010). Poverty data for the middle years were predicted by calculation of the average poverty growth rate from 2001 to 2010. Source: https://openknowledge.worldbank.org/handle/10986/20785 ; and 2) Local estimation of poverty and malnutrition in Bangladesh (2004). BBS in collaboration with UN World Food Programme, https://documents.wfp.org/stellent/groups/public/documents/ena/wfp033309.pdf?iframe= .
<i>Share of school-going population</i>	Share of school-going population (5–19 years) in each district. The school-going population is divided by the district population. Data for the middle years are predicted using the annual average growth rate for the 2001 to 2010 period. Data source: IPUMS (2018).
<i>Access to electricity</i>	Percentage of households without access to electricity. Data source: Sample Vital Registration System (SVRS) report (published by BBS), 2005–2010. www.bbs.gov.bd/vital-Statistics .
<i>Access to paved road</i>	Percentage of unpaved roads out of total (in length) in a district. Data source: <i>Statistical Year Book</i> , BBS.

*Note: Both per capita development expenditure and district GDP are in nominal terms. Therefore they are expected to be affected by the inflation rate. During our study period (2005–09), the average inflation rate was 7.45% with a fluctuating trend. As district or regional CPI data are not available in Bangladesh, we cannot accurately figure out how these nominal variables at district level are affected by inflation. One way is to use the national CPI to convert them into real terms. However, in such a case, all the district level values of the variables will be similarly affected by the inflation rate. As we are

only interested in the spatial inequality of development spending across the districts, rather than the temporal trend, we have refrained from adjusting those two nominal variables with the inflation rate.

Table A2: Alternative estimation methods applied to the static and dynamic panel

Variables	Dependent variable: log of per capita development expenditure							
	Static panel estimations			Dynamic panel estimations				
	Random effect	1 st difference	Pooled OLS	(LSDV. Anderson – Hsiao)	(LSDV Arellano– Bond)	(LSDV Blundell– Bond)	(Difference GMM-two step)	(System GMM)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
L.ln_pc_dev.exp	-	-	-	0.463*** (0.112)	0.408*** (0.104)	0.501*** (0.0876)	0.0345 (0.154)	0.686*** (0.174)
Fragmentation indicators								
Total units per density	-0.00902 (0.0168)	0.000844 (0.0216)	-0.00195 (0.0147)	-0.0501 (0.0490)	-0.0487 (0.0465)	-0.0428 (0.0469)	-0.0603 (0.0738)	-0.0757 (0.0588)
Local units per density	0.0311 (0.0216)	-0.000718 (0.0471)	0.0999* (0.0577)	0.0337 (0.115)	0.0213 (0.109)	0.0456 (0.111)	-0.0122 (0.126)	0.216** (0.0822)
Unions per density	-0.0201 (0.0205)	0.0159 (0.0408)	-0.0972* (0.0581)	0.0471 (0.103)	0.0617 (0.0974)	0.0241 (0.0991)	0.120 (0.0992)	-0.132* (0.0771)
Muncpl per density	-0.00200 (0.0215)	0.0226 (0.0544)	-0.0710 (0.0572)	0.169 (0.123)	0.179 (0.116)	0.135 (0.120)	0.116 (0.136)	-0.127* (0.0704)
Vertical frag1	-0.0229 (0.0144)	-0.00342 (0.0248)	-0.0237** (0.0112)	-0.0781 (0.0496)	-0.080* (0.0469)	-0.071 (0.0469)	-0.0884 (0.0774)	-0.0546 (0.0471)
Political variables								
Vote share_long	0.630** (0.285)	0.446 (0.289)	0.524 (0.422)	0.856*** (0.303)	0.870*** (0.287)	0.861*** (0.325)	0.782** (0.389)	0.792 (0.549)
Swing vote_long	-1.013* (0.548)	-0.809 (0.743)	0.0482 (0.455)	-0.963* (0.543)	-0.982* (0.511)	-0.861 (0.588)	-1.540** (0.586)	-0.232 (0.828)
Num ministers	0.0575*** (0.0170)	0.0402** (0.0192)	0.0737*** (0.0211)	0.0321 (0.0220)	0.0339 (0.0208)	0.0346 (0.0232)	0.0417 (0.0292)	-0.0276 (0.0529)
Partisanship	0.150 (0.107)	0.145 (0.118)	0.0559 (0.127)	0.0759 (0.0994)	0.0831 (0.0942)	0.0629 (0.106)	0.224 (0.136)	0.0501 (0.187)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	2.559* (1.408)	244 0.578	3.007** (1.357)					
Observations	305	5.48	305	244	244	244	183	244
Number of districts	61	0.000	0.522	61	61	61	61	61
Instruments							52	39
AR (2) p-value							0.621	0.733
Hansen p-value							0.588	0.529
Linear restriction test	65.13	5.48	8.43	39.90	47.74	35.26	52	39
p value	0.000	0.000	0.000	0.000	0.000	0.0001	0.621	0.733

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Both in difference GMM (column 7) and system GMM (column 8), to control the number of instruments, the ‘collapse’ command was applied, which creates one instrument for each variable and lag distance, rather than one for each time period, variable, and lag distance. Moreover, in system GMM (column 8), to control the number of instruments, a sub-option ‘equation (level)’ command was included in the IV-style variables. Equation (level) specifies which IVs to use. Also, lag (2 2) was applied to the GMM variables. STATA command *xtabond2* was applied in the GMM estimations, which makes available a finite-sample correction to the two-step covariance matrix derived by Windmeijer (2005). The row for the Hansen J-test reports the p-values for the null hypothesis of the validity of the over-identifying restrictions. The null hypothesis cannot be rejected, which validates the instruments. AR (2) p-value confirms no evidence of significant second-order autocorrelation.

Table A3: Fixed-effects estimates (using alternative specification of the model)

Variables	Dependent variable: log of per capita development expenditure								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Total units per density	0.007 (0.007)								
Local units per density		0.014 (0.011)							
Unions per density			0.011 (0.011)						
Muncpl per density				0.116 (0.072)					
Vertical fragmentation					0.002 (0.014)				
Political variables									
Vote share_long						1.360*** (0.218)			
Swing vote_long							-0.654 (0.727)		
Num ministers								0.114*** (0.0199)	
Partisanship									0.358*** (0.076)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	1.052 (1.496)	0.393 (1.547)	0.731 (1.511)	1.027 (1.479)	1.485 (2.068)	0.538 (1.213)	1.323 (1.500)	0.578 (1.244)	2.285* (1.279)
Observations	305	305	305	305	305	305	305	305	305
R-squared	0.506	0.507	0.506	0.510	0.504	0.610	0.509	0.568	0.575
Number of districts	61	61	61	61	61	61	61	61	61

Notes: Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1.

Table A4: Fixed effects and bias-corrected fixed-effects estimates (introducing interaction term)

Variables	Dependent variable: log of per capita development expenditure	
	Static panel estimation (fixed effects)	Dynamic panel estimation (bias-corrected fixed-effects)
	(1)	(2)
L. ln_pc_exp		0.641***

		(0.0760)
Vote share_long	0.969**	0.923**
	(0.369)	(0.439)
Swing vote_long	-0.215	-0.212
	(1.863)	(1.964)
Vote share*swing vote	-2.646	-1.561
	(4.487)	(4.933)
Number of ministers	0.0677***	0.0352*
	(0.0175)	(0.0206)
Partisanship	0.185*	0.0610
	(0.107)	(0.107)
Controls	Yes	Yes
Year dummies	Yes	Yes
District dummies	Yes	Yes
Constant	-0.165	
	(1.152)	
Observations	305	244
R-squared	0.652	
Number of code	61	61

Notes: Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1.

Table A5: Fixed effects and bias-corrected fixed-effects estimates (using alternative variables)

Variables	Dependent variable: log of per capita development expenditure	
	Static panel estimation (fixed effects)	Dynamic panel estimation bia- corr bootstrap-based fixed effects
L.ln_pc_dev.exp		0.422*** (0.108)
Fragmentation indicators		
Total units per 1,000 km ²	0.0192 (0.0231)	0.171*** (0.0470)
Local units per 1,000 km ²	0.0637* (0.0337)	0.0432 (2.027)

Unions per area 1,000 km ²	-0.0324 (0.0717)	-0.169 (2.030)
Muncpl per 1,000 km ²	-0.253 (0.285)	0.0612 (2.326)
Vertical fragmentation2	0.141 (0.167)	-0.00394 (0.292)
Political variables		
Vote share_short	1.287*** (0.207)	1.113*** (0.180)
Swing vote_short	-1.951*** (0.662)	-1.767** (0.683)
Num_minister2	0.0499** (0.0191)	0.0348 (0.0211)
Controls	Yes	Yes
Year dummies	Yes	Yes
District dummies	Yes	-
Constant	-2.340 (2.163)	Yes
Observations	305	244
R-squared	0.653	
Number of districts	61	61

Notes: Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1.

**Table A6: Fixed-effects regression results
(new core vote and swing vote share values for caretaker government period)**

Variables	Dependent variable: log of per capita development expenditure		
	(4)	(5)	(6)
Fragmentation indicators			
Total units per density	-0.0225 (0.0260)		-0.0311 (0.0223)
Local units per density	0.0939* (0.0560)		0.0653 (0.0551)
Unions per density	-0.0627 (0.0490)		-0.00594 (0.0510)
Municipalities per density	0.0727 (0.0864)		0.0776 (0.0748)
Vertical fragmentation1	-0.0179 (0.0265)		-0.0228 (0.0222)
Political variables			
Core_vote_new		0.487*** (0.141)	0.450*** (0.127)
Swing_vote_new		-1.478*** (0.362)	-1.897*** (0.418)

Num ministers		0.0798***	0.0798***
		(0.0161)	(0.0158)
partisanship		0.277***	0.308***
		(0.0747)	(0.0700)
Controls	Yes	Yes	Yes
Year and district fixed effects	Yes	Yes	Yes
Constant	1.909	0.688	-0.121
	(3.009)	(1.120)	(2.437)
Observations	305	305	305
R-squared	0.514	0.636	0.652
Number of districts	61	61	61

Notes: Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1.

**Table A7: Fixed-effects regression results
(on a different dataset)**

Table A8: Fixed-effects estimations, introducing interactions between core vote share and fragmentation variables

Variables	Dependent variable: log of per capita development expenditure	
	Districts with city corporations	Districts without city corporations
	(1)	(2)
Fragmentation indicators		
Total units per density	0.0216 (0.0273)	0.0172 (0.0407)
Local units per density	0.130 (0.0974)	0.0224 (0.0550)
Unions per density	-0.00229 (0.159)	-0.0121 (0.0940)
Municipalities per density*	-0.696* (0.354)	-0.0217 (0.478)
Vertical fragmentation	0.369 (0.223)	-0.00186 (0.187)
Political variables		
Vote share long*	-1.127 (0.717)	0.894*** (0.289)
Swing vote long	-1.845 (2.107)	-1.482** (0.556)
Num ministers	0.0742*** (0.0200)	0.0837*** (0.0278)
Partisanship	0.526* (0.277)	0.168 (0.108)
Controls	Yes	Yes
Constant	-4.156 (3.991)	-0.489 (3.054)
Year dummies	Yes	Yes
District dummies	Yes	Yes
Observations	55	250
R-squared	0.900	0.654
Number of districts	11	50

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

*In column 1, the coefficient of *Municipalities per density* is negative and weakly significant. However, if the variable is individually regressed against the dependent variable (with and without including the political variables and controls), the coefficient becomes positive and statistically insignificant (results can be provided on request). Therefore, we refrain from making any robust conclusion here. Similarly, the variable *Core vote share* shows a negative association with development spending (which contradicts our main results). Again, if the variable is individually regressed against the dependent variable, the coefficient becomes positive and insignificant. This outcome may have been caused by a high correlation among the political variables.

Variables	Dependent variable: log of per capita development expenditure					
	(1)	(2)	(3)	(4)	(5)	(6)
	Fragmentation variables					
Total units per density	-0.0182 (0.0223)	-0.0182 (0.0223)	-0.0183 (0.0222)	-0.0183 (0.0222)	-0.0188 (0.0218)	-0.0186 (0.0224)
Local units per density	0.0718* (0.0402)	0.0720* (0.0404)	0.0722* (0.0404)	0.0720* (0.0404)	0.0756* (0.0397)	0.0731* (0.0415)
Unions per density	-0.0338 (0.0350)	-0.0338 (0.0352)	-0.0339 (0.0352)	-0.0338 (0.0351)	-0.0368 (0.0362)	-0.0346 (0.0361)

Municipalities per density	0.0191 (0.0765)	0.0193 (0.0759)	0.0195 (0.0757)	0.0193 (0.0759)	0.0223 (0.0724)	0.0195 (0.0768)
Vertical fragmentation	-0.0236 (0.0198)	-0.0236 (0.0198)	-0.0237 (0.0198)	-0.0237 (0.0198)	-0.0242 (0.0195)	-0.0234 (0.0195)
Political variables						
Vote share long	1.387*** (0.208)	1.392*** (0.228)	1.397*** (0.228)	1.394*** (0.227)	1.419*** (0.224)	1.582 (1.142)
vote share_long x total units per density		-6.70e-05 (0.00105)				
vote share_long x local units per density			- 0.000145 (0.00118)			
vote share_long x unions per density				- 0.000110 (0.00122)		
vote share_long x municipality per density					-0.00704 (0.0200)	
vote share_long x vertical frag						- 0.00218 (0.0130)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
District dummies	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.794 (2.403)	0.788 (2.420)	0.783 (2.417)	0.786 (2.417)	0.786 (2.416)	0.738 (2.348)
Observations	305	305	305	305	305	305
R-squared	0.620	0.620	0.620	0.620	0.620	0.620
Number of districts	61	61	61	61	61	61

Notes; Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1.

Further note to Table A1: Estimation technique for dynamic panel

The econometric literature suggests that, in dynamic panels, fixed effects (within) are inconsistent and biased when time (T) is fixed, and the number of cross-sectional units (N) goes to infinity (Nickell, 1981; Anderson & Hsiao, 1982). This bias occurs thanks to the correlation between the lagged dependent variable and the error term (it disappears, however, when T grows large). Two alternative approaches are used to deal with this bias. The first approach is using instruments (IVs) for the lagged dependent variables. Various estimation methods apply this approach, for example, the Just identified IV estimator (Anderson & Hsiao, 1982), the 1st difference GMM estimator (Arellano & Bond, 1991) and the system GMM estimator (Blundell & Bond, 1998).

Alternatively, a bias correction method (using an analytical approximation formula to capture the bias) is applied in the Least Square Dummy Variable (LSDV) method, developed by Kiviet (1995) and Bruno (2005). Compared to GMM estimators the bias-corrected LSDV estimators display superior small sample properties (Bun & Carree, 2006). The only drawback of the estimation is that it holds a strict assumption that all the variables except the lag dependent variable have to be

strictly exogenous. To tackle this issue, the bootstrap-based bias-corrected, fixed-effects estimation proposed by Everaert and Pozzi (2007) comes as a useful solution. This method does not require any analytical expression for the bias. It takes the original bias estimates of LSDV and searches over the parameter space through an iterative bootstrap method until unbiased estimates of the true population parameters are found. Unbiased estimates are obtained if repeatedly generating data from these estimates produces average LSDV estimates that are equal to the original bias LSDV estimates (for details, see Everaert and Pozzi, 2007). Compared to analytical corrections (such as Kiviet's method) this bootstrap-based method provides a better inference in samples with small to moderate T. Moreover, if the cross-sectional variation is larger than the within variation in the panel, a bias-corrected fixed-effects estimation technique provides better estimates than the GMM estimators in terms of accuracy and efficiency (Everaert & Pozzi, 2007; Kotschy & Sunde, 2017; De Vos et al, 2015). Overall, the (bootstrap-based) bias-corrected fixed-effects method appears to be the most conservative and reliable estimator in this current setting (as T is relatively small and N is also not large).

However, the GMM estimators are also applied as part of robustness checks as they better tackle the endogeneity issue. It may be assumed that both fragmentation and political factors have a simultaneous relationship with development expenditure. The study constructed the political variables in the light of Bangladesh's past three national election results, which helps to avoid the problem of endogeneity, following Larcinese et al's (2013) study. Where fragmentation variables are concerned, the endogeneity issue is still a problem. It is difficult to find suitable external instruments for the fragmentation variables. GMM estimators in such a situation are useful in providing consistent results. Therefore, as GMM removes the endogeneity problem by internally transforming the data and by constructing instruments within the model (Roodman, 2009), the study applies IV-GMM estimators and compares the results as part of the robustness check.