Learning by doing for public procurement

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Abstract

A central choice in public administration is whether to 'make', which is production within the public sector, or 'buy', which is public procurement. While 'buy' has the advantage of harnessing the energy of private firms, it requires state capacity in contracting and leads to questions on how to obtain state capacity in contracting. One measure of state capacity in procurement is the extent of failure to spend resources budgeted for procurement. We construct a novel dataset about spending gaps (between what is budgeted and what is spent) in procurement by the Indian union government. We find that the spending gaps are the smallest when buying goods, and the highest with works. We find that ministries that have a sustained engagement with procurement fare better on obtaining minimum gaps in procurement spending, which suggests a process of learning by doing.

JEL classification: H57, H83, L33

Keywords: Public procurement, state capacity, government contracts, procurement expenditure, procurement spending gap.

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1 Introduction

The smooth functioning of governments need capabilities that are required to carry out specific actions (Andrews, Pritchett, and Woolcock, 2017). A prominent choice in public administration is 'make' or 'buy'. Doing the former well, faces challenges of management expertise while the latter needs state capacity in contracting. All purchases by the state involve the state executing contracts with private person. Contracting requires specific expertise in different parts of the contract life-cycle: the ability to arrive at a tangible design of a specific requirement, which can then be used to draft a legal tender; the ability to run a tendering process efficiently to award a contract or a set of contracts to achieve the stated requirement; the ability to manage the contract or the set of awarded contracts; the ability to sign off on closure of the awarded contract. When done well, contracting activities will deliver the requirement as close to the competition time and within budget, as when the contracting is done by a private enterprise.

But, while procurement is a standard economic activity between any two agents in the economy, this has different constraints and challenges when one of the parties is the government. Challenges include reducing corruption and incentives for rent-seeking (Auriol, Straub, and Flochel, 2016; ADB and OECD, 2006; Søreide, 2002), the influence of political will and political economy (Frøystad, Heggstad, and Fjeldstad, 2010; Hunja, 2003), the lack of rule of law (Hazarika and Jena, 2017; CUTS International, 2014) and the need for coordination when procurement processes are fragmented across sectors and entities (Tabish and Jha, 2011; Jones, 2007). All these factors make up a degree of complexity that comes with incentives of actors who are not present in procurement by the private sector, where responsibilities and accountability for failure and success is more readily defined (OECD, 2016).[1] These challenges are not isolated to any specific country. But while these problems appear in public procurement all over the world, it is particularly problematic in developing and emerging economies, where there is more evidence of a lack of state capacity in government contracting and public procurement (Fourie and Malan, 2020; Navarro and Tanghal, 2017; Ambe and Badenhorst-Weiss, 2012; Jones, 2007; Hunja, 2003).

What differentiates developed economies is that they are more likely to have deeper and better established markets with deeper competition and better institutions for enforcement and rule of law. Governments in these economies have developed better market linkages over long periods, within the stability of institutions where rule of law is well-entrenched. Whereas developing economies function in a deals environment where adoption of formal rules and regulations in the absence of requisite state capacity brings no material change to how the government functions (Kar et al., 2019). It takes several iterations and repetitions to develop legal frameworks, standardised tender documents,

[1] The procurement phases include as pre-tender phase (planning and designing), tender phase (tendering, bidding and contract award) and post award phase (contract management, payments and contract closure). Numerous participants include ministers and political office bearers, public servants, private businesses.

skilled procurement officials who can manage contracts from the point of award to contract closure. This process of developing state capacity by going through the procurement contracting life-cycle and fixing problems that arise, across multiple iterations, is termed as '*learning by doing*' (Kelkar and Shah, 2022; Andrews, Pritchett, and Woolcock, 2017).

This paper examines the ability of government to spend budgeted procurement expenditure as evidence of state capacity, when viewed through the lens of capacity in contracting. Our basis for this approach is the observation that every procurement is executed as a contract, and that a contract can be deconstructed as four phases. The lack of state capacity in any or all of these phases will manifest as contracting failure, which will lead to gaps in what was planned as procurement expenditure and what was actually spent. When there is high state capacity, what has been budgeted for procurement is likely to be spent within budget and on time. With weak state capacity, there is likely to be unspent funds by the end of the accounting year, or a cost overrun. We calculate the difference between the budgeted procurement expenditure and the actual procurement expenditure as a procurement *spending gap*. For example, Navarro and Tanghal (2017), and Fourie and Malan (2020), describe procurement related challenges arising from the lack of state capacity, as key reasons for under-spending by government agencies.

In our analysis, we first establish an empirical measure of state capacity which is based on the ability of state to budget expenditure for procurement and actually spend it. In order to calculate the spending gap in procurement, we hand-collect a dataset of estimated procurement expenditures, using budget documents of 33 ministries of the Union Government of India for seven years. We then construct 'spending gaps' for each ministry, for each year, where the spending gap is calculated as the difference between what was budgeted as procurement expenditure for the year and what was actually spent on procurement for that year.

The estimation of the procurement expenditure is done at the level of total procurement, as well as at the level of three categories under which state procures. These are procurement of 'Goods', 'Services' and 'Works'. Within Works, there are 'major' works in which long duration, larger sized projects projects such as for infrastructure or defence, are implemented, as well as 'minor' works, which involve upkeep and maintenance of such projects. A record of dis-aggregation across types of procurement expenditure is useful to analyse cross-sectional variation in state capacity for public procurement.

Based on the presumption that state capacity evolves through a process of 'learning by doing', we present, and test, the following three propositions for such cross-sectional variation:

1. **Greater state capacity is required for more complex procurement**

   Our first proposition connects variation in state capacity with the complexity of what is being procured. Existing research on building state capacity identifies that it takes different capabilities to address problems of varying complexities (Andrews, Pritchett, and Woolcock, 2017). Problems can be categorised as simple, complex and complicated on the basis

of degree of difficulty to overcome them (Glouberman and Zimmerman, 2019). Procurement with fewer unknowns and fewer risks are 'simple', whereas high risk procurement with many unknowns can be termed as 'complicated'. In each case, the time horizon of the procurement is a critical element. The financial cycle of funds allocated for procurement expenditure is fixed, while the implementation horizon vary widely. Routine procurement that can be readily standardised are 'simple'. For example, goods such as office supplies are high volume and low value, and can be completed over short procurement horizons. In comparison, services procurement is less standardised and less objective, and is completed over longer horizons. Finally, major works like infrastructure projects are complex procurement, which are low volume and high value, with the greater risks that come when carried out over very long time horizons (Schapper, Malta, and Gilbert, 2006).

We separately categorise and analyse these different types of procurement, with goods being simple, services as complex and works as complicated. Given the differences in the financial cycle of budgeted funds towards these different categories of expenditure, we hypothesise that complex and complicated procurement will suffer from larger spending gaps with weak state capacity, while goods procurement will have the least spending gaps.

2. Greater state capacity is built through consistent procurement

Lessons on how to contract and procure better are learned from experiences in procuring regularly, which instills confidence in decision making and reduces delays in procurement completion (Tabish and Jha, 2011). Ministries that are consistently engaged in procurement on a large scale will, over the course of time, *learn* how to manage and execute, most of the phases in the procurement cycle, well. On the other hand, occasional and inconsistent procurers will lack the contracting skills which are developed through iteration and repetition, which is part of the process of *learning by doing*.

We hypothesise that ministries with consistent and large procuring budgets will, *on average*, experience lower procurement spending gaps, compared to ministries that are low or inconsistent procurers.

3. Greater state capacity is required to deal with sudden increases in budget

We hypothesise that large and sudden increases in procurement budgets will lead to underspending by ministries with low existing absorptive state capacity, which will act as a binding constraint. The literature on absorptive capacity analyses the ability of governments to use a sudden increase in funds, and points out that sudden spurts in budgeted expenditure leads to under-spending due to lack of absorptive state capacity. Clemens and Radelet (2003) study this in the context of foreign aid flows to developing countries, while Monsod (2016) examines an increase in funds allocated to various sectors. They find that there is a lack of absorptive capacity in such cases, which overwhelms the government's ability to utilise the funds effectively. Inadequate legal frameworks, fragmented procurement processes and a lack of skilled professionals can restrict the utilisation of budgeted funds. We expect that such under-utilisation of procurement budgets is the highest for works procurement, since it requires greater state capacity due to the complexity involved.

We find that procurement is not an activity that is done with either equal success or failure across all parts of government. There is significant variation across departments

to procure well, as measured by the 'spending gaps' in budgeted procurement. Some ministries having low procurement spending gaps, while others having high spending gaps. But there are some consistent trends and features of the cross-sectional variation in procurement capability that points to the role of state capacity in procurement. We find that, on average, the spending gap is lower for simple procurement such as for goods procurement. We find that the largest spending gaps appear consistently for works procurement which is complex in the risks of both project execution as well as in budget management.

We present some evidence of procurement capacity developing as a result of learning by doing. Government departments and ministries that consistently have procurement budget as a material fraction of their total budgets, tend to have lower procurement spending gaps, than those that do not consistently undertake large procurement. In a cross-sectional analysis for a year, or across years, these 'high procuring' ministries and departments have consistently lower procurement spending gaps than 'low procuring' ministries and departments.

Finally, there is evidence that suggests that there is low absorptive capacity in 'low procuring' ministries and departments. When there is a sudden and large increase in their budgets, there is evidence of under-spending (a negative value of the gap between actual spending and budgeted spending for procurement) for these 'low procurers' in the year of the budget increase, compared to the spending gap of the previous year. Further, the evidence suggests that the under-spending continues for the following years as well. This emphasises that procurement is a specialisation that is required by government, since the lack of these skills can lead to poor allocation of funds in a given year, and delayed delivery of goods and services to citizens.

To the best of our knowledge, this is the first work to quantify evidence of the lack of state capacity, through failures in procurement expenditure. Further, we propose and test links between these measures with the process of learning by doing. While the allocation and expenditure of total public funds is well-researched, this is less established in the case of public funds allocated for procurement alone. This work is also the first to present evidence that procurement requires specialised skill, the lack of which has repercussions on poor allocation of public funds and outcomes to citizens. While this work does not fully identify all the types of procurement skills that are required to be developed within government, there is some evidence that the ability to better plan and design tenders for contracting from the market appears to be the capacity that will likely result in planned expenditure being deployed as planned, and is likely to minimise under-spending of budgeted procurement. Another required skill is the ability to manage awarded contracts over the longer horizons of 'works' projects, which is likely to minimise cost over-runs in procurement budgets.

The paper is structured as follows: Section 2 describes in detail the approach that we adopt to measure state capacity as procurement spending gaps, as well as a description of the statistical tools that we employ to establish the propositions of causes and con-

sequences of lack of state capacity from the lens of success or failure in procurement outcomes. Section 3 describes the data used in the analysis, while Section 4 lays out our findings. We conclude with Section 5.

2 Approach

An integral element of our analysis of state capacity in procurement is the magnitude and direction of the procurement 'spending gap'. This is the gap between what has been budgeted to spend in procurement for a year, and what was actually spent by the end of that year. Sharma and Thomas (2021) highlight the heterogeneity in size and type of procurement expenditure across ministries of the Union Government of India. In our work, we hypothesise that if we are able to estimate procurement expenditures of these ministries across years, we can track how successfully (or not) these ministries are able to spend their budgeted procurement as a proxy for state capacity. Further, we can examine trends in the success of procurement spending over time, and attempt to study where there is evidence of more and less success in procurement spending, as a link to what are the causes and the consequences of successful procurement.

Our diagnosis is conducted through the lens of procurement as an contracting activity. This is useful because contract activities can be broken into different phases of contracting, each of which require different capabilities. The lack of specific capabilities can lead to different types of failure in the procurement process. For example, 'over-spending' (where actual expenditure is greater than budgeted expenditure) can indicate a markup on original cost of procurement because of litigation arising from disputes on what the supplier is expected to deliver or because of delayed payments to the supplier. This happens frequently in the case of infrastructure projects (Mehta and Thomas, 2022). Under-spending in procurement can arise from poor planning and designing of contracts, incomplete authorisation or clearances which lead to delays in tendering for, and awarding contracts (CAG, 2022). The literature has identified several such links between problems in contracting and problems in procurement, such as delays due to inadequate investment in planning and designing in the very first phase of contracting (Navarro and Tanghal, 2017), lack of contract management skills (ineffective auditing, monitoring and evaluation) (Manu et al., 2018) and delays in tendering for, and awarding of contracts, along with delayed release of payments to vendors (CAG, 2017) are highlighted as the leading causes of spending gaps in works (complicated) procurement.

A careful diagnosis can then give rise to identifying the most appropriate solutions. In the domain of procurement, very often, the solution is to develop specialised state capacity. For instance, strengthening capacity that is required for the planning and design phase of the contracting life-cycle would require better skills in budgeting procurement expenditure at the start of the financial cycle. A lack of capacity in this phase is likely to lead to a conservative budget, with the budgeted funds being larger than the actual spend, leading to under-spending in procurement. Similarly, a lack of capacity in tendering and

awarding contracts will lead to contracts being awarded much later in the financial cycle than planned, which is likely to lead to under-spending of procurement budgets. If the first two stages of procurement go as planned, but there is a lack of state capacity in contract management, there is likely to be delayed payments to vendors. This can lead to litigation by private parties, which implies a higher (and unanticipated) cost of the project, both in terms of additional legal cost and penalties for delayed payments. This is likely to mean that the actual spend on the project within the project cycle is higher than what is budgeted. Thus, different phases of the contracting life-cycle can lead to different signs on the spending gap in procurement, and can be a indicator on where the problems in procurement lie, as indicated in Table 1.

Table 1 Linking weak capacity in the contract life-cycle to procurement spending gaps

Contract phase Direction on spending gap	Contract Design and Planning	Tendering and Award	Contract Management	Payments and Closure
Under-spending	X	X		
Balanced	✓	✓	✓	✓
Over-spending			X	X

In our analysis, we focus on the size and the magnitude of the spending gaps in procurement expenditure. While we are unable to observe contract performance directly, we use this information to infer the extent to which it indicates the presence of state capacity, and whether there is evidence that is consistent with the three propositions derived from the *learning by doing* hypothesis. For this, we study the procurement expenditure patterns of 33 ministries of the Union Government of India, for the period of 2014-15 to 2020-21.

For this, we first estimate the procurement related expenditure across the ministries, using which we estimate the *spending gaps* in procurement expenditure as described in the following.

2.1 Estimating the spending gap

The spending gap is estimated from two elements: The first is the 'Budget estimates'. In India, this is expenditure estimated for the current year, and placed before the Parliament during the budget session. The second is the 'Actual' expenditure, which has been accounted for, and for which funds have been transferred (cash transaction) for a given financial year. In India, budget details are available for the current financial year, but actuals are provided with a lag of two years (Chitgupi, Gorsi, and Thomas, 2022). Thus, we can only calculate the spending gap for procurement expenditure for any ministry with a lag of two years since that is when both the Budget and Actual expenditure is

visible to the public. However, what is readily available is the total budget and actual expenditure. Procurement expenditure has to be estimated. One approach to estimate the procurement expenditure is presented in Sharma and Thomas (2021), which is based on publicly available budget documents.

We use this data to extend the analysis of procurement spending gaps in Chitgupi, Gorsi, and Thomas (2022), which calculated spending gap for a ministry i during a financial year t as a fraction of budget and actual estimates. They expressed the *spending gap* in percentages as shown below:

$$\text{SpendingGap}_{it} = 100\frac{\text{actual expenditure}_{it} - \text{budgeted expenditure}_{it}}{\text{budgeted expenditure}_{it}} \tag{1}$$

The SpendingGap_{it} gap can be negative (under-spending), positive (over-spending) or zero (as budgeted) as described in Table 1. The lack of state capacity will be observed as the *magnitude of the gap*, irrespective of the *direction* of the gap. The *direction of the gap* – whether it is negative or positive – will depend upon where there are gaps in contracting capacity as shown in Table 1. If there is a lack of good budgeting capacity or the lack of capacity to tender for contracts efficiently, it is likely that contracts will not be awarded within the time period of the planned budget. This is likely to result in under-spending. If, on the other hand, the contracts are awarded as expected, but there is a lack of capacity in contract management, there are likely to be problems with vendors which can lead to unanticipated costs of dispute resolution and litigation in the latter part of the contract. This is likely to result in spending more than budgeted.

Thus, we expect that ministries that have state capacity in procurement will have spending gaps close to zero, while those without will have spending gaps that are far from zero. This can be estimated for the overall procurement. In addition, we can estimate the gap in procurement expenditure separately for goods (G), services (S) and works (W) procurement at the same units of observation. Lastly, we also calculate the spending gap for total expenditure aggregated across all ministries up to the procurement spending gap at the level of the government.

The classification of procurement into G, S and W is relevant from the point of understanding requisite state capacity for successfully executing such procurement. Literature has identified works and infrastructure related procurement to be strife with challenges across all stages of contracting cycle. We consider works (W) to be a *complicated* procurement requiring nuanced and mature understanding of procurement activities, whereas goods (G) are *simple* procurement given they are routine in nature, devoid of excessive planning with limited resources spent in a competitive market. Services (S) are *complex* procurement in the sense that they require certain degree of procurement expertise to clearly spell out the services needed, evaluating and selecting the most appropriate service providers.

2.2 Statistical approaches

In our analysis, we use a descriptive approach with visual inspection of heat-maps and an event analysis, followed by estimating the relationships using a regression framework. We describe these in the following:

2.2.1 Visual inspection using heat-maps

We use heat-maps to identify trends and spending behaviour of ministries. We examine four sets of heat-maps for the procurement spending gaps of all the ministries together: 1) Total procurement, 2) Goods procurement, 3) Services procurement, and 4) Works procurement. In each map, the ministries are sorted in the descending order of their total procurement expenditure measured in Rupees (real terms) as of the accounting year 2014-15.

Each heat-map will present the extent of divergence from 'balanced' spending (which is when is spent is equal to what was budgeted). Each cell on the heat-map represents the spending gap for a particular ministry for a given year. Each row represents a particular ministry and each column represents a specific year. The colour scheme indicates the *direction* of the spending gap. Green indicates procurement over-spending (when more was spent than budgeted), and shades of red indicate procurement under-spending (when less was spent than budgeted). The shade depicts the *magnitude* of the spending gap. Lighter colours indicate gaps closer to zero which indicates a balanced spending, whereas darker shades of green or red indicate greater spending gaps.

This representation visually identifies ministries that are persistently under-spending, overspending or spending as planned. Also, this method of representation helps to identify the years in which the variations are high. This is useful to find evidence of both state capacity as well as the evolution of state capacity as might be predicted by the *learning by doing* hypothesis. For instance, Chitgupi, Gorsi, and Thomas (2022) study the spending gap in procurement to highlight that ministries that consistently spend large fraction their expenditure on procurement are less prone to under-spending as they develop required contracting capabilities.

We can also use these maps to examine the link between state capacity and procurement complexity, or state capacity and consistency in procurement spending. A heat map of spending gap for goods procurement is likely to show up mostly light colours as compared to the spending gap for (say) works procurement, since works is a more complex procurement with higher requirement of state capacity. Similarly, if we expect that ministries with consistently larger procurement expenditure will have developed procurement contracting skills, these should show up as having lighter shades in the heat map even for complicated works procurement compared to those ministries with cons.

2.2.2 Regression analysis

We use a regression model to statistically test the association between state capacity (as measured by spending gap in procurement expenditure) and various ministry and procurement specific features in the dataset.

We estimate a pooled regression model, with the procurement spending gap across all the ministries and across all years as the dependent variable. In each case, variables capturing the procurement experience of the ministry are used as the independent variables. The sign and magnitude of the coefficients on these variables will be an indicator of how procurement experience is related to the cross-sectional variation in procurement spending gaps across different ministries and across different years. We do these estimations separately for spending gaps in total, goods, services and works procurement so that we can study the cross-sectional variation in the relation between the ministries experience in procurement of different complexity.

In addition to the estimated procurement spending gaps, we propose three measures to capture cross-ministry variation in procurement experience as follows:

High/Low procurement measures The analysis in Chitgupi, Gorsi, and Thomas (2022) identified that ministries with higher procurement budgets tend to have smaller spending gaps. Vice versa, ministries with lower procurement budgets tend to have under-spending on the procurement budget.

We build on this observation to create a dummy variable 'HighProcurement' if the ministry budgets procurement spending over a high threshold[2] and 0 otherwise. Similarly, we create a dummy called 'LowProcurement' if the ministry budgets less than a low threshold of procurement expenditure.

Lagged budget values for consistency in procurement In order to capture consistency in procurement budgets, we use values of budgeted expenditure for the previous two years to capture the cross-ministry variation to identify experience in procurement. In the regression setting, these lagged variables across different ministries may help to identify patterns of consistently high procurement budgets, on average, and consistently low procurement budgets, on average, as well.

Growth rate of procurement for consistency in procurement We use the growth rate of budgeted procurement expenditure – $\Delta(\text{ProcurementBudget})$ – as the explanatory variable of experience. This is a measure that can capture consistency in the procurement budget at the level of a ministry. It also helps to identify large increases or decreases and whether these relate to larger or smaller gaps in procurement spending in the model.

Table 2 summarises the independent variables created to measure the procurement expertise at the level of a ministry, for a year. Each of the above measures are based on

[2]In our data, we find that ministries that spend over Rs 30 billion in any given year tend to do so over subsequent years as well.

Table 2 List of variables to measure procurement expertise for a ministry

1. Dummy variable	'HighProcurement'	$= 1$ if procurement spending $>$ Threshold$_{\text{High}}$ $= 0$ Otherwise
2. Dummy variable	'LowProcurement'	$= 1$ if procurement spending $<$ Threshold$_{\text{Low}}$ $= 0$ Otherwise
3. Lagged value	ProcurementBudget$_{-1}$	Budgeted procurement expenditure for one year prior $(t-1)$
4. Lagged value	ProcurementBudget$_{-2}$	Budgeted procurement expenditure for two years prior $(t-2)$
5. Growth variable	ΔProcurementBudget	Percentage change in procurement budget from the previous year

the *budgeted* procurement, as an indicator of what the ministry intends to procure at the start of their financial year. This serves as a proxy measure of the expertise in budgeting and procuring at the ministry.

We use these variables to estimate the following models. In each of these specification, we employ the measure of procurement expertise to explain the extent of state capacity as measured by the estimated spending gap between budgeted and actual procurement spending. There are three model specifications listed in the following:

M1: $\text{SpendingGap}_{i,t} = \alpha_1 + \beta_{High}\text{HighProcurement}_{it} + \beta_{Low}\text{LowProcurement}_i + \epsilon_{i,t}$

M2: $\text{SpendingGap}_{i,t} = \alpha_2 + \beta_{\text{lagproc,1}} \log(\text{ProcurementBudget}_{-1})_i$
$+\beta_{\text{lagproc,2}} \log(\text{ProcurementBudget}_{-2})_i + \epsilon_{i,t}$

M3: $\text{SpendingGap}_{i,t} = \alpha_3 + \beta_{\text{lagproc,1}} \log(\text{ProcurementBudget}_{-1})_i +$
$\beta_{\text{lagproc,2}} \log(\text{ProcurementBudget}_{-2})_i + \beta_{\text{growth}}\Delta(\text{ProcurementBudget}_{i,t}) + \epsilon_{i,t}$

Here, i and t represent the ministries and year respectively, and $\epsilon \sim N(0, \sigma_\epsilon^2)$. $\text{SpendingGap}_{i,t}$ is a real number between $(-\infty, \infty)$. Our hypothesis is that the higher the amount of procurement expertise, the smaller is magnitude of the spending gap. Threshold$_{\text{High}}$ is marked at Rs. 30 Bn. and Threshold$_{\text{Low}}$ is fixed at Rs. 1 Bn.

For **M1**, we expect that the null hypothesis is that $(\alpha_1 + \beta_{\text{High}} = 0)$. α_1 captures the average level of spending gap in procurement across all ministries. In the context of low state capacity, then on average, we can expect that there will be under-spending of procurement budgets ($\alpha_1 < 0$) or over-spending of procurement ($\alpha_1 > 0$).[3] If the dummy variable 'HighProcurement' captures the ability of the ministry to manage procurement better, $\beta_{\text{High}} > 0$ if $\alpha_1 < 0$, or vice-versa.

[3] In the current work, we do not have sufficient information about where procurement contracts fail to be able to predict the direction of the spending gap, as suggested in Table 1.

This supports the *learning by doing* hypothesis, since ministries with large and consistent spending on procurement are believed to have developed state capacity to contract better compared to ministries with small and inconsistent procurement expenditures. Literature highlights that public procurement is a professional discipline requiring contracting, public policy and legal expertise (Tremblay and Boyle, 2018; Jones, 2007; Callender and Matthews, 2000). In India such a cadre of professionals is missing. Ministries with large procurement size are assumed to have developed procurement capabilities because undertaking large scale procurement expenditure requires contracting skills to execute government contracts and procure goods, services and works.

In **M2**, we expect a similar relationship between α_2, which captures the average spending gap in the context of low state capacity. If there is under-spending on average (i.e., a negative spending gap), we expect that $\beta_{lagproc,1}$ will be positive and significant, since ministries with larger than average budgeted procurement for two consecutive periods are more likely to have developed required procurement expertise.

Finally, model **M3** aims to estimate the variation in absorptive capacity across ministries when it comes to the capacity to spend procurement budgets. Increases in previous years' budgets should be positively associated with spending gap variable in the presence of state capacity. Ministries that have developed strong absorptive capacity will efficiently deploy the increased budgeted expenditure towards procurement without large spending gaps. We hypothesize that the sudden spurt in budgeted expenditure for procurement should increase the spending gap, due to the limited absorptive capacity of the ministries.

2.2.3 Event study

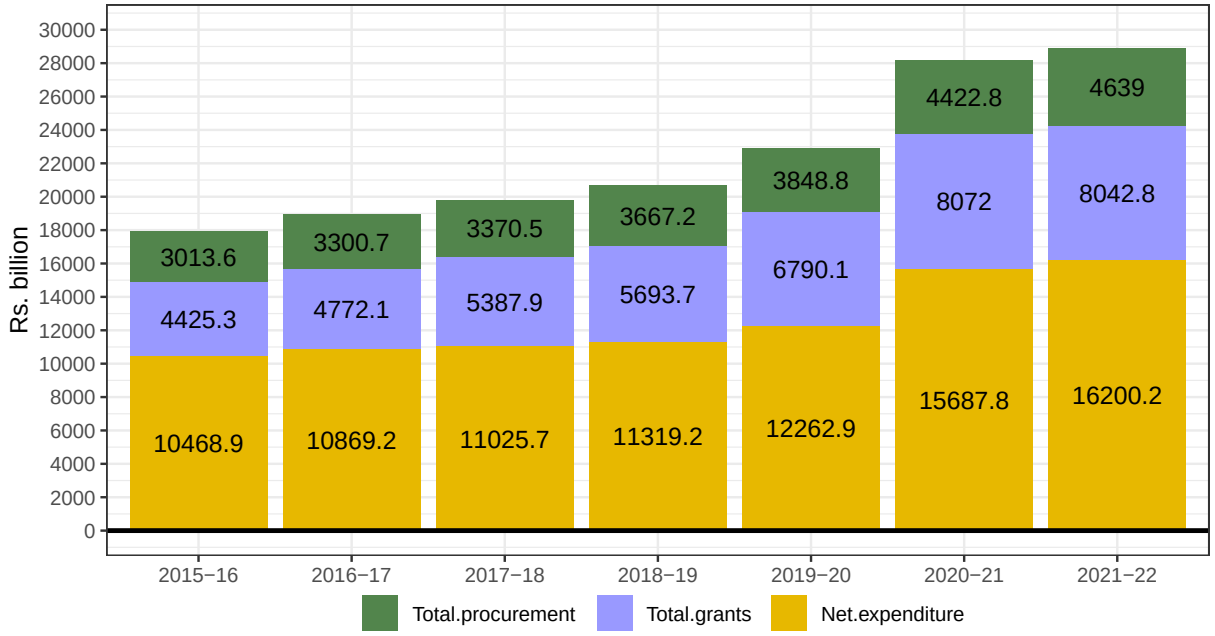
An event study approach is useful to examine how spending gaps behave around any sudden increases in procurement budgets. In this analysis, we identify as an event, where there is an increase in procurement budgets larger than 30%, calculated as follows:

$$\begin{aligned} \Delta(\text{BudgetedProcurement})_{i,t} &= 100\frac{\text{BudgetedProcurement}_{i,t} - \text{BudgetedProcurement}_{i,t-1}}{\text{BudgetedProcurement}_{i,t-1}} \\ &> 30\% \end{aligned} \tag{2}$$

We study the behaviour of spending gap for a period of two years before the year of the large budget increase, and focus on the median spending gap, as well as the 5th and 95th percentile values, for all ministry-years wherever the ministry experience a rise in budgeted expenditure by 30%.

In the following section, we describe the data-set used for the analysis.

Figure 1 Estimated real Union government procurement expenditure, 2015-16 to 2021-22 (Rs Bn.)



3 Data

There are two sources of procurement expenditure information for the Union government: the report of the Controller General of Accounts (CGA) and the Detailed Demand for Grant documents (DDGs) published by the individual ministries and departments. The CGA data, which is published annually as *Accounts at a glance*, is useful to estimate the 'total' allocated procurement expenditure, as well as the total grants allocated, by the Union Government of India. Figure 1 presents these estimates, along with the 'Net expenditure'[4] for the period from 2015-16 to 2021-22,[5] adjusted for 2015-16 prices. This is useful as a picture of how the Union government of India has allocated funds to procurement over this time period.

There is little change in the share of procurement in the total expenditure of the Union Government during this period. This share is stable at approximately 16-17% as noted in Chitgupi and Thomas (2022). This suggests that there has been little increase in how much the share of *buy* activities rises, when total expenditure rises.[6]

[4]This is Total expenditure$_{yyyy}$ − Total procurement$_{yyyy}$ + Total grants$_{yyyy}$

[5]The period prior to 2015-16 does not include object head-wise classification of expenditures and therefore our estimation of Union government procurement is restricted to periods starting from 2015-16.

[6]Chitgupi and Thomas (2022)also observe that the increase in total expenditure on account of increased capital expenditure improves the share of capital component of procurement expenditure. Procurement expenditure for Union government is skewed towards capital compared to revenue or administrative/operating expenditures. The trend depicts that Union government buys more capital related goods

Since the CGA report the estimates of Union government procurement expenditure for actual or accounts data only, rather than does not publish budgeted object head-wise expenditures,[7] the main source of data we use to estimate spending gaps in procurement are the DDGs, which are published annually by the civil ministries of the Union Government. We use these DDGs to estimate total procurement, as well as procurement classified into goods (G), services (S) and works (W) expenditures using the approach first presented by Sharma and Thomas (2021). Our estimates differ on three counts:

- We aggregate the procurement expenditure at the Union government ministry level, not at the department level.

  Union government ministries include departments that function under them e.g. ministry of Home Affair has four departments that function under it which includes Cabinet, Police, Home and Union Territories (UTs).[8] Table 3 gives the complete list of ministries with their respective departments that are included in our data.

- We restrict our procurement estimates to those items that can be explicitly classified as procurement.

  While Sharma and Thomas (2021) classified expenditure type as procurement, non-procurement and 'uncertain' (which could not be explicitly classified as either of the other types), our procurement estimates include only unambiguously of the procurement type. This makes our estimates more conservative, in comparison.

- We estimate both budgeted and actual procurement expenditure. The 'Budget' estimates are provided by the ministries as grants requested for the current financial year. Actual expenditure is 'Actuals' which is procurement expenditure that is accounted for and presented with a lag of two years. These values from DDGs of two different years are first estimated and then lined up to estimate the procurement spending gap for a given ministry, for a given year.

We collected the DDGs for ministries from 2014-15 to 2022-23. With this, we are able to estimate and collate data on Actual and Budgeted procurement for 33 civil Union ministries. This does not include the DDGs for the ministries of Railways and Defence.[9] Table 3 lists the ministries for which we are able to locate publicly available DDGs. There are only 15 ministries with complete data for the entire study period of 2014-15 to 2020-21, which we use to construct a balanced panel for this period. In the table, ministries without any information in the third column are 'standalone ministries'. These do not have any departments under them. For all other ministries, the complete set of DDGs for all departments are only available for three ministries. These are the *Ministry of*

and works as procurement rises.

[7] See Appendix 6 for a detailed explanation.

[8] Each UT publishes its own DDG.

[9] The DDGs for the Ministry of Defence is not available in the public domain, while the Ministry of Railways requires a different approach to estimate procurement from published DDGs. The challenges of estimating the procurement expenditure, budgeted or Actuals, for the Ministry of Railways is presented in Sharma and Thomas (2021).

Table 3 List of ministries and related departments

	Ministry	Department	Number
1.	Agriculture and Farmers Welfare	Agricultural Research	2
		Agriculture and Welfare	3
2.	Atomic Energy		7
3.	Ayush		2
4.	Chemicals and Fertilisers	Chemicals and Petrochemicals	7
5.	Civil Aviation		7
6.	Coal		7
7.	Commerce and Industry	Commerce	3
8.	Communications	Telecommunications	3
9.	Consumer Affairs, Food and Public Distribution	Consumer Affairs	7
10.	Corporate Affairs		3
11.	Education	Higher Education	3
12.	Electronics and Information Technology		7
13.	Environment, Forests and Climate Change	Environment	7
14.	External Affairs		4
15.	Finance	DIPAM	7
		Direct taxes	7
		Economic Affairs	7
		Expenditure	7
		Financial Services	7
		Indirect Taxes	7
		Revenue	7
16.	Fisheries, Animal Husbandry and Dairying	Animal Husbandry	1
17.	Food Processing Industries		3
18.	Health and Family Welfare	Health and Family Welfare	7
		Health Research	7
19.	Home Affairs	Home Affairs	7
		Cabinet	7
		Police	7
		UT	7
20.	Housing and Urban Affairs		7
21.	Information and Broadcasting		3
22.	Jal Shakti	Water Resources	3
23.	Law and Justice	Law and Justice	7
24.	Mines		3
25.	Petroleum and Natural Gas		2
26.	Road Transport and Highways		7
27.	Rural Development		7
28.	Skill Development and Entrepreneurship	Skill Development	3
29.	Statistics and Programme Implementation		3
30.	Steel		3
31.	Textiles		3
32.	Tourism		3
33.	Women and Child Development		7
	Total		229

Table 4 Number of ministries across the study period

Year	No. of ministries
2014-15	19
2015-16	20
2016-17	28
2017-18	29
2018-19	30
2019-20	17
2020-21	15
Total	158

Agriculture and Farmers Welfare, *Ministry of Health and Family Welfare* and *Ministry of Home Affairs*. We have been able to access and estimate the procurement expenditures only for the major departments of the ministries, other than these three.

Table 4 gives the number of ministries for each year of the study period. The availability of DDGs collected over the years has increased from 19 ministries in 2014-15 to 30 for 2020-21. Recent DDGs are easily available on the ministry websites. Further, several ministries now publish machine readable versions of these documents, which makes data collection for research, such as in this paper, possible.

Table 5 Summary statistics of ministry-year observations about procurement

	Min	5^{th}	25^{th}	50^{th}	75^{th}	95^{th}	Max	μ	σ	N
ActualProcurement (in Rs. Bn.)										
	0.01	0.04	0.78	2.61	24.84	193.66	349.38	33.16	66.53	158
BudgetedProcurement (in Rs. Bn.)										
	0.004	0.05	1.00	3.57	31.13	219.38	324.20	36.93	69.73	158
Procurement spending gap (in%)										
Total	-91.09	-70.66	-32.69	**-13.55**	1.55	55.75	273.73	-11.43	42.08	158
Goods	-76.03	-57.48	-30.79	**-11.81**	0.51	44.43	114.06	-11.10	32.33	154
Services	-90.51	-66.88	-30.08	**-11.63**	9.51	46.40	186.73	-6.62	45.10	153
Works	-100.00	-100.00	-67.99	**-34.90**	-2.90	241.61	1630.52	35.81	444.00	146

The reported minimum (Min) and maximum (Max) values are winsorised at 99%.

Table 5 presents a summary of the spending gaps for the pooled set of 158 values of ministry-year observations in our sample. The first two variables in the Table are the values for real Actual procurement expenditure and for real Budgeted procurement expenditure. We find that the median value of both actual and budgeted procurement in a year are close, falling between Rs.2.5-3.5 billion[10] There is large variation in each of these, with σ falling between Rs.67-70 billion.

The focus of our analysis is the annual spending gap in this sample during this period. The total spending gap can be read in the 3rd line in the table. Here, the median is larger than either the actual or budgeted procurement expenditure, at Rs.13.55 billion. The average spending gap is Rs.11.43 billion with a σ of approximately Rs.42 billion, which also suggests that there is large degree of cross-sectional variation in procurement spending gap in the sample. This pattern repeats across all the specific types of procurement: goods, services and works. Goods and services procurement have spending gaps that are similar to each other within the 25-75 percentile ranges. However, the extreme values beyond these points of the distribution vary with higher values of spending gap for services rather than goods.

This is most extreme in the case of works procurement. Here the spending gap at the median is more than 3$\times$ the value seen for goods and services. Not surprisingly, there is a much wider range of values at the extreme ends of the distribution for works procurement spending gaps. This reading informs us of two features of procurement spending at the Union government ministries in India: first, that there is cross-sectional variation across ministries and years, and second, that there is much wider variation in the ability of ministries to spend on procuring works projects than they would typically face when spending on procuring goods or services.

The above observations related to the magnitude of the spending gaps. The last observation to note from the summary statistics in Table 5 is the direction of the spending gap. We see that there are many more negative valued observations than positive observations of procurement spending gaps. This indicates that during this period, ministries faced difficulties in spending their procurement budgets, and were actually able to spend less than budgeted. This indicates a systematic lack of state capacity in contracting to 'buy'. A more detailed analysis is required to identify how these procurement spending gaps vary across specific ministries and specific years, and whether these variations offer a guide on gaps in state capacity in contracting. If these can be identified, they can be used as a guide on where capacity development needs to be focused.

4 Results

Here, we present our analysis about the cross-sectional variation of procurement spending gaps seen in Table 5. The focus of our analysis is to identify whether there is a link

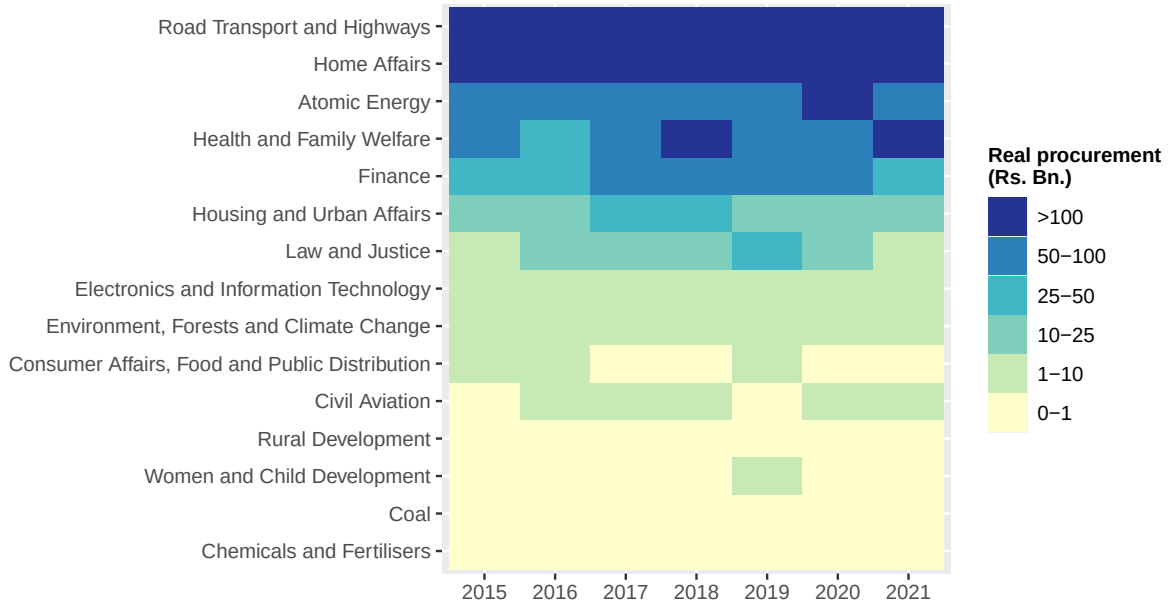
[10] One billion is 100 crore.

of the variation to the ministry itself or to the type of procurement that the variation in spending gaps link to.

4.1 Procurement size and consistency and spending gaps

We extend the analysis used in (Chitgupi, Gorsi, and Thomas, 2022) as the first step to understanding the cross-sectional variation in procurement spending gaps. In this case, we have the extended sample of 15 ministries for the period from 2014-15 to 2020-21. Each row has the ministries listed in the descending order of their real procurement expenditure, adjusted for 2014-2015 prices, following the pattern in Figure 2. The columns are the years of the observed spending gaps from 2014-2015 to 2020-2021.

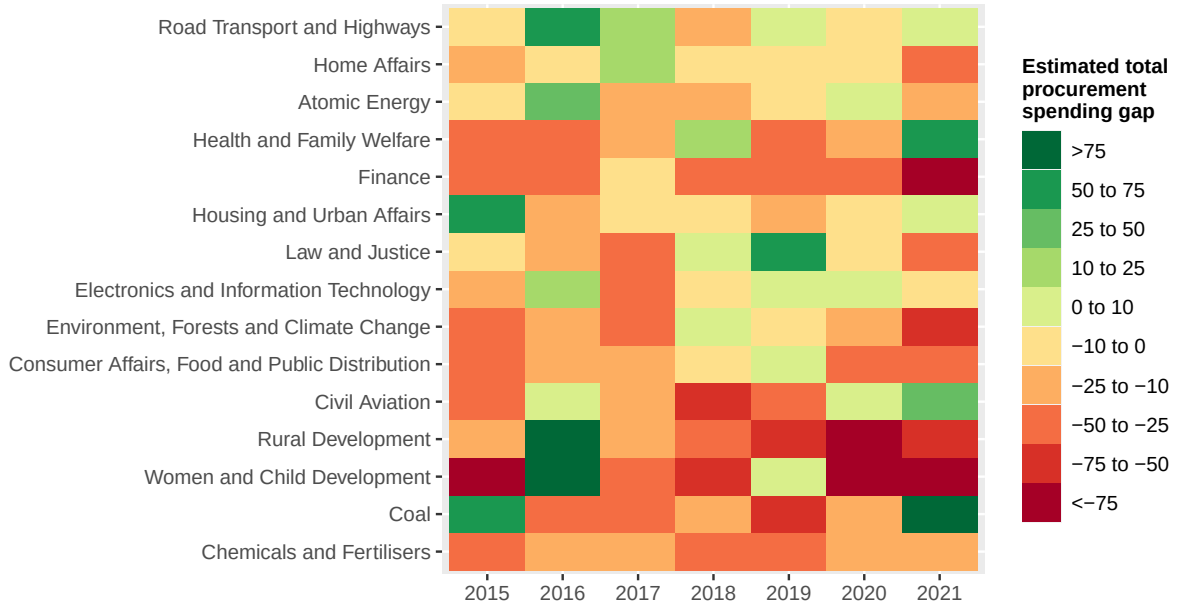
Figure 2 Heat-map of procurement budget estimates, 2014-15 to 2020-21 (in Rs Bn.)



The heat-map of the extended procurement spending gaps is presented in Figure 3. As in the earlier research, we observe that top rows have observations of relatively low spending gaps, while the ministries in the bottom rows have observations with high spending gaps. Ministries such as Rural Development and Women and Child Development experience under spending exceeding 75% of procurement budget.

Given that ministries are organised by decreasing procurement expenditure, the graph suggests that ministries with higher procurement budgets experience lower spending gaps in procurement. A closer examination of the spending gaps across both ministries and time suggests two distinct categories of ministries. One are the ministries with consistently low spending gaps who are also the consistently large procurers, such as *Road Transport and Highways* and *Home Affairs*. These ministries procure more than Rs. 100

Figure 3 Heat-map of procurement spending gap estimates, 2014-15 to 2020-21 (in %)

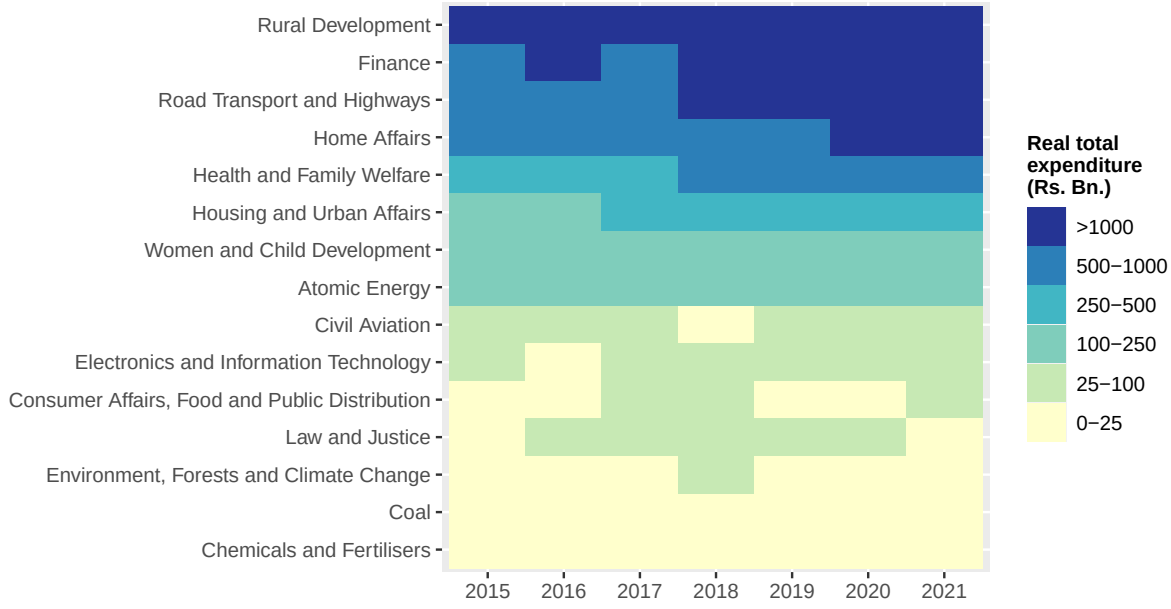


billion annually. Another are the ministries which have varying spending gaps and are consistently low procurers. These ministries spend less than Rs. 1 billion on procurement expenditure annually, such as *Rural Development*, *Women and Child Development*, *Coal* and *Chemicals and Fertilisers*. The remaining are ministries with varying spending gaps and varying procurement budgets such as *Health and Family Welfare* and *Finance*. This suggests that ministries that are consistently high procurers tend to have low procurement spending gaps. This suggest that high procuring ministries tend to have the capacity to procure efficiently.

An alternative hypothesis that suggests itself is that capacity is linked to the overall size of the ministry. If a ministry has a large fraction of the overall budget of the Union government, it is likely to have the resources using which to develop state capacity more generally. This state capacity may then be likely to benefit the procurement activities of the ministry as well. We examine this possibility through the heat-map in Figure 4, where the ordering of the ministries is by *overall budget* rather than the procurement budget.

We find that there is a distinct difference in the ordering of the ministries by total budget when compared to the ordering by procurement budget. The ministry with the largest budget is the ministry of *Rural Development*, which has a low procurement budget. Similarly, *Finance* has a relatively larger budget but lower procurement budget compared to *Home Affairs*. A visual examination of these two orderings with the heat-map and ordering of procurement spending gaps of ministries indicates that size and consistency of the procurement budget has a higher correlation with the spending gap, than the total budget. For smaller procurement spending gaps, the size of the procurement budget matters

Figure 4 Heat-map of total budgeted spending, 2014-15 to 2020-21 (in Rs. Bn.)



more.

Lastly, we test these relationships using the regression model specifications described in Section 2.2.2. In Table 6, we present the regression estimates for model specifications M_1 and M_2.

The estimated coefficients validate the statistical observations in the graphical representations. For Model M_1, the estimated constant is -23.51% which indicates that, on average, ministries in this sample, tend to have *under-spend* their procurement budgets. However, this magnitude of under-spending is reduced to -19.36% for ministries whose budgets have a higher fraction of expenditure as procurement expenditure. This assessment is supported by the estimated coefficients for Model M_2, where the estimated constant is -56.11%. Here, the model specification indicates the effect of consistency in procurement through the coefficients on the previous two years budgeted procurement. While the coefficient on the previous year's procurement budget is not statistically significant, the coefficient on the procurement budget from two year's prior shows statistical significance (at the 90% confidence interval). The coefficient value is positive, which means that the higher the budgeted procurement in the previous years, the *lower* is the spending gap.

These results support the hypothesis of learning by doing in the development of state capacity for procurement, since the more that the ministry participates in procurement activity, the more efficiently the ministry is able to spend their procurement budgets.

Table 6 Pooled OLS results: consistency in procurement

	Dependent variable:	
	Procurement spending gap	
	M_1	M_2
Constant	-23.507^{***}	-56.106^{***}
	(4.156)	(12.916)
HighProcurement	14.145^{***}	
	(5.006)	
LowProcurement	2.275	
	(6.054)	
ProcurementBudget$_{-1}$		-11.261
		(7.969)
ProcurementBudget$_{-2}$		13.958^{*}
		(7.879)
Observations	158	92
R^2	0.066	0.128
Adjusted R^2	0.054	0.108
Residual Std. Error	24.095	20.256
	(df = 155)	(df = 89)

Note: *p<0.1; **p<0.05; ***p<0.01

4.2 Complexity of procurement and spending gaps

We next examine whether cross-sectional variation in procurement spending gaps varies according to the complexity of procurement. Goods are considered to be the simplest procurement while works has the highest complexity. Figure 5 presents the heat-maps of spending gaps with ministries as rows and years as columns, with the ministries listed in the decreasing order of budgeted procurement expenditure.

Figure 5 Heat-map of procurement spending gap by procurement type, 2014-15 to 2020-21 (in %)

These heat-maps show the variation in spending gaps, not only across the three different procurement types, but also in how the degree of variation can differ by ministry. We already observed, from Table 5, that spending gaps in goods and services procurement were more similar to each other in contrast with spending gaps in works procurement. In addition, there is more visible variation in spending gaps by type, across ministries than can be seen for total procurement in Figure 3.

> The ministries of *Atomic Energy*, *Environment, Forests and Climate Change*, *Coal*, *Chemicals and Fertilisers* and *Home Affairs* have the lowest spending gaps for goods procurement.
>
> The ministries of *Atomic Energy*, *Consumer Affairs, Food and Public Distribution*, *Finance* and *Home Affairs* have low spending gaps in services procurement.
>
> Finally, the ministries of *Road Transport and Highways*, *Home Affairs* and *Atomic Energy* have the least spending gaps in works procurement.

However, unlike for total procurement spending gaps, there are no consistent, visible patterns for the three types of procurement. Also, there is no visible, consistent pattern of spending gaps across years. This is the similar to the variation in total procurement spending gap where there is no discernible pattern across years.

We apply the regression analysis to procurement spending gaps for the three types of procurement. We use the same model specifications used to analyse total procurement spending gaps, but we estimate the models separately for each procurement type. These results are reported in Table 7.

The regression results offer new insights into the variation across ministries by type of procurement. The first insight comes from the estimates of Model specification, M_1, where the size of the spending gap is regressed on whether the procuring ministry is a consistently large procurer in the sample period. The estimated coefficient on the constant term is negative and statistically significant for all three types of procurement. This suggests that ministries under-spend their procurement budgets, regardless of the type of procurement. On average, the magnitude of the under-spend is the least for services, and highest for works. In the case of goods procurement, however, here is a positive estimated value for the coefficient on *both* the HighProcurement and LowProcurement dummy. This means that spending gap for goods procurement falls between -11.77 and -7.2%, on average. This is different for services procurement, where the estimated value for the constant may be the lowest across the three types, but the estimated coefficient on the LowProcurement is more than $2\times$ and negative. This means that the under-spend for services procurement by a low procurer ministry is -32.32% while it is -10.47% for a high procurer ministry. This is the most extreme in the case of works procurement. Here, the estimated constant is statistically significant, and is negative. But, the coefficient for HighProcurement is statistically significant and is positive, which means that high procurer ministry have a spending gap of -7.9%, on average. This is similar to the spending gap for services procurement at a high procurer ministry. The estimated coefficient for

Table 7 Pooled OLS results: consistency in procurement by type of procurement

	Dependent variable: Procurement spending gap in					
	Goods	Services	Works	Goods	Services	Works
	M_1			M_2		
Constant	-19.777^{***}	-10.474^{***}	-39.937^{***}	3.127	-64.806^{***}	-174.263^{***}
	(3.254)	(3.752)	(4.894)	(15.124)	(15.400)	(21.082)
HighProcurement	12.548^{**}	4.524	32.025^{***}			
	(5.012)	(4.831)	(6.125)			
LowProcurement	8.451^{*}	-21.855^{***}	-32.852^{***}			
	(5.026)	(6.925)	(6.273)			
ProcurementBudget$_{-1}$				-16.615^{*}	-11.073^{**}	-11.622
				(8.643)	(4.910)	(12.682)
ProcurementBudget$_{-2}$				15.626^{*}	14.470^{***}	20.405
				(8.719)	(5.001)	(12.288)
Observations	154	153	146	91	90	88
R^2	0.046	0.088	0.452	0.078	0.134	0.370
Adjusted R^2	0.033	0.076	0.445	0.057	0.114	0.355
Residual Std. Error	23.351	22.353	30.995	27.653	27.680	34.684
	(df = 151)	(df = 150)	(df = 143)	(df = 88)	(df = 87)	(df = 85)

Note: *p<0.1; **p<0.05; ***p<0.01

LowProcurement of works procurement, is statistically significant and negative. On average, there is a under-spending of -72.78% in works procurement for a low procurer ministry, which is the highest estimate among all procurement types.

A similar observation can be seen from the estimates of Model M_2. The estimate of the constant terms is statistically insignificant for goods procurement, statistically significant and negative for both services and works, with the coefficient value for works procurement being more than double the value for services procurement. Further, there is some adjustment to reduce the magnitude of the spending gap as a function of the previous two years procurement budget, for both goods and for services. However, in the case of works, neither of these estimated coefficients are statistically significant.

This tells us that the spending gaps in procurement spending is largely driven by the spending gaps in works procurement. Thus, while there is evidence that there is state capacity in procuring goods well, and services less so, the most largest spending gaps and therefore, lowest state capacity, is in works procurement. In fact, this is also supported by the value of the R^2 of these estimated models. Both M_1 and M_2 have the largest R^2 values for these models estimated for the spending gaps on works procurement.

These results offer support for the idea that spending gaps in procurement is a useful

approach to identify that there is a lack of state capacity, the extent of which varies from ministry to ministry. This lack of capacity is the highest when state seeks to project works projects. There is far more capacity (and much smaller procurement spending gaps) when state 'buys' goods. In the case of services procurement, there is evidence that high procurer states face low spending gaps, while low procurers have wide spending gaps in spending service procurement budgets efficiently.

This corroborates our understanding that simple procurement such as goods are routine and standardised in nature and therefore ministries which do not have large procurement budgets also perform well in government contracting when compared to services and works which are more complex and complicated. Ministries that are low procurers fare poorly on works procurement where the coefficient is of highest magnitude, negative and significant.

4.3 Absorptive capacity and spending gaps

Finally, we analyse the absorptive capacity of state through the lens of procurement spending gaps. The inability to spend budgeted procurement expenditure points to the possibility that ministries have limited absorptive capacity. This would suggest that under instances of extreme hikes in budgets, there should be an increase in spending gaps, if the ministries do not possess sufficient contracting capabilities.

We examine the summary statistics on ministry level, year-on-year changes in the procurement budgets in Table 5. From this, we observe that an increase in the procurement budget of 30% in any given year is an outlier event in the sample. Put together, there are a total of 27 such instances of ministry-years where a growth of this magnitude or higher is observed. These form the basis of the event study analysis of the response of spending gaps around these events of extreme budget increases. Table 8 provides the number of such events in our dataset. For example, the Ministry of *Women and Child Development* experienced four such budget events in the sample. Nearly 67% of all the ministries in our dataset have experienced such an event *at least once* within our study period.

Table 8 Occurrence of event T=0 by year and ministry in our study period

Year	Frequency	Ministry	Frequency
2015	4	Women and Child Development	4
2016	7	Civil Aviation	2
2017	7	Finance	2
2018	7	Law and Justice	2
2019	1	Rural Development	2
2020	1	Others[11]	15
Total	27	Total	27

Summary statistics for the observations at each point of a two-year window around these event of large budget increases, are presented in Table 9. For example, at T= -1, half of

the ministries experience a positive spending gap of 9.5% of the budgeted expenditure for procurement. However, in the year of the budget increase (T=0), half the ministries spend less than -27.4% of their procurement budgets. This is a small sample with a high degree of cross-sectional variation: on an average, the ministries that had a high increase in procurement budget had a spending gap of -31.3% in the year of the increase.

Table 9 Statistics of the spending gap in a 2-year event window around a large procurement budget increase

Event window	Min	5^{th}	25^{th}	50^{th}	75^{th}	95^{th}	Max	μ	σ	N
-2	-88.05	-64.67	-31.14	-20.75	-13.54	-5.93	-2.74	-26.46	22.77	12
-1	-33.82	-25.86	-11.50	9.52	57.27	99.63	273.73	27.45	68.14	20
0	-88.89	-76.35	-50.33	-27.44	-11.29	5.54	10.33	-31.31	27.67	27
1	-91.09	-79.75	-39.56	-18.97	-2.59	33.32	35.50	-22.91	32.84	18
2	-59.42	-52.77	-19.87	-1.82	1.83	35.28	56.92	-7.32	30.71	12

The summary statistics values presented above are all in %.

We test for the presence or lack of absorptive capacity by estimating a regression model using the M_3 specification. In this model, we estimate the procurement spending gap as a function of the lagged procurement budget variables, over the previous two time periods, as well as the previous period growth in the procurement budget for the ministry. These results are presented in Table 10. The estimations are run separately for total procurement as well as for the three procurement types – Goods, Services and Works.

These regression results retain consistency with the results in Table 7.

We test the robustness of our results by estimating these regressions using the disaggregated data on spending gaps for total procurement as well as the three procurement types, at the level of departments along with stand alone ministries, rather than just the ministries.[12] In each of these cases, the following results remain the same:

1. On average, there is a spending gap for total procurement that is statistically significant. The average spending gap estimated is negative, which suggests that, on average, departments and ministries are unable to spend procurement budgets as planned.

2. Departments and ministries with consistently large procurement budgets have a lower magnitude of spending gap, compared to those that have lower procurement budgets.

3. The large negative value of the spending gap in procurement is driven largely by departments and ministries spending less on *works* procurement than budgeted.

   Departments have smaller spending gaps in service procurement, and the least spending gaps in goods procurement.

4. There is a lack of absorptive capacity even at the level of departments, with statistically significant and negative estimated coefficients on the previous year change in procure budget.

[12]These results have not been included in the paper, but can be made available upon a request to the authors.

Table 10 Pooled OLS results: growth in budgeted procurement expenditure

	Dependent variable:			
	Procurement spending gap in			
	Total	Goods	Services	Works
Constant	-45.461^{***}	3.058	-60.459^{***}	-170.316^{***}
	(11.314)	(13.887)	(15.351)	(18.998)
$\text{ProcurementBudget}_{-1}$	-21.383^{***}	-7.500	-6.047	-19.717^{***}
	(6.243)	(8.982)	(6.362)	(5.779)
$\text{ProcurementBudget}_{-2}$	23.633^{***}	6.469	9.303	28.536^{***}
	(6.274)	(9.225)	(6.234)	(5.703)
ΔProcurementBudget	-0.191^{***}	-0.193	-0.225^{**}	-0.191^{***}
	(0.058)	(0.125)	(0.105)	(0.045)
Observations	90	89	88	87
R^2	0.304	0.105	0.232	0.463
Adjusted R^2	0.279	0.073	0.205	0.444
Residual Std. Error	19.431	24.870	26.447	32.854
	(df = 86)	(df = 85)	(df = 84)	(df = 83)

Note: *p<0.1; **p<0.05; ***p<0.01

5 Conclusion

To the best of our knowledge, our paper is the first to assess state capacity in procurement through the lens of how well government is able to spend procurement budgets. We hand construct a panel data of estimated procurement budgets as well as what was actually spent, over a period from 2014-15 to 2020-21 for 33 ministries of the Union Government of India. We take advantage of the panel data structure of this unique dataset to test the principle of *learning by doing* as a path to develop state capacity in public procurement. We test this by asking whether (a) there is better ability to spend (or have smaller spending gaps) when there is consistent and large budgeted procurement spending, (b) when there is demonstrated state capacity to spend on complex procurement such as services and works procurement, and (c) whether there is absorptive capacity in state, where large increases in budgeted procurement will not lead to large spending gaps.

We use annually published Detailed Demand for Grants (DDGs) documents by Union government civil ministries/departments to calculate the spending gaps in procurement expenditure for all types of procurement; goods, services and works from 2014-15 to 2020-21. At the outset our results show that Union government ministries suffer from lack state capacity in procurement spending. This varies across different types of procurement. We find that Union government civil ministries are better equipped to contract and procure for goods related procurement, fail to contract as budgeted for procurement of works.

Our findings indicate that though there is overall negative spending gaps (under-spending) in procurement related expenditures, ministries have developed sufficient state capacity to contract for simple and short procurement cycle related procurement items such as goods. However, for services and especially for works, we find greater under-spending due to lacking capacity given the complex nature of contracting.

Ministries that are inconsistent or poor procurers of complex and complicated procurement suffer maximum under-spending. We believe this is due to the fact that works procurement are specialised in nature, spread over long gestation periods with higher degree of risk and uncertainty. Ministries that are consistently engaged in large procurement activities and especially in works, invest time and effort in understanding and developing state capacity in contracting. Contracting skills are edified with lessons learned from past mistakes and errors.

When ministries are faced with uncharacteristic increases in procurement budgets, there is an increase in under-spending for services and works procurement. This can be ascribed to lack of absorptive capacity which can manifest in various forms; incompetent or inadequately skilled procurement officials, inadequate or complex legal frameworks, insufficient or deficient contract management systems. In contract, goods procurement does not suffer significant under-spending due to sudden rise in procurement budgets. Further reinforcing that there exists state capacity for goods procurement among Union government ministries.

In order to bridge the capacity gap in public procurement and to better deliver on procurement budgets, ministries could develop specialised procurement teams or agencies within their respective ministries/departments to undertake procurement. Our results highlight that ministry of Road Transport and Highways, department of Atomic Energy and ministry of Health and Family Welfare are top procurers. These have specialised units within their ministries to assist them with procurement related activities; National Highways Authority of India (NHAI), Directorate of Purchase and Stores (DPS) and Medical Stores Organisation (MSO) through Government Medical Stores Depot (GMSD) respectively. Such units act like repositories of contracting knowledge through practice in procurement over time.[13]

Efficient government contracting requires specialised legal and management skills with knowledge regarding intricacies of various procurement regulations, ability to draft and manage contracts along with domain-specific as well as market-specific knowledge. Unlike other countries like US, UK, Canada where there exist specialised procurement officials to assist governments in procurement activities, this is a missing piece in contracting in India. Developing of a separate cadre of procurement officials could also be a way forward to combat state capacity challenges in government contracting especially for complicated procurement.

[13]NHAI was established as a statutory organisation under ministry of Road Transport and Highways in 1989, Directorate of Purchase and Stores under department of Atomic Energy was created in 1973 and Medical Stores Depot for ministry of Health and Family Welfare since 1942.

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6 Appendix

Estimating Union government procurement expenditure

We follow the same technique of mapping the object head-wise expenditures presented in the Accounts at A Glance published by CGA into P, NP and U. Similar to the method used to estimate the procurement expenditure for civil ministries of the Union government using their DDGs. The procurement estimates are inflation adjusted using CPI index (2015-16 as base year). The object head-wise data presented in CGA estimates the procurement expenditure for civil ministries only. Data on procurement for ministry of Defence and Railways is estimated as follows:

- For estimating procurement expenditure of ministry of Defence, we follow Sharma and Thomas (2021), where we consider expenditures across various departments such as Defence Services, Capital Outlay on Defence Services, Defence (miscellaneous) and Defence Pensions. The entire capital expenditure across these departments are considered as procurement expenditure whereas we add only 70% of the revenue expenditure to arrive at the overall procurement expenditure of the ministry of Defence.
- For ministry of Railways we follow Chitgupi and Thomas (2022). We use a combination of data sources which includes its own Annual Reports and CGA annual reports of the ministry rather than the DDGs. We use this approach as it is time consuming and difficult to map and extract procurement related expenditure from the DDGs of ministry of Railways as there are 14 Major Heads [14] of Demands with each head having its own set of object head wise expenditures. The ministry of Railways in its annual report publishes the actual procurement expenditure for the current and previous financial year under the 'Materials Management' section. This section includes revenue and capital expenditures such as procurement for the Stores department, fuel and rolling stock (wagons, engines etc.) under subsection 'Expenditure on purchases'. We also add expenditure mentioned in subsection 'Procurement of iron and steel material'. The limitation of this approach is works (W) procurement cannot be mapped.

[14] These include 13 revenue related major heads and one capital related major head.