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Growth: Evidence from Uganda**

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Abstract

Using detailed administrative data, this paper analyzes the relationship between participation in public procurement (selling to government entities) and firm performance in Uganda. We find positive associations with total sales, gross profits, total compensation of employees, number of workers and sales per employee. Overall sales growth associated with selling to government entities is partly at the expense of a reallocation of firm-level supply away from nongovernment buyers, suggesting there may be short-term capacity expansion constraints. The results are substantiated in an event study approach that accounts for potential self-selection of firms into government procurement, as well as the heterogeneity in timing of selection into public procurement. The reduction in sales to private sector is persistent. It is less acute for firms in services, and within services, among firms that use low-skill labor, suggesting capacity constraints may not be only short term.

Keywords

Public procurement; Industrial policy; Government demand; Firm performance; Economic development, Services

1 Introduction*

Private sector development is a central pillar of Uganda’s national development strategy (e.g., (NPA) (2020)). The government has put increasing emphasis on the role that public procurement can play in achieving private sector development goals, reflected in amendments to procurement regulations to mobilize procurement to support the domestic private sector (PPDA, 2018; Procurement and of Public Assets Authority), 2018; PPDA, 2019b). In Uganda public procurement represents an important share of government spending – accounting for almost 60% of the government budget.¹ Although domestic firms get over 95% of all contracts, these account for only half of the total value of government procurement (PPDA, 2019b). The Buy Uganda Build Uganda (BUBU) policy, launched in 2014, aims to increase the value of procurement that goes to local firms (with a specific focus on micro and small firms, representing some 90% of all firms).² The National Development Plans (NDP I, II and III) make specific reference to the importance of increasing local content provisions in public procurement (Behuria, 2021). The potential to expand the contribution of domestic factors of production is specifically identified for both large and smaller scale projects in construction, utilities, health, education and defense sectors (PPDA, 2019b). Factors that have been identified by the PPDA as inhibiting greater involvement of local firms in procurement include delays in payment, costs of bidding and lack of information (PPDA, 2019a).³

In this paper we use detailed administrative data to analyze the relationship between selling to the government and firm performance in Uganda. Since 2012, registered Ugandan firms must report periodically detailed information on their value added tax (VAT) declarations, including information about their buyers and suppliers. These data include

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¹This budget is funded by a mix of domestic resources (53% of total) and foreign aid (47%).

²PPDA (2018) lays out the specific regulations that apply to favor local bidders. These provisions apply to both foreign resident enterprises that have been in Uganda for two years and national firms.

³Such factors have led many jurisdictions, including OECD countries, to design procurement procedures to support greater participation by Small and Medium Enterprises (SMEs) in public procurement. See e.g., [Hoekman and Taş \(2020\)](#) for references to the literature and an empirical assessment of SME-focused provisions in the EU context.

sales and purchases by government bodies, permitting the identification of whether and when a firm sells goods or services to a government entity, and, if so, the value of the transaction. We match VAT transaction data at the level of reporting firms with information from the corporate income tax (CIT) and pay as you earn (PAYE) datasets, which provide firm-level financial and employee information, respectively, to explore the relationship between participation in public procurement (selling products to government entities) and standard indicators of firm performance, including total employment, average wages, profitability and labor productivity. About a third of firms in the VAT registry sell to government entities at least once during the sample period. On average, the associated transactions are almost three times larger than firm-to-firm transactions. Older firms and enterprises active in construction and services sectors are more likely to sell to the government.

Our baseline specification links several indicators of firm performance to either the size of their sales to government entities or to a dummy variable that switches to one in the year in which they start selling to public bodies. The former specification provides us with more variation since some firms sell to the government in all the years covered in our sample. We employ firm fixed effects—along with industry and location specific time trends—to evaluate the within-firm change in performance that is associated with government demand. Our baseline specification however may not correctly identify the relationship between firm performance and participation in public procurement. It is plausible that the firms accessing procurement contracts are different from those who do not due to the self-selection of some firms into public procurement, and the effect we identify is driven by factors that are endogenous to each firm. To address this issue, we exploit information for a sub-sample of firms that start selling to the government in a given year after 2012 and continue to do so thereafter. For these firms, we can define their entry into procurement as a binary treatment and implement an event study approach to compare the pre-treatment trend in their performance to firms that never sell to public bodies. The firms that enter public procurement are statistically not different in prior performance to firms that never do so, assuaging potential self-selection concerns.

As the distribution of the treatment timing (participation in procurement) is hetero-

geneous across firms over time, we also make use of recent advances in the two-way fixed effects literature that address potential biases in event study coefficient estimates stemming from the presence of negative weights, under parallel trends and no anticipation effect assumptions (De Chaisemartin and d’Haultfoeuille, 2020; Borusyak et al., 2021). The results indicate that selling to the government is positively related to indicators of firm performance, including both the size of sales and other outcomes such as labor productivity, assets, size and profitability.

For some firms, selling to government entities does not simply add a new revenue stream that expands sales relative to what was realized before. If firms have limited slack, success in obtaining significant contracts from the government may push firms to reduce their sales to other customers. An important finding of our analysis is that firms which start selling to the government on average report reduced sales to private sector buyers both within the period in which sales to the government commence, and, conditional on continuing to sell to government entities, over time. This pattern is more acute for firms in agriculture and industry than firms in services, and, within services sectors, for enterprises engaged in higher-skill activities. These findings suggest the existence of short-term capacity constraints and/or that selling to public sector entities is more profitable than supplying the private sector. To our knowledge the observed reallocation of supply by firms that start to sell to government entities has not been a focus of analysis in the literature on the firm-level effects of participation in public procurement.

These findings are confirmed by the event study analysis, accounting for heterogeneity in treatment timing. Since we generally find no evidence of pre-trends, the results based on event study specifications are important for a causal interpretation of our findings for the subset of firms that start selling to the government at some point during the sample. In addition to confirming our main results, the event study reveals that the identified relationships persist in the years following the first-time firms sell to government.

The remainder of the paper is structured as follows. Section 2 briefly reviews some of the related literature. Section 3 describes the data and provides descriptive statistics on the extent to which firms in Uganda supply to government entities. Section 4 introduces the empirical framework used for analysis. In Section 5 we present the results of esti-

mation of the relationship between selling to government entities and indicators of firm performance. Section 6 discusses the results based on the event study approach, including estimators that correct for heterogeneity in treatment timing. Section 7 concludes.

2 Related literature

Private sector development remains a priority issue for many low- and middle-income countries. Small and medium-sized enterprises (SMEs) often find it difficult to increase and sustain growth because of limited local demand for their products and constraints impeding product differentiation and the realization of scale economies needed to supply international markets. Such constraints may include an inability to obtain external financing needed to expand and improve production capacity. In addition to providing a mechanism for the government to source inputs and allocate contracts to provide public goods and government services, many countries use public procurement to pursue distributional or industrial development goals. This may involve price preference policies or earmarking of certain types of contracts for domestic firms (“buy national” policies), often with a focus on SMEs or firms located in specific regions ([Kattel and Lember, 2010](#); [Nielsen, 2017](#); [Day and Merkert, 2021](#)). Even if not used as a tool to promote private sector development, government expenditures on goods and services are an important component of national gross domestic product (GDP). Public procurement, on average, accounts for 12-14% of GDP, with relatively little variation across countries at different stages of development.⁴ Thus, understanding how public procurement impacts on firm performance is important.

Much of the literature on procurement and development deals with the design of procurement processes to ensure realization of value for money public policy objectives and focuses on questions such as control of corruption and collusion among bidders. Less attention has been given to the role participation in public procurement as such (as opposed to procurement processes and procedures) can play as an instrument to pro-

⁴[Bosio and Djankov \(2020\)](#) report that in 2018 government expenditure on goods and services in low-income countries averaged 12% of GDP, in middle-income countries 13.2%, and about 14% in high-income countries.

mote private sector development. Obtaining contracts to supply government entities may affect firm performance through various channels. One potential mechanism for a positive effect of obtaining public procurement contracts on firm performance is that it relaxes a firm's financial constraints. Another channel is that firms may benefit from learning by doing or adopting new products/techniques after winning a procurement supply contract. Empirical evidence on whether and how government demand may contribute to firm performance is limited. Some studies find a positive association between winning a procurement contract and firm performance while others do not. Focusing on construction firms in Germany, [Gugler et al. \(2020\)](#) for example find that winning firms significantly increase labor demand in the period following winning a procurement contract. Effects are generally heterogeneous across firm characteristics, but seem to be more salient for younger, smaller and domestically owned firms ([Hoekman and Sanfilippo, 2020](#)). [Hebous and Zimmermann \(2021\)](#) find that firms winning government contracts expand capital investment in the presence of financing constraints. [Di Giovanni et al. \(2022\)](#) find that procurement facilitates access to credit, especially for enterprises most likely to be financially constrained – small firms. Relaxation of credit constraints in turn bolsters the investment capacities of firms, spurring their growth.⁵ An important question in this regard is whether positive effects of participation in procurement (government demand) are sustained or transitory. [Ferraz et al. \(2015\)](#) provide evidence that participation in procurement is associated with greater employment that is sustained over time, as do [Hvide and Meling \(2020\)](#), focusing on the employment effect of Norwegian start-ups winning procurement contracts. Conversely, [Fadic \(2020\)](#) and [Srhoj \(2021\)](#) find that positive effects for treated firms are transitory, lasting only for the duration of a government supply contract. We explore this question for the Ugandan firms in our sample in Section 5.5 below.

⁵An implication is that loss of procurement contracts for firms where government contracts are relatively important will result in lower investment – see e.g., [Coviello et al. \(2022\)](#).

3 Data

The main source of information used in the analysis is the VAT registry. We utilize data from the registry provided by the Uganda Revenue Authority (URA). The VAT was introduced in Uganda in 1996, with a basic 18% rate and a set of exemptions. The VAT accounts for over 30% of national tax revenues (Almunia et al., 2021). Since 2012, all registered firms above a certain threshold must provide their VAT declarations monthly using an electronic form. This makes our sample a representative snapshot of bilateral transactions occurring between firms in the country over the period considered. Our starting point is monthly information reported by each firm in “Schedule 1” of their VAT declaration. Schedule 1 records all sales transactions to other VAT registered firms, as well as information on sales to final consumers and non-VAT registered entities in aggregate form. Additional Schedules include purchases of inputs (Schedule 2), imports (Schedule 3) and administrative expenses, respectively.

Data are available for a 12-year period, starting in 2009 through 2020, for 19,218 reporting firms, for a total of 81,309 firm-year observations. Most firms report sporadically in the years before 2012 and are more likely to be observed for shorter and more recent periods. Some 76% of the firms report information for less than 6 years, and slightly more than half for less than 3 years. Given weaker coverage in earlier years and because information for 2020 is available for the first quarter only, we limit the empirical analysis to the period 2012-2019. After aggregating all information at the firm-year level we are left with a final sample of 18,457 unique firms and 68,835 firm-year observations.

By matching the masked firm identifier provided by URA to a registry including basic information on each reporting firm, we can determine the sector of activity and the type of organization reporting data. The latter information allows us to identify whether the buyer in each transaction is a government entity or not. Not all firms in the VAT data match with an entry in the registry, a limitation made more severe by the large number of unmatched entries on the declared partner side.⁶ Focusing on firms with a match in

⁶In total, the number of matched reporting firms in the VAT data is 15,150 (accounting for slightly more than 82% of the total sample). This difference is most likely to be due to the fact that the registry cover firms established up to 2018, so that younger ones cannot be matched. We also cannot exclude that some Tax Return Forms report the wrong TIN.

the registry, Table 1 reports descriptive statistics on the number of firms by sector and the share of firms selling at least once to government entities during the sample period. Table 2 provides information on entities reporting in the VAT database distinguishing between types of organizations. Of interest for the analysis that follows are sales to entities classified as “Government” or “Local Authority.” The former comprises central government and agencies, the latter spans local governments and municipalities.

Although the number of government entities is small relative to the population of companies, Figure 1 shows that a relatively large share of Ugandan firms sell to government entities at some point during the sample period. Specifically, 6,725 out of the 18,457 firms considered in the period 2012-2019 (36.4% of the total) reported at least one transaction with a government entity during the sample period.

Table 1: Distribution of firms by sector - Full Sample

	Number	Share (%)	% firms selling at least once to government
Administrative and support service activities	689	3.7	41.7
Public administration and Defense	349	1.9	74.2
Agriculture, Forestry, & Fishing	201	1.1	24.9
Construction	2158	11.7	53.3
Activities of households as employers	40	0.2	32.5
Education	37	0.2	0.43
Electricity, gas, steam supply	186	1	49.5
Mining and quarrying	77	0.4	24.7
Financial and insurance activities	196	1.1	40.8
Human health and social work activities	109	0.6	45
Accommodation and food service activities	602	3.3	49.3
Information and communication	807	4.4	48.3
International organizations and bodies	6	0.03	66.7
Transportation and storage	807	4.4	31
Manufacturing	1268	6.9	34.1
Other service activities	758	4.1	38.4
Real estate activities	476	2.6	20.4
Arts, entertainment and recreation	112	0.6	42
Professional, scientific and technical	1111	6	48.4
Water, sewerage, waste management	76	0.4	50
Wholesale and retail trade, repair services	5085	27.6	32.4
Unknown	3307	17.9	41.7
Total	18457	100	

Notes: Shares are rounded to the first decimal. Government= Government entities and funded projects + Local authority.

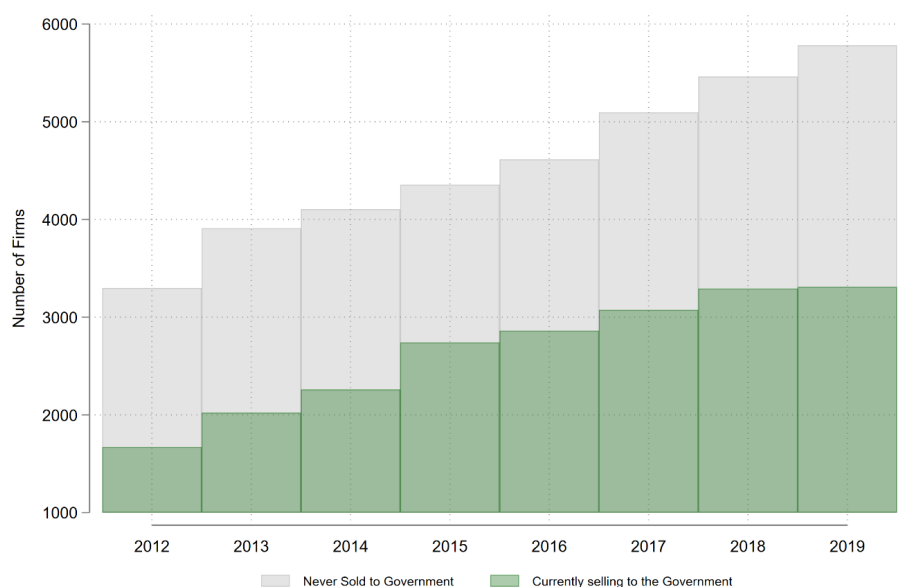
Table 2: Distribution of selling firms by type - Full Sample

Type of Firm	Number	Share (%)	% firms selling at least once to government
Company	14191	76.9	38.9
Government entities and funded projects	75	0.4	77.3
International and Diplomatic Institutions	4	0.02	50
Local Authority	272	1.5	79.4
Non-Government Organizations	22	0.1	31.8
Other	596	3.2	40.9
Unknown	3297	17.9	38.9
Total	18457	100	

Notes: Shares are rounded to the first decimal. Government= Government entities and funded projects + Local authority.

Figure 1 shows that the number of firms that sold at least once to government entities in a given year increases over time, but the share of all firms selling to government is relatively constant during the sample period. Figure 2 plots data on the number of firms that sell to government entities throughout the sample period and those that either enter or exit the government market. Slightly less than half of the firms that provided goods or services to government entities at least once during the period did so throughout the sample period (45.3%), while 14.5% and 17%, respectively, started or stopped selling to government bodies.⁷

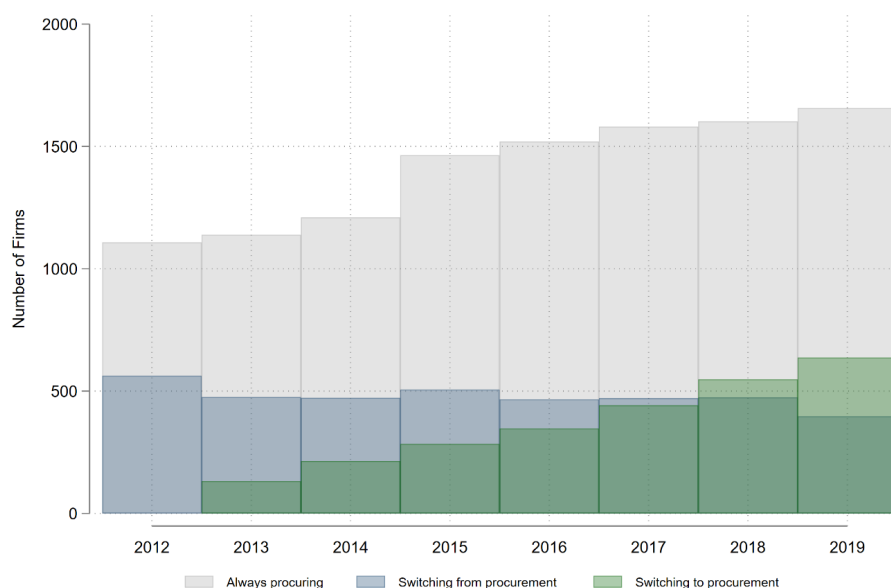
Figure 1: Firms selling at least once to government vs firms that never do



Transactions involving the government as a buyer represent 3.9% of the total number of VAT transactions recorded over the period considered. The average value is UGX 104.28 million (roughly USD 30 thousand), which is about 2.9 times larger than the average firm-to-firm transaction (UGX 36 million or approximately USD 10 thousand). Firms that sell to the government are more likely to be concentrated in trade services, construction, manufacturing and high value-added services activities (ICT and Technical Professions) (Table 1). They tend to be bigger in terms of overall sales (Table 3), a feature that is

⁷These figures correspond to 16.5%, 5.3%, and 6.2% of all firms, respectively.

Figure 2: Firms selling at least once to government vs firms that never do



particularly evident for firms that always sell to government bodies (Table 4). Firms that start selling to the government tend to be smaller on average (Table 4). Moreover, firms that sell to the government tend to have a larger number of partners to which they sell and from which they source (Table 5). Finally, firms that sell to the government are older on average (Figure 3).

Table 3: Average total sales: Never selling to government vs. selling at least once

	Never Selling	Selling at least once
2012	2609.4	10045.9
2013	3268.8	11824.3
2014	3205.8	11753.6
2015	3675.5	11470.4
2016	4640.2	10886
2017	3708.9	11383.8
2018	3813	11902.7
2019	3968.6	11431

Notes: Values in constant 2017 UGX million.

Table 4: Average total sales across procurement pattern

	Selling to govt throughout	Entry into selling to government	Exit from selling to government	Entry and exit during sample period
2012	13832	5286.5	14316	6317
2013	17103.2	4737	17096.1	7582.6
2014	17401.8	4664.7	17029.8	7339.4
2015	15168.1	4876.4	17843.4	7830.7
2016	14847.7	4788.4	15467.3	7483.3
2017	15945.6	5169.7	15104.1	7777.1
2018	15764.4	4868.4	15652.9	9613.4
2019	15063.5	4823.3	15284.1	8942.7

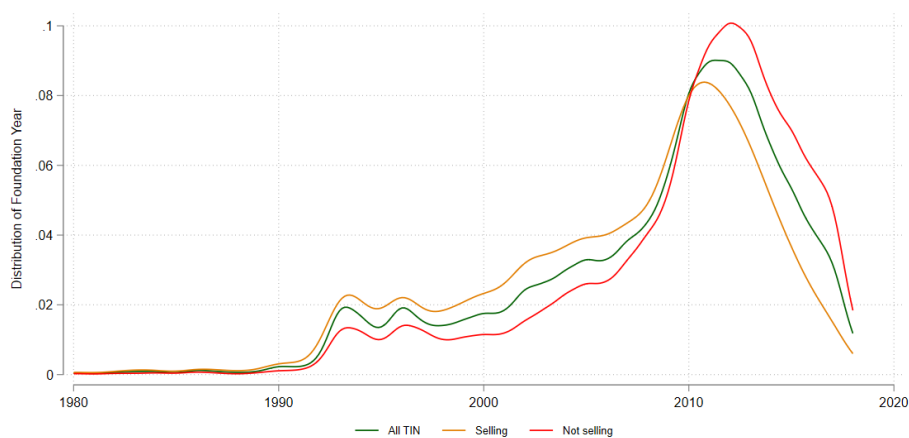
Notes: Values in constant 2017 UGX million.

Table 5: Selling to government and network of up- and downstream partners

	Avg. Number of Customers	Avg. Number of Suppliers
Never sells to government	9	13
Sells to government at least once	39	21

Notes: Government= Government entities and funded projects + Local authority.

Figure 3: Distribution of firms' establishment year by procurement status



Notes: This figure compares the year of establishment across the sub-set of firms that sell at least once to the government to the sub-set of firms that never do.

For a subset of firms, it is possible to match financial and employment information from the Corporate Income Tax (CIT) and Pay-As-You-Earn (PAYE) datasets, respectively. For these firms we can evaluate differences between firms that do and do not sell to government entities across several standard indicators of performance (such as labor productivity, capital intensity, investment). However, using information from both the CIT and the PAYE datasets reduces the size of the sample, as the matching between the datasets is imperfect. Out of the 18,457 unique firms in our VAT dataset, 14,628 firms can be matched in the CIT, but only 8,202 in the PAYE. The total number of firms for which we can combine VAT sales, CIT and PAYE data is 7,146. This leaves us with 29,753 firm-year pairs (or 43.2% of the entire sample).

Descriptive statistics are reported in Table 6 on average employment, compensation, fixed assets and investment for the firms in this subsample, distinguishing between sector of activity and whether a firm has sold products to the government at least once in the period under consideration. Overall, firms that sell to the government at least once tend to be larger and pay higher salaries.

Table 6: CIT descriptives by Sector and Procurement Behavior

Procurement status	Num. Employees		Total Compensation		Wages per capita		K/L		Fixed Assets		Total Investment	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Administrative and support service activities	29	250	91.7	262.5	10774.7	5950.8	1.5	1.4	542	682	7	11
Public administration and Defense	53	150	154.6	4252.1	7387.6	13925.6	0.8	1.3	101	120383	0	3394
Agriculture, Forestry, & Fishing	146	129	562.2	415.3	14268.8	10402.2	2.7	1.9	11334	20356	53	51
Construction	13	34	48.1	177.8	11212.2	9238.1	1.7	1.8	751	2604	14	346
Activities of households as employers	129	15	222.6	11.3	7984.2	4769.7	1.3	1.2	183	43	0	4
Education	49	103	270.6	349.4	10130.5	18940.6	1.2	1.3	927	2638	0	113
Electricity, gas, steam supply	9	84	131.5	2652.5	27112.2	34801.4	1.4	2.5	364	216469	1	923
Mining and quarrying	42	39	237.8	724.2	11996.9	38638.7	3.3	2.7	8893	18200	700	127
Financial and insurance activities	81	232	1536	10398.9	33601.7	36496.5	0.9	1.1	4279	29324	9852	210267
Human health and social work activities	152	59	2621.9	504.8	19514.3	16295	1.1	1.6	6831	2468	777	159
Accommodation and food service activities	25	79	116.5	431.8	5806.1	4698.7	2.1	2.7	1914	8424	15	4
Information and communication	25	43	384.6	1233.7	26448.9	21411.5	1.4	1.5	5622	22640	1277	209
Extraterritorial organizations and bodies	.	18	18.2	842.7	.	28572	0.8	4.2	26	56264	0	84930
Transportation and storage	22	36	117.1	393.1	10457.9	14223.6	1.8	1.4	1532	2420	70	70
Manufacturing	49	141	390.9	941.5	9461.9	10225.2	2.8	2.4	8094	22601	151	724
Other service activities	24	19	56.5	90.4	11444.1	12536.7	1.3	1.2	603	355	250	27
Real estate activities	18	23	212.9	196.8	12679.8	16236.7	3.5	3.6	13442	21201	1539	3812
Arts, entertainment and recreation	31	132	180.3	1179.1	10488.2	8116.7	1.5	1.8	887	3254	118	616
Professional, scientific and technical activities	13	25	102.4	315.2	16819.5	17578.9	1.1	1.2	218	585	10	10
Water supply, sewerage, waste management	16	12	65.7	91.2	9472.1	12136.3	1.5	1.8	297	1946	2	1
Wholesale and retail trade, repair services	20	23	86.9	240.4	9763.7	12445.2	1.2	1.4	653	2115	33	180

Notes: Sample averages for firms who ever sold to the government during the sample period ("Yes") versus firms who never sold to the government ("No").

4 Empirical Framework

To investigate whether selling to the government plays a role in the subsequent performance of firms, we estimate the following relationship:

$$Y_{it} = \beta_1 Gov_{it} + \beta_2 X_{it} + \lambda_i + \theta_{st} + \delta_{jt} + \varepsilon_{it} \quad (1)$$

Y_{it} is an outcome for firm i in year t . These outcomes include sales to different partners (from VAT); number of buyers and suppliers (from VAT); gross profits (from CIT); the value of fixed assets (CIT), investment and total compensation paid by the firm (also both from CIT); and total number of employees (from PAYE). For the sub-sample of firms that can be matched across the three datasets outcomes of interest are measures of labor productivity (sales per employee), capital intensity (the ratio of fixed assets to total compensation), and the average wage paid.

Our explanatory variable of interest, Gov_{it} , measures either the value of sales to government entities by firm i at time t or a dummy, taking the value of 1 when a firm i starts selling to the government and zero otherwise. X_{it} includes firm specific time varying controls (the age of the firms), and $\lambda_i, \theta_{st}, \delta_{jt}$ are firm fixed effects, sector time trends and location time trends, respectively. Firm fixed effects account for firm-specific unobserved factors, while the addition of sector and location time trends accounts for industry-specific or geographic factors that may influence the relationship between selling to the government and firm performance. This includes sector-specific or location-based industrial and public procurement policies. Standard errors are clustered at the firm level.

Equation (1) allows us to identify within-firm changes in performance associated with selling to government entities. While the inclusion of a broad set of fixed effects helps to account for omitted variables, reverse causation, due to the self-selection of certain types of firms into procurement and measurement error are potential sources of bias that we cannot account for. Hence, while this initial analysis provides evidence on the relationship between the variables of interest, caution is called for in interpreting them in a causal manner. In Section 6 we exploit information for the sub-sample of firms that start selling to government entities at some point after 2012 to implement an event study approach.

Conditional on parallel trends and absence of anticipation effects. The event study results in similar findings and provides a stronger basis for causal interpretation of the relationships examined.

5 Results

This section summarizes the findings based on estimation of equation (1). First, we present results using the whole sample of firms included in the VAT registry and different definitions of total sales as dependent variable. Second, we present a set of findings for other indicators using the sub-sample of firms for which we can match VAT with CIT and/or PAYE data. Third, we discuss potential sources of heterogeneity focusing specifically on the sectoral distribution of firms. Finally, we provide some robustness checks.

5.1 Main results: Full VAT sample

Table 7 reports estimates of the relationship between the magnitude of sales to government and overall sales and sales to other partners. Sales are reported in logs, and all regressions include the full set of fixed effects. Results in Panel (A) indicate that selling to the government is associated with (i) higher levels of total sales (column 1); and (ii) lower levels of sales to non-government entities. The latter finding suggests that sales to government come at the expense of sales to other buyers, i.e., involve reallocation of capacity as opposed to being additional. The VAT registry data permit us to distinguish between sales to other registered companies and to final consumers (columns 3 and 4). This shows that selling to the government seems to crowd-out transactions with other firms, whereas overall final sales benefit from participating in government procurement. In section 5.3 we investigate in more detail whether the potential crowding out is associated with firm capacity constraints or related to the sector of activity. Results in columns (4) and (5) show that firms selling to the government tend to increase their network of input-output relations. Following an increase in sales to the government, they experience an increase of local (non-government) partners, both as buyers and suppliers.

Table 7: Baseline Correlations (Full Sample)

	Total Sales (1)	Sales To Companies (2)	Sales Excl. Govt. (3)	Non-Govt. Buyers (4)	Non-Govt. Suppliers (5)
Sales to Govt. (Log)	0.044*** (0.00124)	-0.119*** (0.00124)	-0.045*** (0.00326)	0.882*** (0.0884)	0.127*** (0.0139)
Obs.	56149	55073	56138	56149	44439
Adj. R-squared	0.809	0.623	0.679	0.790	0.876

Notes: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors clustered by sector in parentheses.

Treatment variable is the total sales to government bodies (central and local) in log form. These sales exclude sales to firms that could not be identified from the registry. All equations include Firm, Location x Year and Sector x Year Fixed effects, and control for the age of the firm. Standard errors clustered at firm level. All dependent variables are transformed as $\log(x+1)$.

In Appendix Table A-1 we replicate the results of Table 7 using a binary variable taking the value 1 in the first year in which a firm sells products to a government entity and 0 otherwise. Note that this definition assumes that once ‘treated’ a firm remains so over the remaining years in the sample, independent of whether it continues to sell to government entities in subsequent years. The results based on this alternative measure of participation in procurement definition are fully consistent with those using the value of sales to government entities as the explanatory variable.

5.2 Main Results: CIT and PAYE sub-samples

After matching with CIT and PAYE, we can compute a set of additional indicators that allows for a better assessment of the relationship between selling to government entities and firm performance. We estimate the association between selling to the government and a range of dependent variables such as (i) gross profits; (ii) value of fixed assets; (iii) investments; and (iv) total wage bill (from the CIT). For the smaller sub-sample based on the PAYE data we also estimate (v) labor productivity (sales per employees); (vi) capital intensity (fixed assets on compensation); and (vii) wages per capita (compensation of employees). Results are summarized in Table 8. Overall, selling to the government is associated with higher levels of profits, greater size (both assets and employment) and productivity. We obtain similar results with a discrete definition of the treatment instead

of the continuous one – see Appendix Table A-2. The robustness of the findings suggests that the effect we identify is not driven by the definition of the treatment.

Table 8: Firm-level performance indicators (CIT and PAYE sub-samples)

Panel (A)				
	Gross Profits (in logs)	Fixed Assets	Total Investments	Total employee compensation
	(1)	(2)	(3)	(4)
Sales to Govt. (Log)	0.031*** (0.00588)	0.031*** (0.00572)	0.001 (0.00325)	0.036*** (0.00646)
Obs.	37330	38857	38856	39231
Adj. R-squared	0.493	0.586	0.706	0.557
Panel (B)				
	Total Sales per Employee	Capital/Labor ratio	Average Salary	Num. of Employees
	(1)	(2)	(3)	(4)
Sales to Govt. (Log)	0.029*** (0.00151)	0.000 (0.000936)	0.002 (0.000927)	0.004*** (0.000743)
Obs.	25997	28447	16887	25997
Adj. R-squared	0.769	0.827	0.792	0.908

Notes: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors clustered by sector in parentheses.

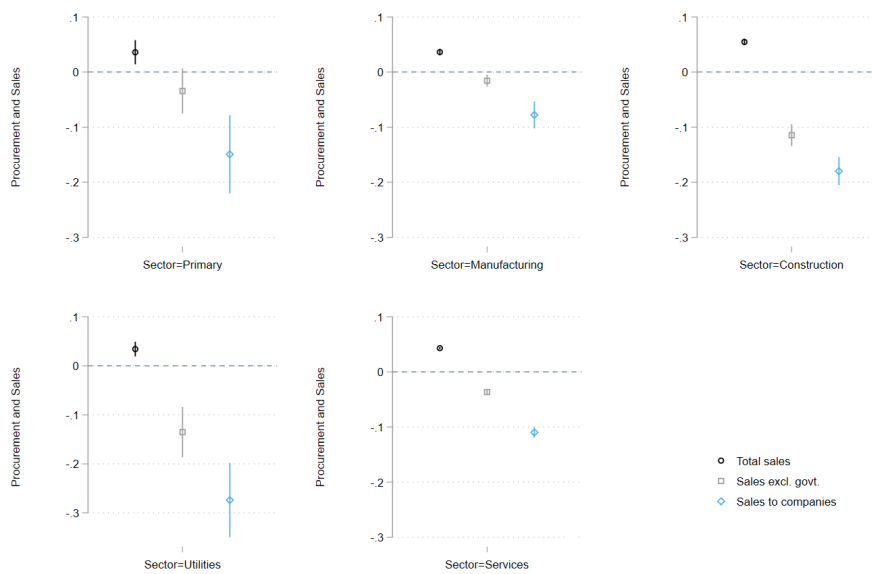
Treatment variable is the total sales to government bodies (central and local) in log form. These sales exclude sales to firms that could not be identified from the registry. All equations include Firm, Location x Year and Sector x Year Fixed effects, and control for the age of the firm. Standard errors clustered at firm level. All dependent variables are transformed as $\log(x+1)$.

5.3 Heterogeneity across sectors

Figure 4 summarizes results if we split the sample by the main sectors in which firms operate, to assess if the potential implications of selling to the government vary across sectors. We distinguish between firms in agriculture and mining, manufacturing, construction, utilities, and services. The relationships are generally in line with the main findings: selling to government entities is positively associated with total sales but negatively associated with sales to other buyers across all sectors, reflecting a decline in the sales to other companies. Figure 5 repeats the exercise for the sub-sample for which we

can use additional measures of firm’s performance as dependent variables. The results reveal heterogeneity across sectors but, apart from firms in the primary sector, there is a statistically significant positive relationship between selling to the government and our measure of labor productivity. In the case for firms in manufacturing, construction, and services. We also observe a positive relationship with many of the other performance indicators, including total employment and average wages (in case of construction and services).

Figure 4: Procurement and sales by sector

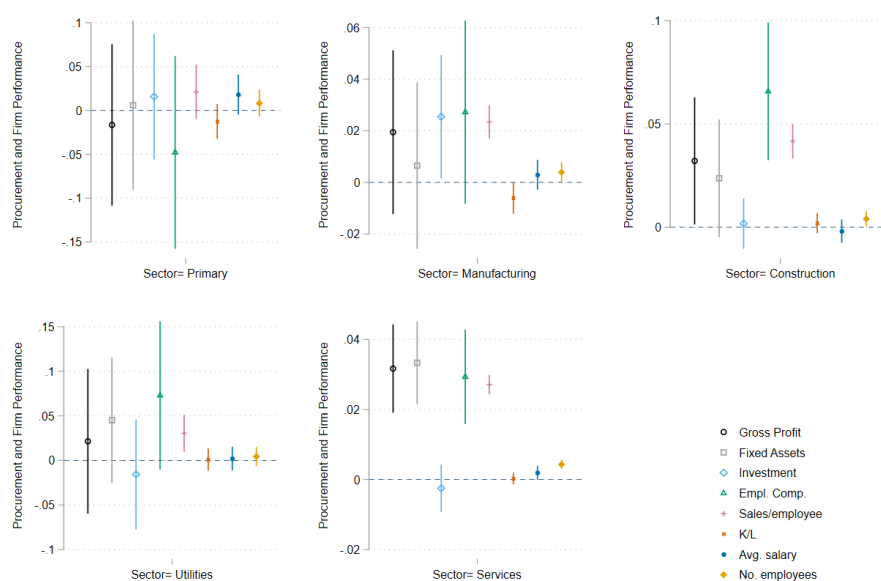


Notes: The figure reports coefficients that are estimated from equation (1) and that correspond to sub-samples by sectors (s)= Primary, Manufacturing, Construction, Utilities, and Services.

5.4 Factor intensity as a differentiating factor

The negative correlation between selling to government entities and sales excluding government could potentially be due to capacity constraints confronting firms in Uganda. This would imply that firms in the short-term fulfil government contracts by partially re-allocating output that would otherwise have been sold to other firms. We investigate this hypothesis by exploiting the variation in the physical capital requirements across sectors, under the assumption that firms in sectors with higher capital intensity may face bigger constraints in expanding output in the short run if they do not have slack to do so, i.e.,

Figure 5: Procurement and firm performance across sectors

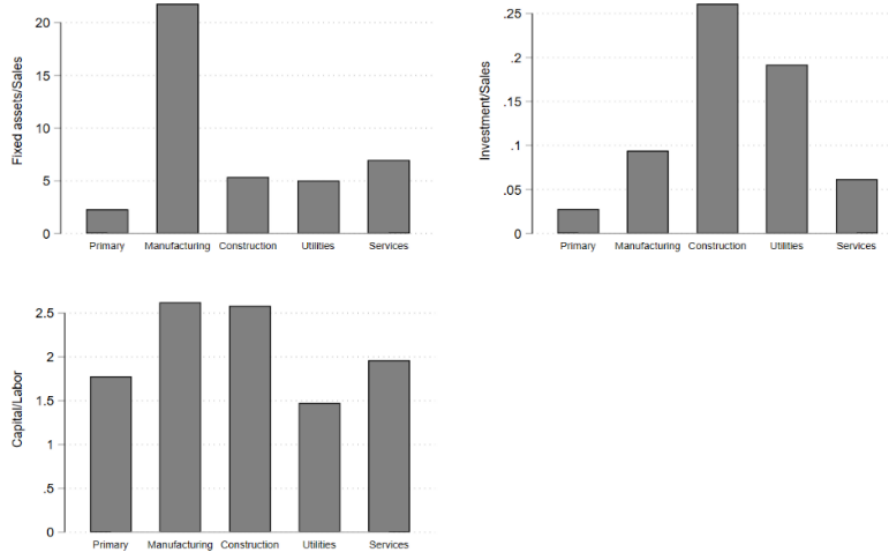


Notes: The figure reports coefficients that are estimated from equation (1) and that correspond to sub-samples by sectors (s)= Primary, Manufacturing, Construction, Utilities, and Services.

capacity utilization rates are high. In the medium term, the need to invest in additional capacity to be able to serve other buyers may inhibit output expansion if firms cannot obtain financing for doing so. The data show that firms in services depend less on fixed assets to generate sales. This suggests that production technology in the service sector might be less capital intensive (Figure 6), making it easier for service firms to expand in the short run after obtaining a contract to supply government entities.

To assess the potential role of heterogeneity in the average capital intensity of services and non-services firms we add an interaction term $Gov_{it} \times Services_s$ to the baseline model (equation 1), where $Services_s$ is a binary variable that equals 1 if firm i operates in a services sector. Column 1 in Table 9 shows that the interaction term is positive and statistically significant at 1% level. The coefficient implies that firms in the services sector substitute less between sales to the government and sales to rest of the firms. The margins plot in Figure 7 confirms that compared to non-services firms, firms in services sectors experience a smaller decline in sales to non-government entities as their sales volume to government bodies increases.

Figure 6: Sector wise capital requirements



Notes: The figure shows the difference across sectors in using capital efficiently. Capital to labor ratio is proxied by the ratio of total fixed assets and total employee compensation.

Table 9: Sales to government and sales excluding government entities

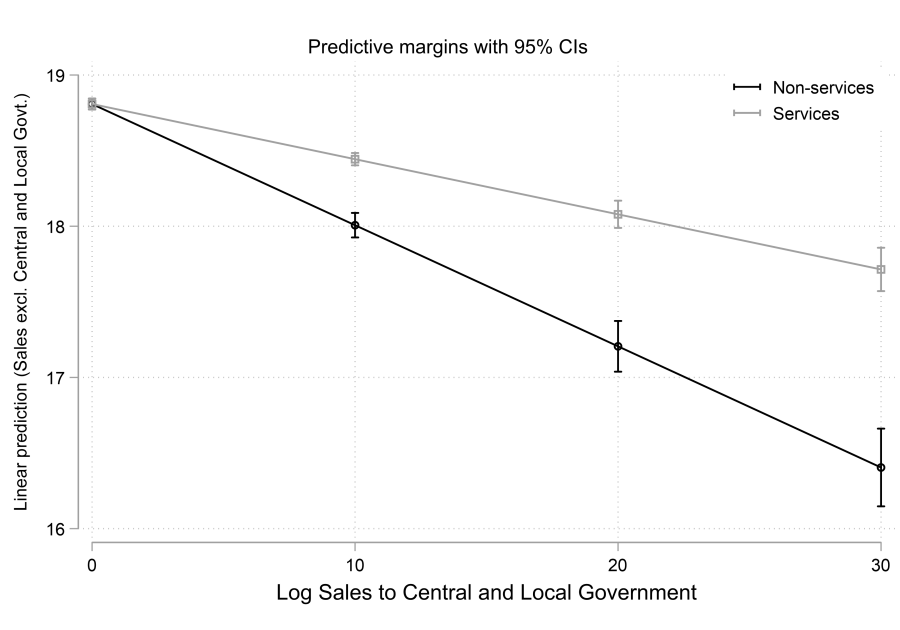
	Sales Excluding Government	
	(1)	(2)
Sales to Govt	-0.0801*** (0.0046)	-0.0554*** (0.00473)
Sales to Govt × Services	0.0437*** (0.00537)	
Sales to Govt × Low-skill-services		0.0266*** (0.0056)
Obs.	56039	41525
Adj. R-squared	0.7059	0.7238

Notes: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors clustered by sector in parentheses.

Treatment variable is total sales to government bodies (central and local) in log form. These sales exclude sales to firms that could not be identified from the registry. The regression includes Firm and Location × Year Fixed effects, and a control for the age of the firm. Standard errors clustered at the firm level. All dependent variables are transformed as $\log(x+1)$. In Column 2 we restrict the sample to firms within the services sector.

We also consider heterogeneity within services by distinguishing between firms that provide high-skill services and firms that provide low-skill services using the classification proposed by [Nayyar et al. \(2021\)](#), that split services firms into four categories: innovators, high skill, low-skill for the domestic market and tradable low-skill. We consider a

Figure 7: Marginal effects, services vs. non-services firms

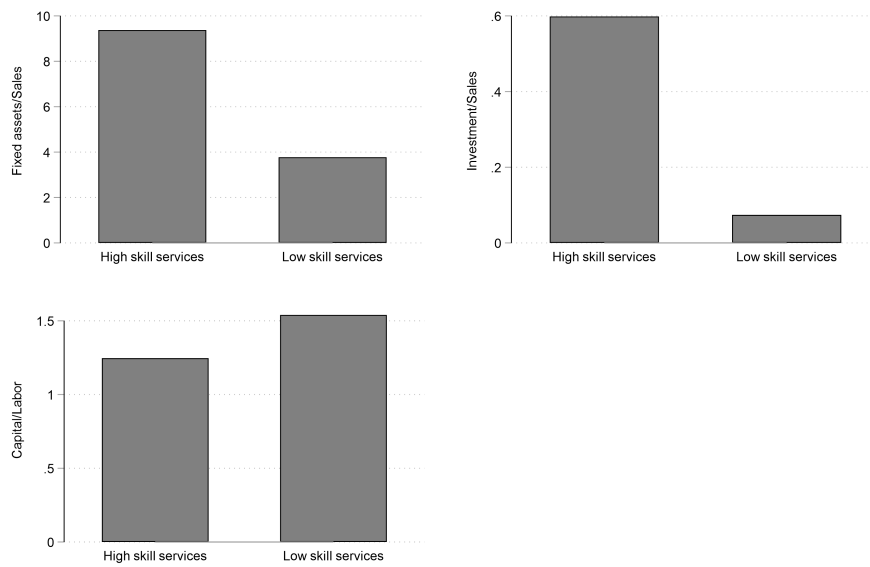


Notes: The marginal effects are estimated from a modified equation (1) where the explanatory variable Gov_{it} is interacted with a binary variable $Services_s$ that equals one if the firm i belongs to the services sector.

firm as “low-skill” if it can be classified as either low-skill domestic or low-skill tradable. Low-skill services firms rely significantly less on fixed assets or investments to generate additional sales compared to the high-skill services firms (Figure 8, the two charts on the top). Their production technology however is slightly more capital intensive on average than that of high-skill services firms. The descriptive statistics suggest that low-skill firms may be able to fulfil their sales obligation to government entities without having to significantly reallocate sales to other firms in the short-term.

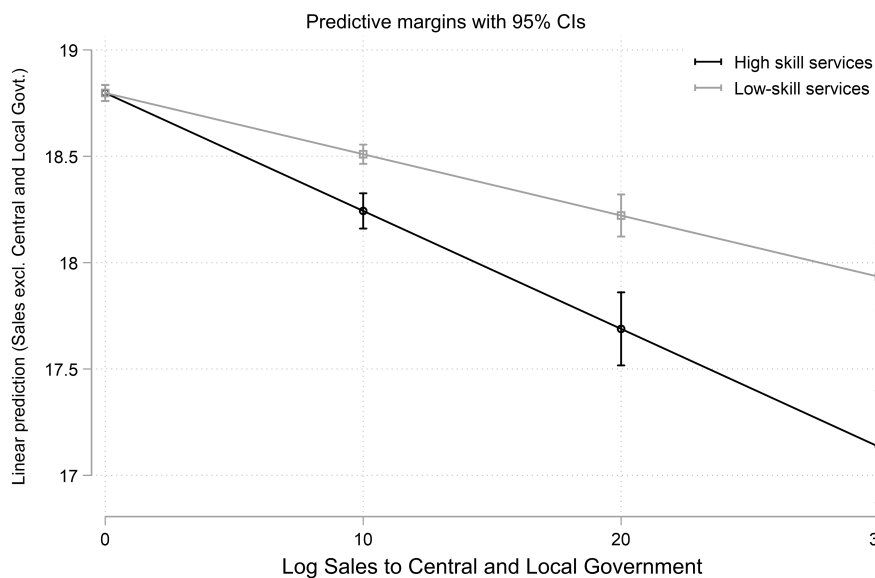
We test this hypothesis by restricting the analysis to the firms in the services sector, and by adding an interaction term $Gov_{it} \times Low\text{-skill}\text{-services}_s$ to the baseline model, where $Low\text{-skill}\text{-services}_s$ is a binary variable that equals 1 if firm i is classified as operating in a low-skill services activity. Column 2 of Table 9 shows that the interaction term is once again positive and statistically significant at 1% level. The coefficient on the interaction term implies that low-skill firms experience a smaller decline in sales to non-government firms as they increase sales to government entities. The margins plot in Figure 9 confirms that the low-skill firms substitute less between sales to the government and sales to non-government entities.

Figure 8: Capital requirements within services



Notes: Notes: The figure shows the difference across high-skill and low-skill services in using capital efficiently. Capital to labor ratio is proxied by the ratio of total fixed assets and total employee compensation. A higher capital to labor ratio among low-skilled services implies a smaller proportion is spent on employee compensation relative to the stock of fixed assets.

Figure 9: Marginal effects, high-skill vs low-skill service firms

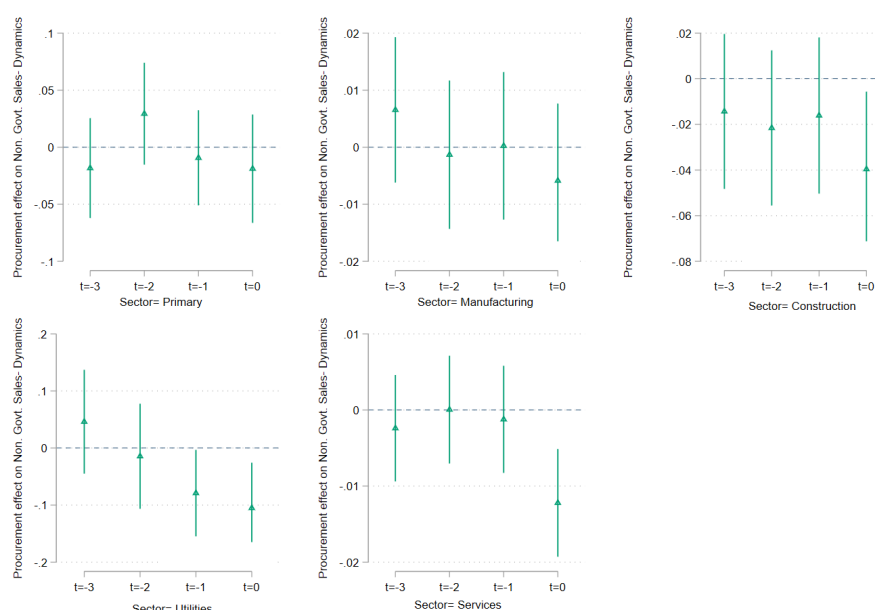


Notes: The marginal effects are estimated on the sub-sample of firms involved in services and from a modified equation (1) where the explanatory variable Gov_{it} is interacted with a binary variable $Low-skill-services_s$ that equals one if the firm i employs low-skill labor.

5.5 Dynamics of reallocation across buyers

We next explore the dynamic effect of participation in government procurement on sales excluding government. This allows us to assess whether firms can overcome a potential capacity constraint over time, which would indicate that past sales to the government have a smaller substitution effect on current sales to all other firms. To estimate such dynamics, we modify the baseline equation (1) to also include sales to the government in the past three years. Figure 10 reports information on the dynamics of substitution between government demand and private sales across different sectors. Figure 10 shows that the ‘reallocation’ becomes less pronounced over time for all sectors. Although in most instances the lags are statistically not different from zero, the pattern suggests firms expand capacity to fulfill the government contracts.

Figure 10: Dynamics of substitution by sector



Notes: The coefficients are estimated from a modified equation (1) that includes up to three years lags of the explanatory variable Gov_{it} . Each panel corresponds to a sub-sample of firms in sector (s)= Primary, Manufacturing, Construction, Utilities and Services.

6 Causal Identification: Procurement and firm performance

The relationship between participation in procurement and firm performance that we estimate in equation (1) rests on the assumption that firms that sell to government bodies

would have performed similarly to firms that never do so, in absence of this treatment. To test this assumption, we implement a flexible event study design where we examine if the trajectory of the estimated effect on firms' performance changes significantly after a firm gains access to procurement contracts. This helps us to rule out any pre-trends in the performance across firms that sell to the government and firms that never do so (i.e. that the result is not driven by pre-existing differences between the two groups). The event study design also enables us to identify if there is a persistent effect of receiving procurement contracts on firm performance.

Figure 11 provides descriptive evidence of the divergence in firms' performance around the time they first received a procurement contract. The figure shows total sales (in logs) over time for firms that started selling to the government at some point after 2012 and continued to do so thereafter and for firms that never sell to the government. Across all years we observe a sharp improvement in sales for procuring firms relative to the firms that never participate in public procurement, around the time the firms start to sell to the government and better performance thereafter.

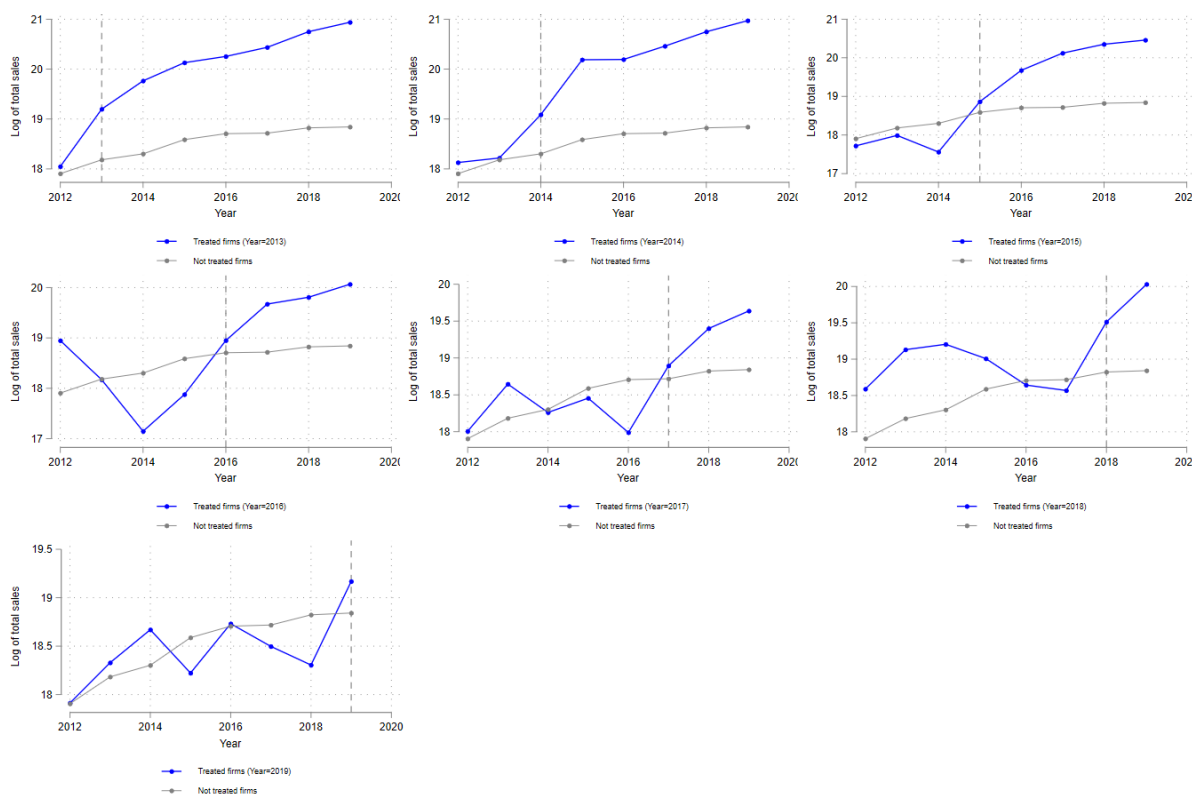
To investigate this more formally, we estimate the dynamic effect of procurement participation on firms' performance as follows:

$$Y_{it} = \sum_{k=-5}^5 \beta_k Gov_{i,t-k} + \lambda_i + \theta_t + \epsilon_{it} \quad (2)$$

Where Y_{it} is the outcome of interest (in logs) for firm i in year t . $Gov_{i,t-k}$ denotes the set of dummies capturing up to five years before the year of first procurement, and up to five years after. λ_i and θ_t are firm and year-specific fixed effects, respectively. We estimate the baseline event study model using an OLS estimator.

Figure 12 plots the resulting estimates of the evolution in firm performance around the first year in which they start selling to the government. The points denote the yearly estimates relative to the year prior to the receipt of procurement, while the lines denote the 95% confidence interval. The first panel shows that there is no significant difference in total sales across the treated and control groups prior to the treatment, which assuages

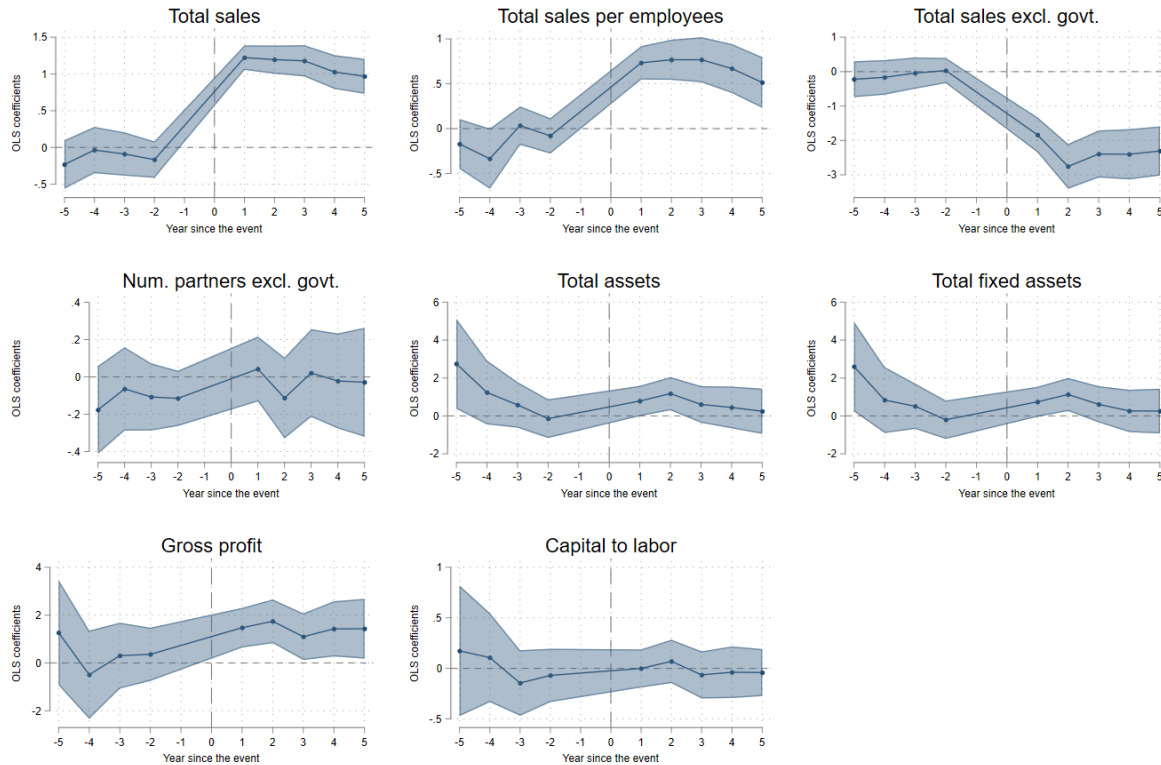
Figure 11: Sales before and after procurement, by timing of procurement



Notes: The figure shows the evolution of sales across firms that enter procurement to firms that never enter procurement, by the year of their entry into procurement.

concern that unobserved factors determine entry into procurement. Importantly, there is a sharp increase in sales relative to the control group in the year of treatment, and this difference persists over time. The third panel shows that firms selling to the government significantly reduce their sales to non-government customers relative to the control group in the year of the treatment, and these sales do not recover even up to five years after they first start selling to government entities. The findings from the event study analysis corroborate our baseline results: while procurement significantly boosts the overall sales, it comes at the cost of firms restricting their sales to non-government entities. Further, the difference in the evolution of outcomes does not appear to be endogenous to selection into procurement.

Figure 12: Dynamics of firm performance around procurement



Notes: The coefficients are estimated from equation (2) that include dummies for up to 5 years before, during, and up to 5 years after a firm entered procurement. All the point estimates are relative to the period $t-1$. The point estimate for $t=0$ is not reported in the event study graph in the Stata package (*EventPlot*), even though the corresponding binary variable is included in the estimation, and the coefficient is statistically significant for all outcomes except for the number of partners excl. govt. and capital to labor.

6.1 Role of staggered treatment timing

The event study estimates could be biased even in the absence of pre-trends. A recent strand of econometric literature has highlighted that event study estimates could be contaminated by the treatment effects from other periods (for an overview of the issues and proposed solutions see [Roth et al. \(2022\)](#) and [De Chaisemartin and D’Haultfoeuille \(2022\)](#)). Specifically, when the treatment is – as it is in our case – heterogeneous over time across different units, the effects we find may not provide the correct weighted average of treatment effects across units (and time). This is due to the fact that with heterogeneous treatment, we end up comparing treated units both with never treated (or not yet treated) units, which is correct, as well as with already treated units, which is not. The introduction of the latter type of comparison results in negative weights for some of the coefficients estimated.

To understand how these negative weights might bias our coefficient estimates, we

begin with the two-way fixed effects (TWFE) estimation in equation (1). However, unlike in equation (1) our binary treatment variable compares firms that obtain procurement contracts sometime after 2012 and continue to do so thereafter with firms that never sell to government entities. Appendix Table A-3 presents the diagnostics from the Stata package by [De Chaisemartin and d'Haultfoeuille \(2020\)](#) that compute the number of Average Treatment Effect on the Treated (ATT) that are weighted to provide the TWFE estimate, as well as the number of ATTs that receive a negative weight, which would then bias the estimated TWFE coefficient. The diagnostics show that for some outcomes the share of ATTs that received a negative weight range between 10% to 27%. Thus, the diagnostics suggest that the staggered nature of the treatment might bias our results.

We address this concern using alternative estimation methods proposed by ([De Chaisemartin and d'Haultfoeuille, 2020](#); [Borusyak et al., 2021](#)) that account for bias due to heterogeneity in treatment timing.⁸ The results are presented in Appendix Figures A-1 and A-2. The results are consistent with the OLS event study estimates allowing us to rule out concerns that the evolution in the difference in outcomes across the treatment and control firms is contaminated by the staggered nature of the treatment.

6.2 Heterogeneity across sectors

We next assess if the substitution away from private buyers around the time of procurement is conditional on sectoral characteristics that might proxy high capital constraints. We estimate equation 3 which includes additional timing dummies that are interacted with $Sector_s$ where the binary variable compares: 1) firms in services to firms in agriculture and industry; and 2) firms that provide low skill services to firms that offer high skill services. As discussed in the previous section, the hypothesis is that the reduction in sales to non-government firms around the time of first selling to government entities is smaller

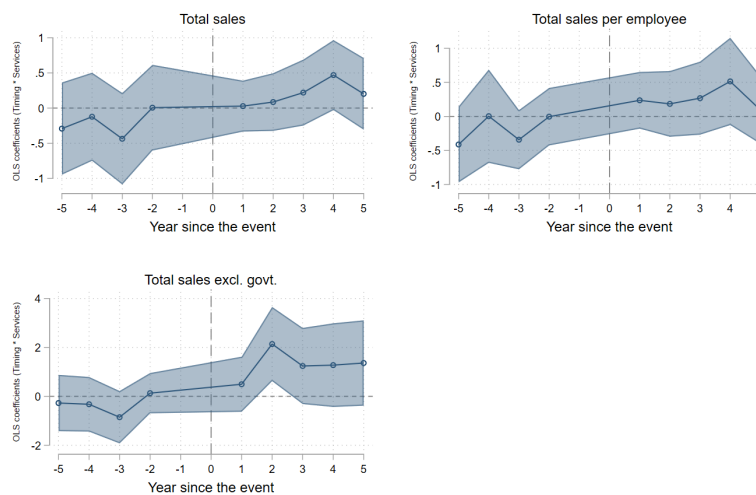
⁸The estimator proposed by [De Chaisemartin and d'Haultfoeuille \(2020\)](#) is a weighted average of the DID estimands that compare the evolution of the mean outcome in two sets of groups: those switching from no treatment to treatment between $t-1$ and t , and those remaining untreated. This estimator assumes that there are no groups whose treatment decreases over time i.e., those switching from treatment to no treatment. The estimator proposed by [Borusyak \(2022\)](#) is constructed as follows. First, the unit and period fixed effects are fitted by regressions on untreated observations only. Second, they are used to impute the untreated potential outcomes and therefore obtain an estimated treatment effect for each treated observation. Finally, a weighted average of these treatment effect estimates is taken with weights corresponding to the estimation target.

in services relative to non-services, and in low-skill services relative to high-skill services.

$$Y_{it} = \sum_{k=-5}^5 \beta_k Gov_{i,t-k} + \sum_{j=-5}^5 \beta_j Gov_{i,t-j} \times Sector_s + \lambda_i + \theta_t + \epsilon_{it} \quad (3)$$

Panel C in Figure 13 shows that the contraction in sales to non-government firms increases sharply around the time of procurement among the non-services firms relative to the services firms, and this effect persists over time. Similarly, Panel C in Figure 14 shows a larger contraction in sales to non-government firms among high skill services relative to low skill services around the timing of procurement and this effect persists even up to five years after.⁹

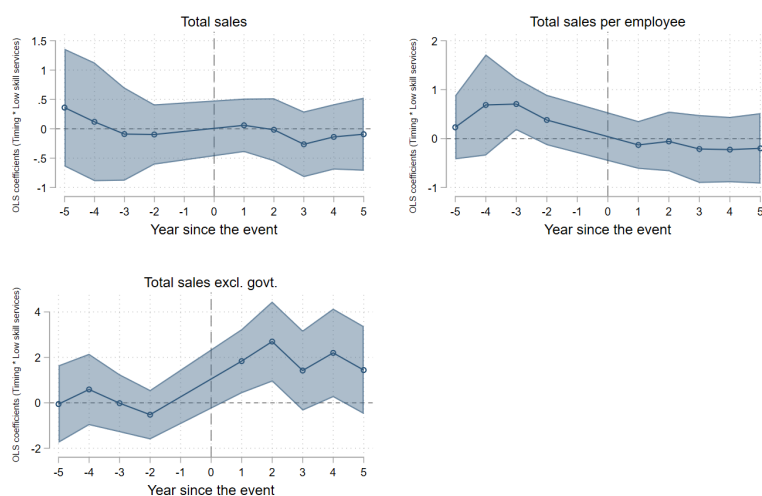
Figure 13: Dynamics of firm performance around procurement (services vs. non-services)



Notes: The coefficients are estimated from equation (3) that include dummies for up to 5 years before, during, and up to 5 years after a firm entered procurement, as well as their interaction with a binary variable $Sector_s$ that equals one if firm i belongs to the Services sector. All the point estimates are relative to the period $t-1$. The point estimate for $t=0$ is not reported in the event study graph in the Stata package (*EventPlot*), even though the corresponding binary variable is included in the estimation.

⁹Figures A-3 and A-4 in the Appendix use an alternative estimator, based on a sub-sample rather than on an interaction term, to account for the staggered treatment and show that the heterogeneous evolution across sectors is not contaminated by the underlying setting. The Stata package for the alternative estimator by De Chaisemartin and d'Haultfoeuille (2020) does not estimate the effect of the interaction terms. The heterogeneous effects have to be estimated through a sub-sample analysis.

Figure 14: Dynamics of firm performance around procurement (low skill services vs. high skill services)



Notes: The coefficients are estimated on a sub-sample of firms in Services with equation (3) that include dummies for up to 5 years before, during, and up to 5 years after a firm entered procurement, as well as their interaction with a binary variable $Sector_i$ that equals one if firm i used low-skill labor. The sectoral classification is based on [Nayyar et al. \(2021\)](#). All the point estimates are relative to the period $t-1$. The point estimate for $t=0$ is not reported in the event study graph in the Stata package (*EventPlot*), even though the corresponding binary variable is included in the estimation.

7 Conclusion

The foregoing analysis reveals there is a positive relationship between a firm selling to government entities – a proxy for participation in public procurement – and a range of firm performance indicators. Across all sectors we find a positive correlation with total sales, gross profits, total compensation of employees, number of workers and sales per employee, a measure of labor productivity. Statistically significant positive relationships between procurement participation and performance are particularly prevalent for services firms and enterprises in the construction sector, with sales to government associated with higher wages, higher employment, and higher labor productivity. For all industries apart from the primary sector there is a statistically significant positive association between selling to the government and labor productivity.

The positive association between participation in public procurement and total sales is accompanied by a reduction in sales to non-government entities, i.e., overall sales growth is partly at the expense of a reallocation of firm-level supply to government buyers. We confirm these patterns in an event study approach where we account for the possible self-selection of some types of firms into public procurement, as well as the het-

erogeneity in timing of selection into procurement.

The sustained reduction in sales to non-government entities following successful entry into public procurement suggests that many firms may be limited in their ability to expand capacity. Alternatively, government contracts may be more profitable. We find some indication for the capacity constraint hypothesis, reflected in the reallocation pattern being associated with differences in factor intensity of production: it is less pronounced for firms in services, and within the services sector, for firms engaging in low-skill activities. Due to data limitations, we cannot identify the exact mechanism due to which firms that enter public procurement reduce sales to non-government entities in the long-term. Assessing the drivers of the pattern of substitution of sales across buyers requires information on the extent to which firms that obtain government contracts are credit constrained and the incentives for managers of firms to continue to sell – or increase sales – to non-government clients. Collecting such data calls for a survey of a representative set of firms in Uganda.

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Appendix

A1 Baseline correlations - Discrete treatment

This section presents the estimates for equation (1), where we use a binary variable which equals one in the first year in which a firm sells products to a government entity and zero otherwise. Table A-1 and Table A-2 show findings that are qualitatively similar to the baseline results, even if we use a discrete treatment variable.

Table A-1: Baseline Correlations (Discrete Treatment - Full Sample)

	Panel (A)				
	Total Sales (1)	Sales To Companies (2)	Sales Excl. Govt. (3)	Num. Non-Govt. Buyers (4)	Num. Non-Govt. Suppliers (5)
After First Sale	0.610*** (0.0319)	-1.716*** (0.13)	-0.642*** (0.0674)	13.065*** (2.057)	1.618*** (0.375)
Obs.	56149	56138	55073	56159	44439
Adj. R-squared	0.803	0.618	0.677	0.789	0.875

Notes: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors clustered by sector in parentheses.

Treatment variable is a dummy that equals 1 from the time a firm first sold to the government. These sales exclude sales to firms that could not be identified from the registry. The regression includes Firm and Location x Year Fixed effects, and a control for the age of the firm. Standard errors clustered at the firm level. All dependent variables are transformed as $\log(x+1)$. In Column 2 we restrict the sample to firms within the services sector.

Table A-2: Firm-level performance indicators (CIT and PAYE sub-samples)

Panel (A)				
	Gross Profits (in logs) (1)	Fixed Assets (2)	Total Investments (3)	Total employee compensation (4)
After First Sale	0.666*** (0.174)	0.408* (0.16)	-0.094 (0.0864)	0.627*** (0.19)
Obs.	37330	38857	38856	39231
Adj. R-squared	0.493	0.586	0.706	0.557
Panel (B)				
	Total Sales per Employee (1)	Capital/Labor ratio (2)	Average Salary (3)	Num. of Employees (4)
After First Sale	0.439*** (0.0392)	0.026 (0.0288)	0.021 (0.0326)	0.059** (0.0208)
Obs.	25997	28447	16887	25997
Adj. R-squared	0.765	0.827	0.792	0.908

Notes: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors clustered by sector in parentheses.

Treatment variable is a dummy that equals 1 from the time a firm first sold to the government. These sales exclude sales to firms that could not be identified from the registry. All equations include Firm, Location \times Year and Sector \times Year Fixed effects, and control for the age of the firm. Standard errors clustered at firm level. All dependent variables are transformed as $\log(x+1)$.

A2 TWFE with heterogeneous treatment effects, diagnostics

This section uses the diagnostics proposed by [De Chaisemartin and d’Haultfoeuille \(2020\)](#), to identify the composition of the TWFE estimator which is estimated using a modified equation (1), where the treatment variable compares firms that enter procurement sometime during the sample period and continue to do so for the rest of the sample, to firms that never receive procurement. The diagnostic identifies the proportion of ATTs that receive a negative weight due to the staggered treatment and therefore could bias the sign of the TWFE estimate. Table A-3 shows that for some of the outcomes the share of ATTs that receive a negative weight range between 10% to 27%, and therefore might bias the corresponding TWFE estimate.

Table A-3: TWFE with heterogeneous treatment effects, diagnostics ([De Chaisemartin and d’Haultfoeuille, 2020](#))

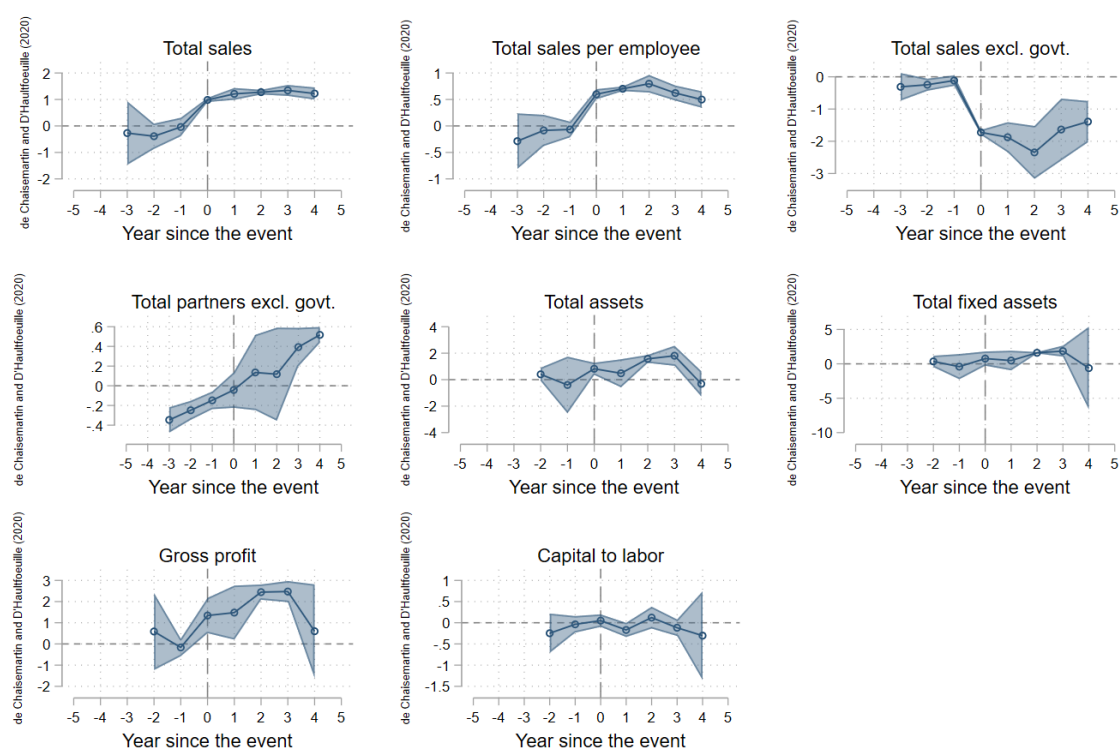
	Total Sales (1)	Sales per Employee (2)	Sales Excl. Govt. (3)	Total Assets (4)
ATT	2603	1217	2513	2183
% Negative Weights	0	10.19%	0	22.59%
	Fixed Assets (5)	Gross Profits (6)	Capital/Labor Ratio (7)	
ATT	2183	2146	1711	
% Negative Weights	22.59%	22.7%	26.7	

A3 Event study estimates adjusted for heterogeneity in treatment timing

This section uses the advances in the two way fixed effects literature to address the potential biases in the event study estimates that may arise due to the heterogeneity in treatment timing. We first use the estimator proposed by [De Chaisemartin and d’Haultfoeuille \(2020\)](#) in Section A3.1. Figure A-1 summarizes the evolution of outcomes across treated and control firms, which is similar to the baseline event study estimates in Figure 12. Next in Section A3.2 we use the estimator proposed by [Borusyak et al. \(2021\)](#) to control for the bias that can be due to the heterogeneity in treatment timing. Once again the evolution of firm outcomes, which is reported in Figure A-2, is generally similar to the baseline event study findings.

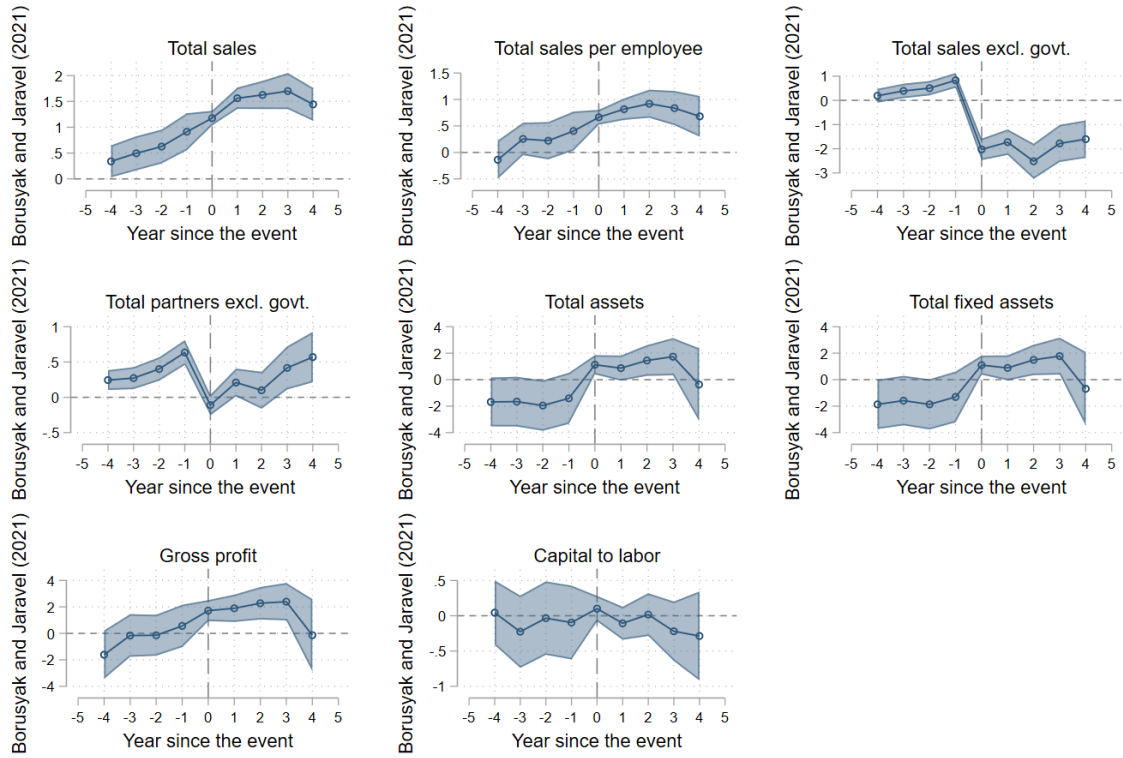
A3.1 Alternative estimator (De Chaisemartin and d’Haultfoeuille, 2020)

Figure A-1: Event study estimates adjusted for heterogeneity in treatment timing



A3.2 Alternative estimator (Borusyak et al., 2021)

Figure A-2: Event study estimates adjusted for heterogeneity in treatment timing

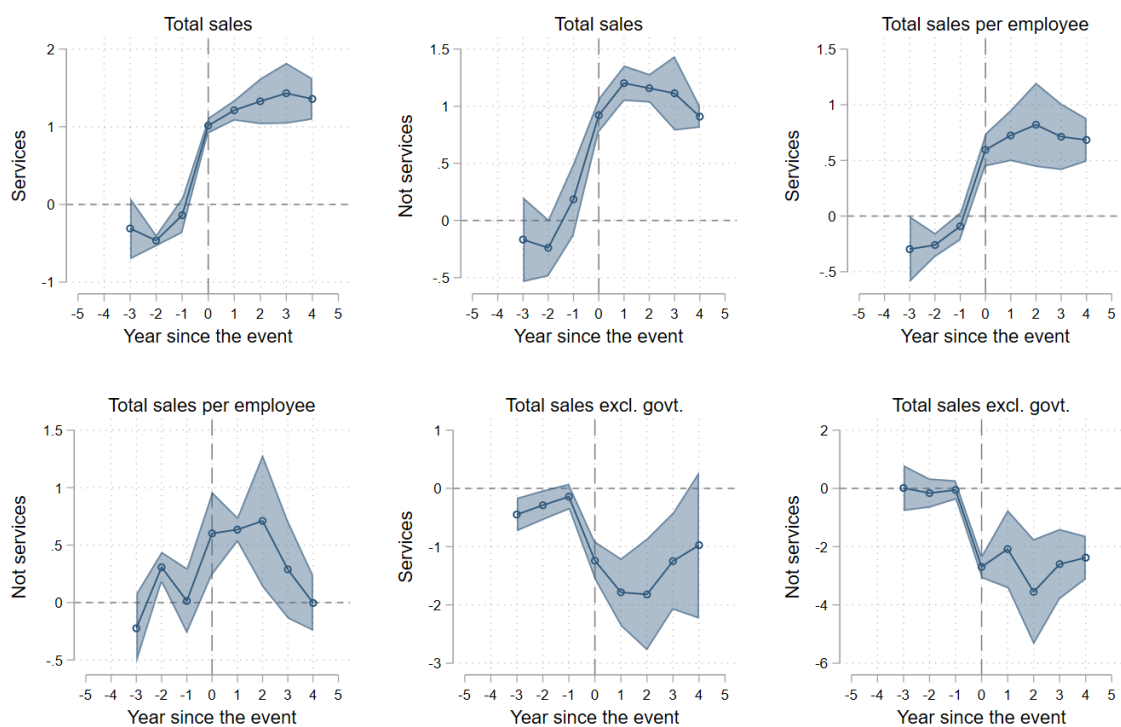


A4 Event study estimates by sector and adjusted for heterogeneity in treatment timing

This section uses the [De Chaisemartin and d’Haultfoeuille \(2020\)](#) estimator to assess whether the evolution of sales’ outcomes that changes discretely around procurement, is also heterogenous across sectors. Figure A-3 shows that the reduction in sales to non-government entities around entry into procurement is less pronounced among services. Figure A-4 shows that within services, the reduction in sales to private sector is less acute for firms that use low-skill labor.

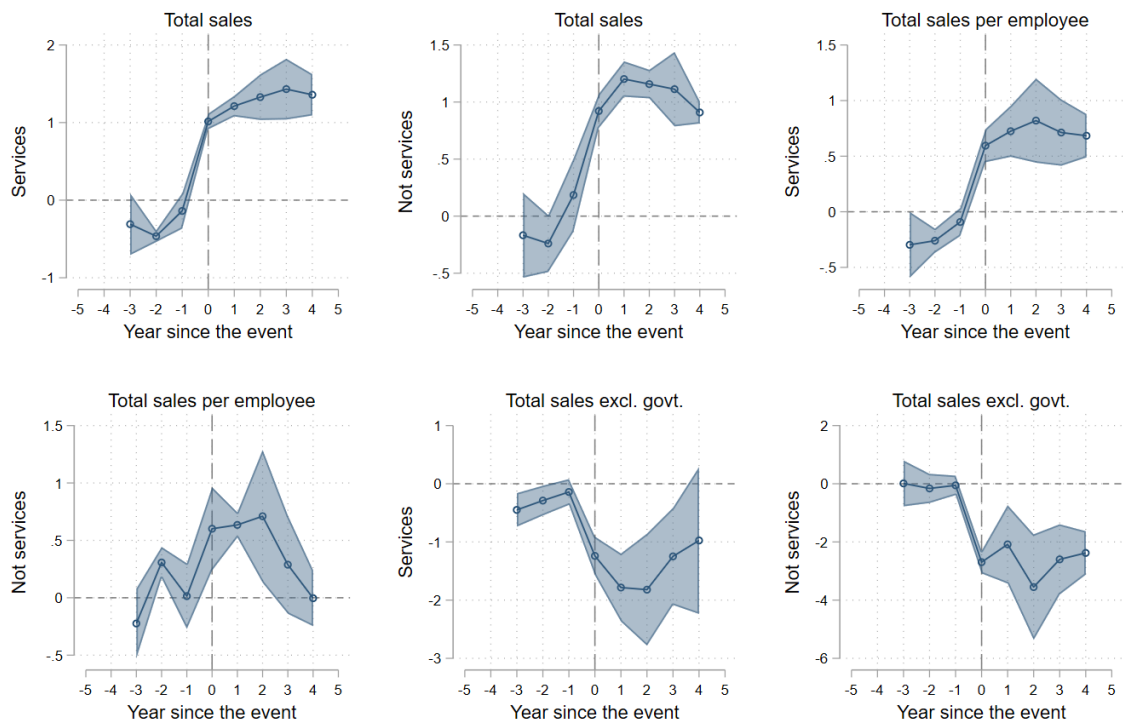
A4.1 Services vs. non-services

Figure A-3: Event study estimates adjusted for heterogeneity in treatment timing



A4.2 Low skill vs high skill services

Figure A-4: Event study estimates adjusted for heterogeneity in treatment timing



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