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State-owned suppliers, political connections and performance of privately-held firms

Evidence from Belgian firm data

by Pablo Muylle and Emmanuel Dhyne

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Abstract

While past decades were characterized by economic liberalization and deregulation, there re-mains an enduring presence of political influence over the private economy. Such influence can either benefit (e.g. government support addressed at survival and growth prospects) or harm (e.g. reduced efficiency and innovation) firms. This study investigates the impact of government ownership among suppliers on the behavior and performance of privately-held firms. We argue that this channel of government influence on the private economy plays a prominent role, in addition to that of political connections (i.e. the direct presence of politicians on the boards of firms), a more established channel of political influence. Leveraging Belgian firm-level trans-action data, the research reveals that purchasing inputs from state suppliers is associated with lower firm profitability and productivity, along with higher leverage and employment. Notably, the relationship between state suppliers and performance persists even when controlling for the direct presence of politicians on the boards of firms. These findings underscore the influence of government support on firms' behavior and financial performance and highlight the importance of considering both state suppliers and political connections when assessing the comprehensive impact of government influence on private enterprises.

Keywords: Governmental Influence, SOE Suppliers, Political Connections, Economic Liberalization, Firm Performance.

JEL Codes: D22, D72, G38, H11, H32, L33.

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Non-technical summary

The private economy is subject to varying degrees of political influence. This influence can occur through the direct presence of politicians on the boards of firms (later referred to as 'political connections'). This is a channel through which politicians are directly able to influence decision-making processes in firms and has already been extensively discussed in the literature. Another channel of political influence occurs through the presence of state-owned firms (SOEs) in supplying industries.

If a given firm is only able to purchase inputs from a non-competitive market occupied by one or few SOEs, this likely affects the quality, price and variety of inputs a firm can purchase. In turn, a given firm may see an impact on its profitability, productivity and decisions regarding debt and employment. However, SOE suppliers may also provide certain benefits to firms. They could offer firms greater flexibility and financial backing (e.g. through trade credit), creating opportunities for technology upgrading and investment. Such support may enable firms to enhance productivity and competitiveness, positioning them favorably in a dynamic and evolving economic landscape.

While previous literature was only able to look at this question from an aggregate perspective (i.e. how much inputs an average firm purchases from a given industry characterized by a certain percentage of SOEs), we utilize Belgian transaction-level data to identify for each individual firm how much inputs they purchase from SOE suppliers. This is a more direct and accurate way to evaluate the importance of (private) competition in supplying industries. We also contribute to the literature by looking at the effect of both channels of political influence (i.e. political connections and purchasing inputs from SOE suppliers) together.

Before answering the main question of interest, we first identify what type of firms purchase inputs from SOE suppliers. Overall, in the context of Belgium, the proportion of inputs purchased from SOE suppliers is rather limited. Larger firms and manufacturing firms are more likely to purchase inputs from state suppliers, while foreign firms also show a higher likelihood of purchasing from government-owned suppliers. More leveraged firms are more likely to have SOE suppliers, while more productive, profitable, and financially constrained firms are less likely to possess SOE suppliers. Politically connected firms are more likely to purchase inputs from upstream state-owned firms, especially those connected to in-government parties and federal political connections.

We find that both SOE suppliers and political connections are associated with lower firm profitability and productivity, as well as higher indebtedness and employment levels, suggesting that government support influences firms' behavior and financial performance negatively. This finding is in line with earlier literature on this topic. We find rather large effects, ranging from, for each additional SOE supplier, 1 percentage points lower profitability as measured by return on assets, to a 15.1 percent larger number of employees.

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1 Introduction

Amid the global trend toward economic liberalization and deregulation, state-owned enterprises (SOEs) continue to play a prominent role in many countries' economies. This persistent presence of government ownership, and, more broadly, political influence over the private economy, raises pertinent questions about the efficacy of deregulation efforts, and the role of remaining political influence over private firms. This research aims to evaluate the relationship between state ownership among upstream firms (i.e. suppliers), and the decision-making processes and performance of privately-held buyers.

The anticipated effects are manifold. On one hand, state suppliers might provide lower-quality or more expensive inputs, leading to double marginalization and negatively impacting the buyer's performance. Additionally, the ease of securing financial support, such as trade credit, from state suppliers during times of financial distress can influence a firm's behavior. This support, while increasing the chances of survival, may reduce the firm's agility, potentially harming productivity and profitability. Conversely, the presence of state-owned suppliers could offer firms greater flexibility and financial backing, enabling opportunities for technological upgrades and investment. They may also choose to charge lower input prices, either as a deliberate policy or by reducing double marginalization, given that SOEs do not prioritize profit maximization. Such support can help buyers enhance productivity and competitiveness, positioning them advantageously in a dynamic and evolving economic landscape.

This research is situated within two strands of the literature. First, it relates to the broader literature on economic liberalization and its impact on firms' performance. Previous studies have extensively explored the effects of within-industry deregulation and liberalization, revealing that liberalization of entry and privatization of state-owned enterprises in potentially competitive markets can lead to increased investment and entry, thereby allowing for sectoral productivity improvements (Alesina et al., 2005; Anderton et al., 2020; and Olley and Pakes, 1996). Furthermore, upstream regulations, which include SOE monopolies, have shown a negative relationship with downstream firms' productivity (Arnold et al., 2016; Bourlès et al., 2013; Cette et al., 2016, 2017). The vast majority of this existing body of literature, however, draws conclusions based on industry-level data. This research makes a valuable contribution to the existing literature on economic liberalization and sectoral productivity by examining the firm-specific specific influence of state-owned suppliers on the productivity of individual Belgian firms. Leveraging firm-level transaction data from the National Bank of Belgium (NBB) and comprehensive financial information from Orbis Europe, this study identifies for each private buyer the number of state-owned suppliers and share of inputs purchased from these suppliers. This is a more direct and accurate way to evaluate the importance of (private) competition in supplying industries.

Second, our research relates to literature on political influence over the private economy. The most established channel through which politicians could affect private businesses, is their direct presence on the boards of privately-held firms (which we will refer to as "political connections" in the remainder of this paper). Firms with political ties benefit from access to critical resources such as favorable bank lending, lower tax rates, and government contracts, which align with resource dependence theory and can enhance performance through reduced bureaucratic friction and independent oversight from politicians (Akcigit et al., 2023; Faccio, 2006; Li et al., 2008; Niessen and Ruenzi, 2010; and Schoenherr, 2019). However, these connections can also lead to resource misallocation and reduced innovation, with mixed impacts on firm performance depending on the political and economic context (Akcigit et al., 2023; Bertrand et al., 2018; Boubakri et al., 2008; and Tihanyi et al., 2019). Our research contributes to this strand of the literature by investigating SOE presence in the supply chain as an alternative way in which governments can exert influence over the private economy. We argue that these two channels are linked, as politically connected businesses are more likely to purchase inputs from SOE suppliers, for instance, to advance the goals of the government, to "do a favor" to other politicians, or to gain political popularity by ensuring employment in SOES. To this avail, we identify politically connected firms through their associations with election candidates for one of the municipal, regional, or federal elections in Belgium from the past 15 years. If these two channels of political influence are indeed related, the prominence of state suppliers may simply proxy for the more established channel of political connections through the presence of politicians on the firm's boards.

Before estimating the relationship between the presence of SOE suppliers in a firm's supply chain, and the performance of this firm, we first identify the characteristics of firms purchasing inputs from SOE suppliers. Overall, in the context of Belgium, the proportion of inputs purchased from SOE suppliers is limited. Research findings indicate that larger firms and manufacturing firms, as well as firms with sizeable foreign ownership, are more likely to purchase inputs from state suppliers. Furthermore, more leveraged firms are associated with higher probabilities of purchasing inputs from SOE suppliers, while more productive, profitable, and financially constrained firms are less likely to engage with SOE suppliers. These characteristics correspond to the profile of more mature, less dynamic firms. Finally, politically connected firms are more likely to purchase inputs from upstream state-owned firms, especially those connected to in-government parties and federal political connections. This indicates the necessity to jointly evaluate both channels of political influence when estimating the impact on firm performance, as the presence of state suppliers may simply proxy for political connections.

Nevertheless, we find that both state suppliers and political connections are associated with lower firm profitability and productivity, as well as higher leverage and employment, suggesting that government support influences firms' behavior and financial performance negatively. The coefficients found for the two channels of political influence decrease only slightly after jointly including both channels in our models. This highlights the importance of considering both the presence of state suppliers and political connections when one intends to analyze the (full) impact of government influence on private enterprises. Findings in this paper represent stylized facts, illustrating associations between variables rather than indicating causality.

This paper is structured as follows. Section 2 provides a brief overview of existing literature on deregulation and liberalization. In section 3, we describe the data sources used in this paper. We provide stylized facts about the prevalence and importance of state-owned suppliers in Belgium in section 4. The impact of input purchases from SOE suppliers on firm performance is described in section 5, in which we present both the empirical strategy and results. In section 6, we extend our analysis to politically connected firms. First, we discuss the interplay between the politically connected firms and the presence of state suppliers. Second, we incorporate the political connections dimension into the previous firm performance estimations. We conclude the paper with section 7.

2 Literature

Deregulation and liberalization Previous decades have been characterized by rapid deregulation, which has been studied extensively in academic literature. Deregulation and liberalization

affect the performance of firms in various ways. First, it may result in the exit of less-productive and entry of more-productive firms, subsequently allowing for a more efficient allocation of production factors (Anderton et al., 2020). Second, liberalization in upstream industries can positively affect downstream firms by the introduction of new and better-quality inputs, which also holds for inputs from the service industry (Arnold et al., 2016, 2011). Third, higher levels of competition in upstream industries may also result in lower barriers to entry in downstream industries (Bourlès et al., 2013 and Cette et al., 2017). Fourth, upstream deregulation could increase the rents for downstream firms, reducing incentives to implement efficiency improvements in these industries (Bourlès et al., 2013 and Cette et al., 2017).

Alesina et al. (2005); Anderton et al. (2020); and Olley and Pakes (1996) find that liberalization of entry and privatization of SOEs in potentially competitive markets significantly spurred investment and entry, with a greater effect for industries and countries with lower initial levels of regulation. The resulting 'business churn' allows for aggregate sectoral productivity improvements (Anderton et al., 2020 and Olley and Pakes, 1996). Additionally, Nicoletti and Scarpetta (2003) assert that lower entry barriers and state control accelerate the process of catch-up to best-practice technologies in manufacturing industries. Conway et al. (2007) find that the detrimental effect of anti-competitive regulation on productivity is larger in IT-heavy industries.

There exists a wide literature focusing on the impact of upstream liberalization on downstream firms. Most existing research points towards a negative relationship between upstream regulations and the productivity of downstream firms (e.g. Bourlès et al., 2013 and Égert, 2016). This effect is stronger for firms closer to the global technological frontier (Bourlès et al., 2013), and seems to be driven primarily by a reduction in investments in R&D and IT in downstream firms (Cette et al., 2017). They also matter more in better (legal) institutional environments. Égert (2016) explains this by the stricter application of product market regulations in such environments. Arnold et al. (2016, 2011) find a significantly positive relationship between the overall level of reforms, presence of foreign providers, and extent of privatization in the service industry, and the productivity of downstream manufacturing firms, but not regarding the level of competition in the service industry. This effect holds for local and foreign manufacturing firms, though the effect on the latter tends to be stronger (Arnold et al., 2016). Finally, Cette et al. (2016) find that also labor market reforms are positively associated with productivity gains in downstream firms (in which this labor is employed). Interestingly, Égert (2016) finds that product market regulations only negatively affect productivity when labor market regulations are weak.

Finally, a strand of literature evaluates the relationship between regulatory burden and international, country-level productivity convergence. Conway et al. (2007), for example, assert that the dispersion of cross-country productivity levels was partly the result of heterogeneity in regulatory settings. Countries with more liberal regulatory policies benefited more from improvements in the world productivity frontier than countries with more restrictive policies. A further elaboration on this topic, however, is beyond the scope of our paper.

Political connections Political connections (i.e. the direct presence of politicians on the boards of firms) is a channel of government influence over the private economy that received considerable

attention in the literature. Firms may benefit from having political ties by obtaining easier access to key resources and benefits. These include, among others, informational resources, favorable bank lending terms, lower tax rates, reduced regulatory requirements, being awarded government contracts, and being bailed out in times of financial distress (Ding et al., 2014; Faccio, 2006; Li et al., 2008; Niessen and Ruenzi, 2010; Saeed et al., 2016; and Schoenherr, 2019). In short, they benefit from smoothing out bureaucratic frictions (Akcigit et al., 2023). Governments are also more likely to enact policies protecting connected firms, e.g. by means of anticompetitive policies (Ding et al., 2014 and Faccio, 2006). These potential advantages align with the resource dependence theory, which suggests that access to critical resources empowers firms, providing them with a competitive edge and reducing uncertainty (Saeed et al., 2016 and Wong and Hooy, 2018). Furthermore, as politicians are outsiders to the corporate world, they may also be able to provide an independent view on the organization, which could eventually positively affect performance (Niessen and Ruenzi, 2010).

On the other hand, politicians may abuse their power and extract rents from connected firms. By doing so, they would negatively affect performance and firm value (Faccio, 2006). By attracting a disproportionate amount of resources, they hamper allocative efficiency in the economy (Schoenherr, 2019) and overall innovation and creative destruction (Akcigit et al., 2023).

The effect of political connections on firm performance is unclear, as Tihanyi et al. (2019) conclude in their meta-analysis. Most China-based studies find performance gains for connected firms (Ding et al., 2014; Du and Girma, 2010; Wong, 2010; and Wong and Hooy, 2018), as well as Niessen and Ruenzi (2010) for German firms, whereas Bertrand et al. (2018); Boubakri et al. (2008); and Saeed et al. (2016) conclude political connections exercise a negative impact on firm performance. Du and Girma (2010) and Saeed et al. (2016), however, assert that this adverse relationship is more pronounced for more autocratic regimes and/or in regions with less developed markets and legal systems, which may not be extendable to the context of Belgian firms.

3 Data

Orbis Europe We primarily use firm-level data from Bureau Van Dijk's (BvD) Orbis Europe database.[1] This database compiles information from numerous private and public firms across the globe. The data is sourced through various country-specific data providers, typically aggregating annual firm reports (an overview of data providers is provided by Kalemli-Ozcan et al., 2015). The result is a single database that allows for cross-country comparisons. Data is restricted to the 2002-2018 time frame.[2] We only retain active firms and exclude consolidated accounts and non-business firms in our estimations.[3]

Each iteration of BvD Orbis encompasses firm-level financial information over a period of 10 years.

[1] We include information from the preceding Amadeus database for years before 2016. The discontinuity in data provision is accounted for by excluding firms that first appeared in Orbis Europe, despite already existing before 2016. It is important to note that this exclusion does not substantially impact our estimation results.

[2] At the time of writing, 2018 was the last year available. We exclude years before 2002 because of the more limited firm coverage.

[3] Excluding non-business firms implies we only assess the impact of state-owned businesses, not state activities in the public sphere like government administration departments and schools.

However, the ownership details remain static: each release solely includes the most current ownership information. This poses a challenge for our research objectives, as it impedes the ability to monitor ownership (e.g. over suppliers) over time or incorporate firm-specific fixed effects. In light of this limitation, we aggregate several versions of BvD Amadeus and BvD Orbis following a procedure outlined in Merlevede et al. (2015). Different issues can be merged using each firm's unique identifier in the database. Given that these identifiers may undergo occasional modifications over time, we address such systematic alterations by referencing the identifier change log provided by BvD. Through this data aggregation approach, we extend our coverage beyond the most recent decade, encompassing a longer financial data and ownership timeline.

BvD Orbis offers rich information on European firms, and has thus been used extensively in past research (some recent examples are Autor et al., 2020 and Gopinath et al., 2017). Yet, one limitation is that, while for the countries retained in our data subset the number of unique firm identifiers roughly matches the official figures reported by statistical agencies, key information concerning these firms is often missing. This data gap frequently encompasses essential metrics like employment and material costs, both pivotal for computing productivity measures. Typically, data coverage exhibits greater comprehensiveness for larger, publicly listed firms, mandated by law to disclose more comprehensive information. This situation implies that the outcomes presented in this study could potentially exhibit bias towards larger firms, possibly skewing the representation away from the entire economy. Nonetheless, we assert that the decision to incorporate the broader BvD Orbis dataset, encompassing not only listed entities, remains advantageous, as by doing so, we can capture a larger share of the economy. Additionally, each individual listed firm has a much larger stake in a country's key economic indicators than an individual small firm, though jointly, small firms remain of great importance for the European economy.[4]

Using BvD Orbis, we construct indices for profitability (return on assets - ROA[5]), productivity (total factor productivity - TFP[6]), financial performance and solvency (leverage[7] and the ASCL score for financial constraints[8]), implicit interest rates[9] and effective tax rates[10]. These indices will be used at several points throughout this paper. Note that foreign-owned firms are companies with at least 10% of their shares held by a direct shareholder from another country.

State-owned suppliers The key explanatory variables in this paper relate to state-owned suppliers. To determine whether a supplier is state-owned, we require, for each firm in BvD Orbis, information about state affiliation in its ownership structure. In the appendix (section A.2), we provide a brief overview of the characteristics of Belgian SOEs, and the relationship between their government ownership and firm size and performance.

[4]Concretely, SMEs constitute 52.4% of value added and 64.4% of persons employed in the EU (Eurostat, 2022).
[5]Defined as net income over total assets.
[6]Utilizing the control function methodology proposed by Wooldridge (2009).
[7]Defined as in Kalemli-Özcan et al. (2022).
[8]The ASCL score for financial constraints, as defined by Mulier et al. (2016), is a composite index ranging from 0 to 4, based on financial indicators such as cash flow-to-capital ratio, leverage ratio, firm age, and firm size. A score of 0 indicates no financial constraints, suggesting that the firm has easy access to external financing, while a score of 4 indicates severe financial constraints, implying significant difficulty for the firm in securing external funds.
[9]Defined as interest expenses over liabilities.
[10]Defined as tax expenses over P/L before taxes.

We identify state suppliers in a multi-layered approach. Firstly, we rely on the firm's legal structure as a foundational criterion. BvD Orbis features a distinct legal categorization for "pure" state-owned entities, enabling immediate classification. The terminology of legal forms is country-specific, but, as an example, "Public institution", "State Enterprise" or "Municipal company" unambiguously points towards state ownership. Secondly, we scrutinize the identified shareholder and Global Ultimate Owner (GUO) types within BvD Orbis. Instances where types like "Public authority," "State," or "Government," individually or in combination, surface, indicate the presence of at least one state owner. Thirdly, recognizing the limitations of the aforementioned methods in accurately identifying all state-owned firms, we employ a manual check of the firms with shareholders or GUOs with names that include specific words. These words include "City" and "Ministry", and are translated into the variety of languages present in our data set. Nevertheless, it remains inevitable that certain firms might be erroneously labeled as privately-owned. Consequently, a certain level of bias stemming from measurement error is plausible.

As previously indicated, the determination of the state ownership identification variable is a product of both a firm's legal structure and the particulars pertaining to its shareholders and Global Ultimate Owners (GUOs).[11] Only state ownership of over 10% is retained as one may assume lower degrees of ownership do not imply any form of control over the firm. We classify a firm as being an SOE as long as government-affiliated owners possess at least 10% of the shares. We do, however, also construct variables for minority (10-49%) and majority (50-100%) state ownership. If a GUO or the legal form indicates state ownership, a firm is always identified as a majority government-owned company. In cases where all data related to a firm's legal structure and ownership is absent, the ownership classification remains unidentified, resulting in the exclusion of such firms from estimations.

In a final step, we provide a list of state-owned firms to the National Bank of Belgium (NBB) by extracting government ownership from BvD Orbis using the above-mentioned procedure. NBB subsequently provides us with aggregated data on input purchases from state-owned suppliers for each Belgian firm between 2002 and 2021. More precisely, we observe for each firm the share of inputs purchased from state-owned suppliers, as defined in equation 1, as well as the number of such suppliers. We also construct alternative indicators for non-utility state suppliers.[12]

$$\text{Share of SOE suppliers in total input purchases} = \frac{\text{Total input purchases from SOE suppliers}}{\text{Total input purchases from all suppliers}} * 100 \quad (1)$$

Politically connected firms This paper also uses a binary indicator denoting whether a firm is politically connected as an additional explanatory factor. One potential manifestation of political connections is that they could offer the firm advantageous access to government resources, or increase the likelihood of being bailed out by the government. To test the hypothesized difference in firm behavior, we match, for each firm, lists of names of directors, administrators, and other individuals exerting control over the management of the company, provided by BvD Orbis, with lists of

[11] A GUO is the individual or entity at the top of the corporate ownership structure.

[12] Utility suppliers are those in NACE Rev. 2 section D (electricity and gas supply), section E (water supply, sewerage, waste management), and the following state-owned companies: bpost (postal delivery), Proximus (telecommunications provider), SNCB, De Lijn, STIB and TEC (public transportation providers).

names of election candidates. By doing so, we are able to identify firms with direct connections to politicians. For each firm-year combination, we create a variable indicating whether a firm had at least one politician on its board in the given year. Table A2, in the appendix, provides an overview of the number of politically connected firms identified in our Belgian sample.

We identify individuals as politicians if they were election candidates during the previous elections for at least one of the elections for which we extract candidate lists. An overview of elections in Belgium is provided in the appendix (Table A1). Note that there exist different levels of government, elected at different times and organized by different governmental entities. We include all levels of elections: local elections (municipal, municipal district, OCMW/CPAS, provinces), regional elections (communities, regions), federal elections, and elections for the European Parliament. With the notable exception of the 2018 local elections in Flanders for which an exportable list was available, candidate lists were obtained by web scraping procedures.[13] This excludes candidate lists for the 2006 local elections, local elections in the German-speaking community, and the 2003 federal elections.

For a limited number of elections, we are also able to identify the political party each candidate is affiliated with, and, based on this, we subsequently construct an indicator of each candidate's political ideology. Similarly, we are able to identify, for each year, whether a certain politician was affiliated with a party in government in the given year and on the relevant level. We identify PTB/PVDA, PS/Vooruit, and Ecolo/Groen (and predecessors) to be left-wing, and MR/Open VLD, N-VA, DéFI, and Vlaams Belang to be right-wing. We obtain this information for the regional and federal elections of 2014 and 2018, as well as for the 2010 federal elections. As we do not find it optimal to limit our sample to observations for which party information is available given the large reduction in data richness that would follow from this (most notably, we would lose municipal candidates), this implies that we will misidentify certain connections for which no such data is available, as "not left-wing" or "not right-wing". Given this, the results obtained on variables related to political ideology can be interpreted as underestimations.

4 State-owned suppliers in Belgium: a descriptive analysis

4.1 Stylized facts

We first show the median number of state-owned suppliers per private firm.[14] As indicated in Table 1, only a small proportion of firms (about 10%) purchase inputs from a state-owned supplier. Likewise, among the firms with a non-zero number of SOE suppliers, most only purchase inputs from one or two state suppliers, with only a fraction of firms purchasing inputs from more than two of these suppliers. Table 1 also offers an alternative gauge of state-owned suppliers, excluding those categorized as providing public utilities. According to this criterion, we note a decrease of approximately 15,000 firms (or 2.5% of the total sample) with government-owned suppliers.

[13] For data sharing and verification purposes, we made the candidate list obtained publically accessible via https://github.com/pabm/electioncandidates_BE.

[14] For the purpose of this overview, we aggregate all years by calculating for each firm the median number of state suppliers.

Table 1: Median number of state suppliers per firm

	All state-owned suppliers		Excluding utility state-owned suppliers	
Number of suppliers	Number of firms	Percentage of firms	Number of firms	Percentage of firms
0	449,946	88.35	462,499	91.11
1	48,746	9.57	38,623	7.61
2	7,083	1.39	4,665	0.92
3	1,972	0.39	1,104	0.22
4	732	0.14	356	0.07
5	324	0.06	153	0.03
6	165	0.03	65	0.01
7	107	0.02	46	0.01
8	55	0.01	27	0.01
9	41	0.01	24	0.00
10	100	0.02	42	0.01

NOTES: For unique firms. Aggregated by identifying median number of state suppliers for each firm.

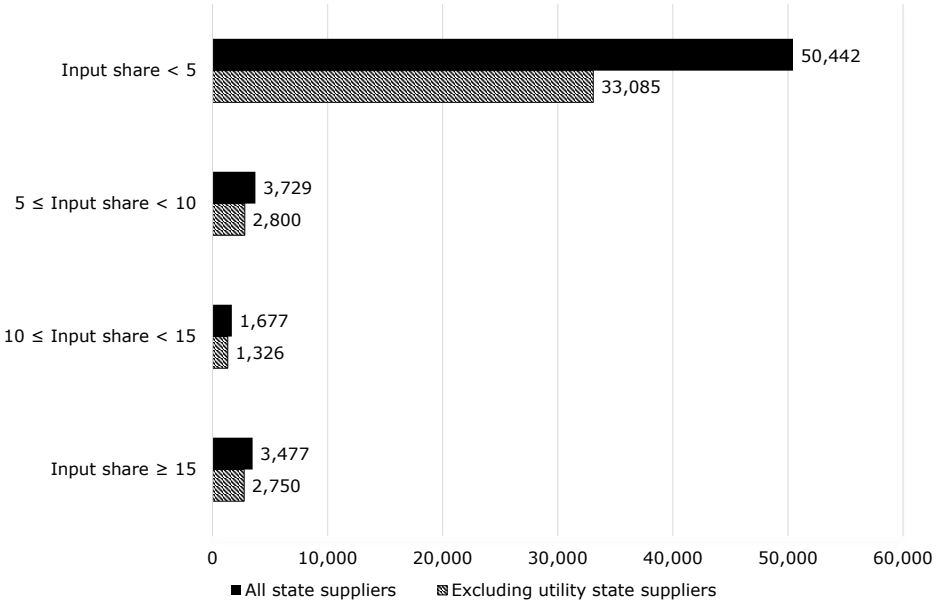
Given that state firms are typically larger in size, they may, on average, supply larger quantities of inputs than their private counterparts. This implies that merely observing the number of state suppliers would lead to an underestimation of their relative importance. To evaluate this claim, we plot bins of firms with state suppliers for which the median proportion of inputs purchased from such suppliers relative to total input purchases is less than 5%, between 5% and 10%, between 10% and 15%, and higher than 15%.[15] Since a large number of firms do not engage with state suppliers and only a small number have multiple state suppliers, we limit this figure to include only firms that have at least one state supplier. Figure 1 presents the distribution obtained. The vast majority of firms with a non-zero number of state suppliers purchase less than 5% of their total inputs from these suppliers (Figure 1a). Yet, there remains a non-negligible proportion of firms purchasing 15% or more of their inputs from SOE suppliers, indeed indicating that some state suppliers are of above-average importance. Figure 1b, in which we visualize the maximum share of input purchases from state-owned suppliers over the lifetime of each firm, indicates that a substantial number of firms ever purchased more than 15% of its inputs from SOEs (42,097 firms instead of 3,477 firms with median input shares above 15%).

In Figure 2, we observe the geographical distribution of firms purchasing inputs from state suppliers. For each NUTS3-region in Belgium, we calculate the mean number of SOE suppliers per firm active in this region (panel a), as well as the mean share of input purchases from SOEs (panel b).[16] Both indicators provide a similar geographic distribution, with levels of input purchases from state suppliers being higher in the center of the country, most notably in the provinces of Flemish and Walloon Brabant, Liège, Hainaut and Antwerp. On average, firms in these regions are supplied by around 0.15 SOEs, constituting around 0.50% of their total input purchases in value. The lowest

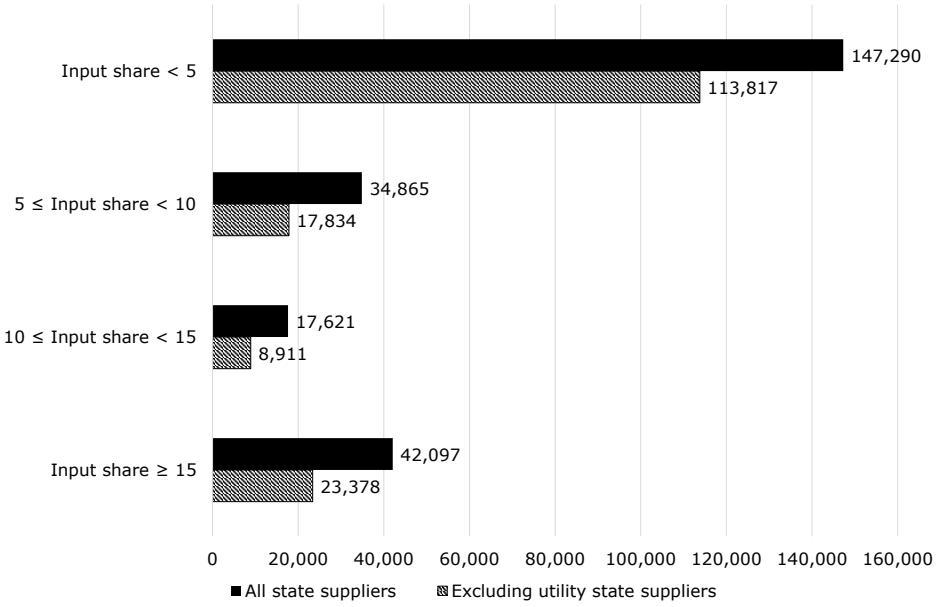
[15] For the purpose of this overview, we aggregate all years by calculating for each firm the median and maximum shares of inputs from state suppliers.

[16] For the purpose of this overview, we aggregate all years by calculating for each firm the median number of state suppliers and shares of inputs from state suppliers.

Figure 1: Non-zero input shares from SOE suppliers per firm



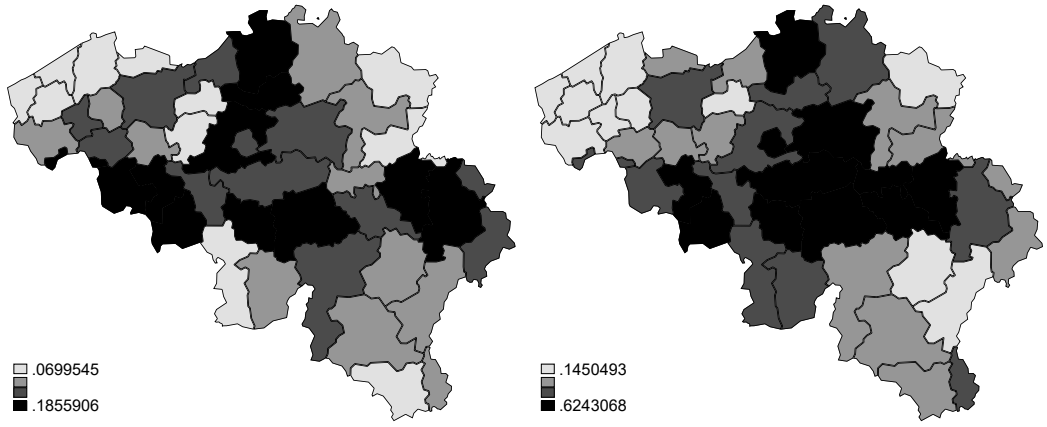
1(a) Median input share



1(b) Maximum input share

NOTES: For unique firms. Aggregated by identifying median and maximum share of inputs purchased from state suppliers for each firm. The x-axes indicate the number of firms in each category.

Figure 2: SOE suppliers per firm, by region



2(a) Number of SOE suppliers

2(b) Input share of SOE suppliers (%)

NOTES: Aggregated by calculating the average by regions of the median number of state-owned suppliers and share of inputs purchased from state suppliers for each unique firm. Values indicate the average number of SOE suppliers (e.g. 0.186 suppliers) in Figure 2a, and the average share of inputs sourced from SOE suppliers (e.g. 0.624%) in Figure 2b.

levels are found in the provinces of West Flanders and Luxembourg.

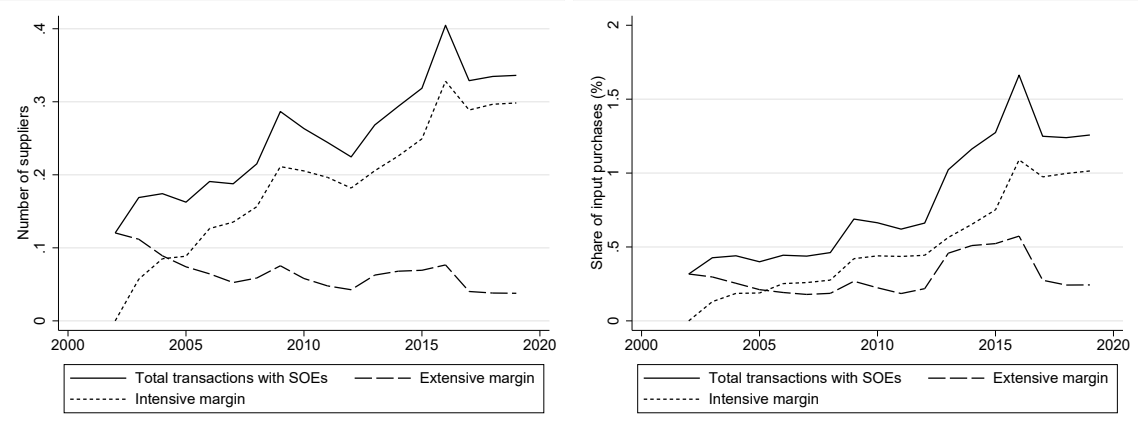
Figure 3 describes the evolution of input supplies provided by SOEs over time, calculating separately the extensive margin (i.e. firms purchasing input supplies from state firms for the first time) and intensive margin (i.e. firms that already purchased such inputs in previous years). Both panel a, which shows the evolution of the mean number of SOE suppliers, as well as panel b, describing the evolution of mean input shares, portray an overall increasing trend. This trend is mainly driven by the intensive margin, with the extensive margin remaining relatively stable over time. Indeed, in the appendix (Table A4), we show that the prevalence of state suppliers among existing individual firms is relatively stable: of the 4,293,520 potential year-on-year changes, we only find an actual change in 8.73% of the total possible changes (722,845 of the total).[17] This indicates that our findings are not primarily driven by the inclusion of new or newly supplied firms, with no observed SOE suppliers in previous years in our sample.

The prevalence of firms purchasing inputs from SOE suppliers also differs by industry. Table 2 provides an overview of the average number of state suppliers and share in total input purchases by industry.[18] We find relatively heterogeneous prevalence and importance of state suppliers across industries. For both indicators of SOE suppliers, firms active in the manufacturing industries (C) and utility industries (gas, electricity, water, sewage, waste management: D, E) are characterized

[17] We also test for stability by estimating autoregressive models with one-year lags as explanatory variables. Results are displayed in the appendix (Table A5), with columns 1 to 3 including all state-owned suppliers, and columns 4 to 6 only non-utility SOE suppliers. We find a highly significant degree of persistence in having at least one SOE supplier (columns 1 and 4, coefficients around 0.60), as well as in the number of SOE suppliers of a given firm (columns 2 and 5). In columns 3 and 6, we find an even higher level of persistence (coefficients around 0.86) in the number of SOE suppliers conditional on having at least one such supplier (in both years under consideration).

[18] For the purpose of this overview, we first aggregate, over each firm, all years by calculating the median number and share of SOE suppliers per firm.

Figure 3: SOE suppliers per firm, evolution over time



3(a) Number of SOE suppliers

3(b) Input share of SOE suppliers

NOTES: Mean number of state suppliers and share of inputs purchased from state suppliers by year. Moving average filter applied: (1/4)*[x(t-3) + x(t-2) + x(t-1) + x(t)]. Extensive margin refers to firms purchasing input supplies from state firms for the first time in the given year. Intensive margin refers to firms that already purchased such inputs in previous years. Values indicate the average number of SOE suppliers (e.g. 0.3 suppliers) in Figure 3a, and the average share of inputs sourced from SOE suppliers (e.g. 1.5%) in Figure 3b.

by the highest prevalence of SOE suppliers and largest SOE shares, while construction (F), retail (G), and accommodation (I) industries typically have a low prevalence.

Finally, Figure 4 plots the evolution of both input purchases from SOEs (as previously), as well as output sales to SOEs. We observe that both indicators portray an increasing trend, with input purchases from government-owned firms rising more rapidly than output sales to these firms. Levels are relatively similar, averaging around 0.3 SOE suppliers/customers per firm, and 1% of input purchases/output sales from/to SOEs.

4.2 Determinants of purchasing inputs from state suppliers

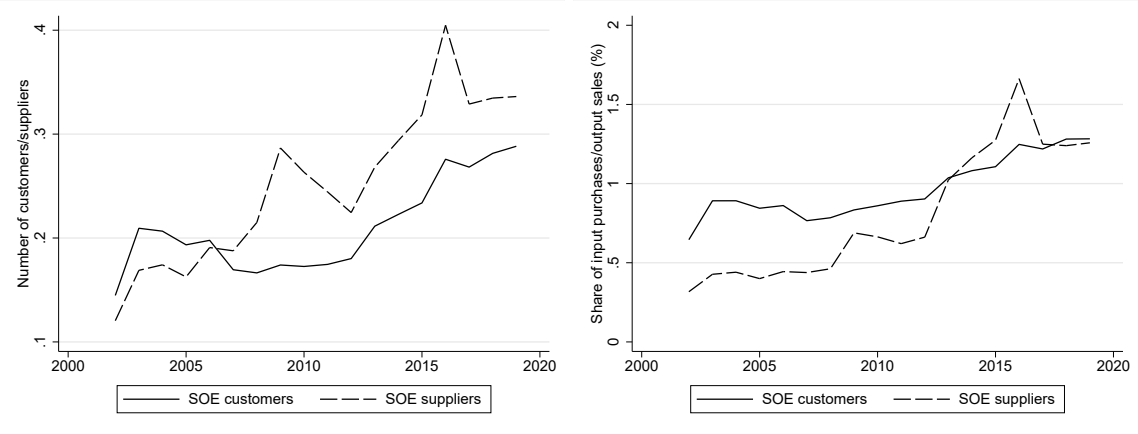
Particular firm traits may correlate with varying levels of input purchases from SOEs. In section 4.1, we provided evidence for heterogeneity by industry. In this exercise, we construct simple probit models regressing a dummy variable indicating whether a firm has a state supplier (column 1 of Table 3), on various firm-level characteristics, controlling for industry, size and/or profitability, and year fixed effects (in column 2). Similarly, we also allow for non-linearity in the relationship between firm characteristics and the likelihood of having a state supplier by distinguishing groups of firms with state suppliers for which the proportion of inputs purchased from such suppliers is lower than 10% and higher than 10% (columns 3 and 4). We hypothesize that firms with input purchase shares above 10% are more driven by strategic objectives, and are therefore likely to possess different characteristics. Industry controls are 2-digit industry fixed effects, size control variables include firm turnover and total assets. Each coefficient in Table 3 is the result of a separate regression.

Table 2: SOE suppliers per firm, by industry

Industry		Average number of suppliers	Average share of inputs (%)	Total number of firms in industry	Firms with at least one SOE supplier
CA	Manufacture of food products, beverages and tobacco products	0.27	0.22	6623	1605
CB	Manufacture of textiles, apparel, leather and related products	0.36	0.35	2474	715
CC	Manufacture of wood and paper products, and printing	0.26	0.40	5868	1354
CE	Manufacture of chemicals and chemical products	0.97	0.52	1156	506
CF	Manufacture of pharmaceuticals, medicinal chemical and botanical products	0.64	0.81	482	152
CG	Manufacture of rubber and plastics products, and other non-metallic mineral products	0.43	0.25	2857	829
CH	Manufacture of basic metals and fabricated metal products, except machinery and equipment	0.27	0.22	6980	1569
CI	Manufacture of computer, electronic and optical products	0.53	0.97	971	328
CJ	Manufacture of electrical equipment	0.55	0.41	891	298
CK	Manufacture of machinery and equipment n.e.c.	0.47	0.32	2170	702
CL	Manufacture of transport equipment	0.57	0.65	681	219
CM	Other manufacturing, and repair and installation of machinery and equipment	0.20	0.33	5396	1100
D	Electricity, gas, steam and air-conditioning supply	0.67	2.03	972	260
E	Water supply, sewerage, waste management and remediation	0.51	1.01	1492	427
F	Construction	0.10	0.18	88630	13140
G	Wholesale and retail trade, repair of motor vehicles and motorcycles	0.18	0.44	139736	27391
H	Transportation and storage	0.25	0.93	20912	4074
I	Accommodation and food service activities	0.07	0.23	47594	8169
JA	Publishing, audiovisual and broadcasting activities	0.21	0.57	5693	1013
JB	Telecommunications	0.38	1.30	1561	347
JC	IT and other information services	0.14	0.79	26445	3890
L	Real estate activities	0.04	0.32	48767	10861
MA	Legal, accounting, management, architecture, engineering, technical testing and analysis	0.09	0.47	110896	14006
MC	Other professional, scientific and technical activities	0.11	0.45	6570	915

NOTES: Aggregated by calculating the average by industry of the median number of state-owned suppliers and share of inputs purchased from state suppliers for each unique firm.

Figure 4: SOE customers per firm, evolution over time



4(a) Number of SOE customers

4(b) Output share of SOE customers

NOTES: Mean number of state customers and share of outputs sold to state customers by year. SOE supplier lines included for reasons of comparison. Moving average filter applied: (1/4)*[x(t-3) + x(t-2) + x(t-1) + x(t)]. Values indicate the average number of SOE suppliers (e.g. 0.3 suppliers) in Figure 4a, and the average share of inputs sourced from SOE suppliers (e.g. 1.5%) in Figure 4b.

All explanatory variables are standardized to allow for easier comparisons. We exclude state-owned firms. The discussed estimation results are derived from specifications incorporating control variables. Since the dependent variables are binary, we estimate probit models and present coefficients. These coefficients are then transformed into average marginal effects in the text below.

First, we observe that firms with a one standard deviation higher likelihood of selling their outputs to at least one SOE customer, are also 3.19% more likely to purchase inputs from SOE suppliers (t = 43.26). Second, we find that larger firms are associated with higher levels of purchases from SOE suppliers, the largest effect being for turnover: firms with a one standard deviation higher turnover, are 17.11% more likely to engage with at least one state-owned supplier (t = 46.61). Effects are also highly significant for the number of employees (13.74%, t = 64.51) and total assets (11.61%, t = 40.89).

Third, we find that manufacturing firms are associated with substantially higher likelihoods of purchasing inputs from at least one state-owned supplier (1.32%, t = 5.84). We do not find that utility firms and transportation firms are significantly more likely to have such supplier(s), after controlling for size. Fourth, surprisingly, foreign firms purchase more inputs from government-owned suppliers, despite controlling for their typically larger size, though the effect is small (0.74%, t = 17.42). We do not find a significant relationship regarding listed firms.

Fifth, more leveraged firms (2.22%, t = 19.66) are more likely to utilize SOE suppliers, while more productive (-3.45%, t = -9.46), more profitable (-2.12%, t = -24.34), more financially constrained firms, as defined by the ASCL score (-0.42%, t = -3.13), and firms facing higher implicit interest rates (-2.93%, t = -14.63) are less likely to maintain at least one SOE supplier. Wage cost per

employee is not significantly related to utilizing SOE suppliers. Sixth, we find that both trade credit provided and received are positively associated with higher likelihoods of utilizing SOE suppliers (respectively 3.34%, t = 13.72 and 6.26%, t = 25.70). Finally, we find that a firm's effective tax rate is not associated with a higher likelihood to be supplied by at least one SOE.

Results in columns 3 and 4 reveal substantial non-linearity in the relationships between the firm characteristics evaluated before, and the share of inputs a private firm purchases from state-owned suppliers. In most cases, the previously found overall effects are the strongest for firms purchasing less than 10% of their inputs from SOEs. For example, the observation that mostly larger firms have at least one state supplier, holds substantially more predictive power for firms with input shares below 10%. This implies that, among others, firm characteristics like firm size, are less apt at explaining why we observe higher SOE input shares. We rationalize this by the fact that firms with larger shares of SOE inputs, are typically different (i.e. they have specific reasons to purchase such inputs) beyond the explanatory factors we included in this exercise.

Analyzing the relationship of interest across various ranges of SOE input shares also contributes to clarifying the insignificance of certain previously obtained results. Utility and transportation firms, for example, are only (significantly) positively related with SOE input shares above 10%. This may be because these firms have specific operational and strategic needs that drive them to rely more heavily on state-owned suppliers when the proportion of their inputs from such suppliers is substantial. They might require the stability and reliability that SOEs can provide, which becomes more apparent when their reliance on SOEs surpasses the 10% threshold.

5 State suppliers and performance, profitability

The primary aim of this paper is to examine how purchasing inputs from state-owned suppliers relates to the firm's performance and profitability. The expected effect is ambiguous. On the one hand, state suppliers may change the incentives of a firm (not) to pursue profit maximization. For example, the performance and profitability of firms could decrease if one assumes that state suppliers are more likely to behave leniently in times of financial distress (e.g. by means of trade credit), or if the quality of the inputs provided is lower. On the other hand, flexibility and financial support by state suppliers may also provide firms with greater opportunities to invest in technology upgrading.

In this paper, we investigate the relationship between SOE suppliers and the following performance/productivity variables. First, we observe the relationship between SOE suppliers and profitability and productivity measures, specifically ROA and TFP.[19] We hypothesize that SOE suppliers may impact a buyer's profitability negatively by supplying lower-quality, more expensive inputs, or by allowing unprofitable firms to survive. Conversely, access to informational and financial resources could enable firms to make better decisions and invest in technology upgrading. Additionally, we estimate the relationship using labor productivity, defined as value added per employee, in the appendix.

Second, we measure financial performance using the leverage ratio.[20] We hypothesize an unam-

[19] As an alternative productivity measure, we also include results for labor productivity, as measured by value added per employee, in the appendix (Table A6).

[20] We also utilize sub-components of the leverage ratio as defined by Kalemli-Özcan et al. (2022). First, we estimate

Table 3: Heterogeneity behind likelihood to have SOE suppliers: estimation results, standard deviations change

		(1)	(2)	(3)	(4)
		State-owned suppliers Probit		$0 \leq$ Input share <10 Probit	Input share ≥ 10 Probit
		Without control variables	With control variables	With control variables	With control variables
A	State-owned customers	0.276*** (57.07)	0.154*** (44.18)	0.147*** (41.55)	0.158*** (31.01)
B	Employees	0.455*** (48.31)	0.443*** (67.40)	0.460*** (71.40)	0.167*** (15.56)
	Turnover	0.851*** (49.32)	0.796*** (58.88)	0.846*** (57.48)	0.299*** (23.22)
	Total assets	0.471*** (25.92)	0.489*** (41.22)	0.556*** (51.81)	0.0734*** (7.68)
C	Manufacturing firms	0.110*** (11.14)	0.0613*** (5.42)	0.0618*** (5.52)	0.0331** (2.74)
	Transportation firms	0.110*** (11.14)	0.00539 (0.45)	-0.00576 (-0.48)	0.0665*** (4.80)
	Utility firms	0.0254*** (7.79)	0.00345 (0.82)	-0.00425 (-1.09)	0.0410*** (8.06)
D	Foreign firms	0.107*** (22.70)	0.0350*** (16.62)	0.0304*** (13.75)	0.0577*** (21.53)
	Listed firms	0.0303*** (34.34)	-0.000980 (-1.18)	-0.00139 (-1.65)	-0.000545 (-0.32)
	Wage cost per employee	0.256*** (16.68)	0.00412 (0.51)	0.00480 (0.60)	0.0159 (1.54)
	TFP	0.172*** (9.54)	-0.110*** (-9.41)	-0.118*** (-10.13)	-0.00617 (-0.38)
	Return on assets (ROA)	0.0472*** (11.59)	-0.101*** (-25.85)	-0.0959*** (-24.91)	-0.0774*** (-16.30)
	Leverage	0.0517*** (10.00)	0.105*** (24.19)	0.114*** (25.56)	0.0187*** (4.14)
	Interest rate	0.0517*** (10.00)	-0.0924*** (-14.67)	-0.0883*** (-13.16)	-0.0483*** (-5.11)
	Financially constrained firms (ASCL score)	0.260*** (35.07)	-0.0188** (-3.03)	-0.00556 (-0.91)	-0.106*** (-16.87)
	Trade credit provided	0.427*** (14.22)	0.159*** (13.98)	0.181*** (15.25)	0.0197 (1.80)
	Trade credit received	0.669*** (30.68)	0.299*** (28.64)	0.357*** (31.47)	0.0370*** (4.20)
E	Tax rate	0.000627 (0.97)	0.0000415 (0.05)	0.0000187 (0.02)	0.000128 (0.27)

NOTES: Each cell contains results from separate regressions. E.g. 2nd row, 2nd column is a regression of "Employees" on "State-owned suppliers", controlling for control variable set B. All explanatory variables are standardized. Continuous variables are defined in natural logarithms. TFP is the total factor productivity estimated by WLP-methodology; RoA is return on assets calculated as P/L over total assets, $Leverage$ is calculated as long-term debt and current liabilities over total assets, as defined by Kalemli-Özcan et al. (2022); $IntRate$ is the implicit interest rate calculated as interest expenses over liabilities; $TaxRate$ is the effective tax rate calculated as tax expenses over P/L before taxes. Control variables used are (A) Industry, size, year, (B) Industry, year, (C) Size, year, (D) Industry, size, year, (E) Industry, size, profitability (return on assets), year. Size control variables are turnover and total assets. Industry control variables are 2-digit industry fixed effects. Profitability control is return on assets. Standard errors are clustered by industry-year combinations. t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

biguously positive effect on leverage, mainly driven by SOE suppliers providing more flexible trade credit. Furthermore, by increasing the survival prospects of unprofitable firms and offering greater opportunities to invest in technology upgrading, these firms would require more debt.

Finally, we measure efficiency by the number of employees, controlling for firm size and industry characteristics. We expect a positive effect on employment if state-owned suppliers are more likely to behave leniently during financial distress, thereby reducing the need for layoffs.

5.1 Methodology

We estimate the relationship between state suppliers and performance/profitability by regressing ROA, leverage, number of employees, and TFP, on a dummy variable indicating whether a firm is supplied by a government-owned firm in the preceding year.[21] Furthermore, we also utilize the number of SOE suppliers as an explanatory variable, and given the potential non-linearity of this relationship, we distinguish groups of firms with state suppliers for which the proportion of inputs purchased from such suppliers is lower than 10% and higher than 10%.[22] As before, we hypothesize that firms with input purchase shares above 10% are more driven by strategic objectives, or are of a particular nature difficult to capture in the data. On the one hand, firms with SOE suppliers may be more prone to pursuing non-economic/societal objectives, negatively affecting firm performance. On the other hand, these firms may also benefit from governmental support in the long run. We jointly include dummy variables corresponding to these groups in a regression. In all specifications, we control for age, foreign ownership, stock exchange listing, and lagged firm size (as measured by turnover and total assets)[23], as well as fixed effects by combinations of industry (2-digit NACE), region (NUTS-3), and year. In the appendix (Table A9), we provide estimation results for key dependent and explanatory variables using an extended set of firm-specific control variables, additionally including lagged capital/labor ratio and material input expenses. Given the relatively high degree of stability, as discussed in section 4.1, differences can be mostly expected between firms, and therefore using firm-level fixed effects is unlikely to yield meaningful results. We estimate all specifications utilizing both the default measure of inputs from state firms, as well as an alternative indicator of state-owned suppliers by excluding those we consider as providing public utilities. Standard errors are clustered by industry-year combinations.

The general structure is as follows:

$$Performance/Profitability_{i,j,k,t} = \beta_1 StateSuppliers_{i,j,k,t-1} + \boldsymbol{X}'_{\boldsymbol{i,j,k,t}}\beta_2 + \gamma_j\gamma_k\gamma_t + \epsilon_{i,j,k,t} \quad (2)$$

using the ratio of trade credit received by the firm over total assets. Second, we re-adopt the ratio defined by Kalemli-Özcan et al. (2022), but excluding trade credit. In this way, the following holds: $leverage = tradeCreditRatio + leverage_noTradeCredit$.

[21] Lagging the explanatory variable of interest may also alleviate simultaneity concerns.

[22] In the appendix (section A.3), we also estimate models exploiting cross-sectional variation between firms regarding state suppliers, by assuming firms to have SOE suppliers when (1) they do so in at least one year of their existence, (2) they do so in at least 75% of the years observed. Results largely hold also for these alternative assumptions.

[23] We hypothesize more mature, larger, foreign, and listed firms to have higher performance. Furthermore, we believe there is likely some correlation between having SOE suppliers, and the control variables. For example, younger and less mature firms could opt to purchase inputs from SOE suppliers for strategic purposes, e.g. more flexibility during the start-up phase. They may also be less able to diversify their supply chain given their smaller size. We assume foreign-owned firms, on the other hand, to have a broader and more international supply chain, making them less likely to purchase inputs from SOEs.

with firm i, industry j, NUTS-3 region k, and year t, and $\boldsymbol{X}'_{\boldsymbol{i,j,k,t}}$ a vector of firm-specific control variables: firm age, foreign ownership, stock exchange listing, and lagged firm size (as measured by turnover and total assets).

5.2 Baseline results

Results are presented in tables 4 (ROA), 5 (leverage), 6 (number of employees) and 7 (TFP). Columns 1 to 6 in each table include results utilizing information from all state suppliers in our sample, whereas columns 7 and 8, otherwise repeating columns 1 and 6, restrict this to input purchases from non-utility SOEs. Column 1 in each table presents baseline results, using a binary indicator of whether a firm purchases inputs from at least one state supplier as the explanatory variable of interest. In column 2, this binary indicator is replaced by the (discrete) number of such suppliers. Column 3 exploits the potential non-linearity in the previous relationship by evaluating whether different degrees of input purchases heterogeneously affect firm productivity and profitability. The remaining columns will be discussed later in this paper.

We find that purchasing inputs from a state-owned supplier is strongly associated with lower values of profitability: ROA is 1.87 percentage points (t = -16.94) lower. Such firms are also 19.7% (t = 30.60) more leveraged, and employ 24.2% (t = 20.86) more workers (note that we control for firm size in all specifications). Similarly, we find a negative relationship regarding productivity (TFP and labor productivity): TFP decreases with 6.13% (t = -7.60). The lower profitability found corresponds to the hypothesis that inputs from state suppliers may be of inferior quality, or purchased at a higher cost, and that firms are more likely to pursue non-economic objectives in response to government support. The heightened leverage ratio provides evidence for the hypothesis that government support manifests through government-induced debt, enabling financially troubled firms to sustain their operations. The larger number of employees may be an indication of the non-economic motives of government-supported firms. The results continue to hold if we exclude utility government-owned suppliers, with coefficients similar to those for input purchases from all state suppliers.

The finding of the positive effect on leverage can be interpreted in two ways. On the one hand, it may indicate that private firms hold more long-term debt, potentially issued by government-owned institutions. On the other hand, the result could also be driven by state suppliers providing more trade credit to private firms. Given that both components of debt are included in the numerator of the leverage ratio defined by Kalemli-Özcan et al. (2022), in the appendix (tables A7 and A8), we also provide results for these two sub-components of the leverage ratio.[24] We find that the positive effect of state suppliers on leverage holds for both of these sub-components, although coefficients are smaller for the leverage ratio excluding trade credit. This indicates that firms with (more) SOE suppliers indeed hold more long-term debt, relative to total assets, but that this previously-found relationship was partly driven by the larger provision of trade credit by these suppliers.

Similarly, evaluating the relationship between a discrete increase in the number of state-owned sup-

[24]These subcomponents are: (1) the ratio of trade credit received by the firm over total assets, (2) the ratio defined by Kalemli-Özcan et al. (2022), but excluding trade credit. In this way, the following holds: $leverage = tradeCreditRatio + leverage\_noTradeCredit$.

Table 4: State suppliers and ROA: estimation results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All state suppliers						Excl. utility state suppliers	
State suppliers $(t-1)$	-0.0187*** (-16.94)				-0.0176*** (-14.84)	-0.0175*** (-14.74)	-0.0222*** (-16.20)	-0.0211*** (-13.57)
# of state suppliers $(t-1)$		-0.0101*** (-23.44)						
State suppliers $(t-1)$ with $0 \leq$ Input share < 10			-0.0189*** (-17.01)					
State suppliers $(t-1)$ with Input share ≥ 10			-0.0162*** (-7.83)					
Politically connected $(t-1)$				-0.0167*** (-6.85)	-0.0157*** (-6.01)	-0.0100*** (-2.73)		-0.0102*** (-2.76)
Politically connected $(t-1)$ x State suppliers $(t-1)$						-0.0125*** (-3.09)		-0.0124*** (-2.79)
Industry x region x year FE	Y	Y	Y	Y	Y	Y	Y	Y
Control variables	Y	Y	Y	Y	Y	Y	Y	Y
N	2162327	2162327	2162327	1597499	1440534	1440534	2050433	1349480

NOTES: ROA is return on assets calculated as net income over total assets. Coefficients are derived from OLS models. # of state suppliers $(t-1)$ is a discrete variable, other explanatory variables shown in the table are binary indicators. Columns 7 and 8 re-estimate columns 1 and 6, respectively, utilizing a (more restrictive) definition of state suppliers excluding utility SOEs. Control variables are firms-specific and consist of age, foreign ownership, stock exchange listing, and lagged firm size (as measured by turnover and total assets). We also include fixed effects by by combinations of industry (2-digit NACE), region (NUTS-3), and year. Standard errors are clustered by industry-year combinations. t statistics in parentheses. * $p < 0.01$, ** $p < 0.05$, *** $p < 0.01$

pliers and firm performance, we find negative estimates regarding profitability and profitability, and positive estimates for leverage and employment. For example, one additional SOE supplier is associated with a 1.01 percentage points (t = -23.44) lower ROA, an 8.29% (t = 33.95) larger leverage ratio, and 15.1% (t = 29.56) more workers.

We also find that the aforementioned relationships are subject to substantial non-linearity. With respect to leverage, employment and productivity, we find that the impact of input purchases from state firms decreases in the share of such inputs in the total input purchases of firms. We only find a significant negative association with TFP for firms purchasing less than 10% (-6.35%, t = -7.98), and not for input purchase shares higher than 10%. Excluding utility suppliers, however, the coefficient on input purchases above 10% becomes significantly positive (3.18%, t = 1.94). Similarly, regarding leverage, we find that the impact of state input purchases decreases, from 20.7% (t = 30.33) for input purchase shares below 10%, to 9.09% (t = 11.37) for purchase shares above 10%. For employment this is 24.9% (t = 20.76) and 12.6% (t = 9.15), respectively. For firm profitability (ROA), however, we do not detect substantial non-linearity. These findings go against the common logic that more political influence results in a larger impact on firm behavior. One possible explanation is that with larger SOE input shares, indicating greater political influence, positive effects of such influence may emerge (e.g., increased risk-taking and innovation). Furthermore, such firms may also encounter heightened public scrutiny.

Table 5: State suppliers and leverage: estimation results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All state suppliers						Excl. utility state suppliers	
State suppliers $(t-1)$	0.197***				0.204***	0.202***	0.211***	0.220***
	(30.60)				(28.23)	(28.16)	(30.24)	(27.49)
# of state suppliers $(t-1)$		0.0829***						
		(33.95)						
State suppliers $(t-1)$ with $0 \leq$ Input share < 10			0.207***					
			(30.33)					
State suppliers $(t-1)$ with Input share ≥ 10			0.0909***					
			(11.37)					
Politically connected $(t-1)$				0.0999***	0.0854***	0.0212		0.0260
				(5.08)	(4.36)	(0.88)		(1.07)
Politically connected $(t-1)$ x State suppliers $(t-1)$						0.138***		0.125***
						(4.98)		(4.14)
Industry x region x year FE	Y	Y	Y	Y	Y	Y	Y	Y
Control variables	Y	Y	Y	Y	Y	Y	Y	Y
N	2135449	2135449	2135449	1586923	1433075	1433075	2024203	1342446

NOTES: Leverage is calculated as long-term debt and current liabilities over total assets, as defined by Kalemli-Özcan et al. (2022), defined in natural logarithm. Coefficients are derived from OLS models. # of state suppliers $(t-1)$ is a discrete variable, other explanatory variables shown in the table are binary indicators. Columns 7 and 8 re-estimate columns 1 and 6, respectively, utilizing a (more restrictive) definition of state suppliers excluding utility SOEs. Control variables are firms-specific and consist of age, foreign ownership, stock exchange listing, and lagged firm size (as measured by turnover and total assets). We also include fixed effects by by combinations of industry (2-digit NACE), region (NUTS-3), and year. Standard errors are clustered by industry-year combinations. t statistics in parentheses. * $p < 0.01$, ** $p < 0.05$, *** $p < 0.01$

Table 6: State suppliers and number of employees: estimation results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All state suppliers						Excl. utility state suppliers	
State suppliers $(t-1)$	0.242***				0.233***	0.230***	0.276***	0.266***
	(20.86)				(17.16)	(17.04)	(18.97)	(15.17)
# of state suppliers $(t-1)$		0.151***						
		(29.56)						
State suppliers $(t-1)$ with $0 \leq$ Input share < 10			0.249***					
			(20.76)					
State suppliers $(t-1)$ with Input share ≥ 10			0.126***					
			(9.15)					
Politically connected $(t-1)$				0.224***	0.191***	0.0696***		0.0725***
				(10.11)	(7.88)	(3.63)		(3.90)
Politically connected $(t-1)$ x State suppliers $(t-1)$						0.210***		0.246***
						(6.91)		(7.31)
Industry x region x year FE	Y	Y	Y	Y	Y	Y	Y	Y
Control variables	Y	Y	Y	Y	Y	Y	Y	Y
N	1078728	1078728	1078728	773095	752819	752819	995920	684826

NOTES: Dependent variable is defined in natural logarithm. Coefficients are derived from OLS models. # of state suppliers $(t-1)$ is a discrete variable, other explanatory variables shown in the table are binary indicators. Columns 7 and 8 re-estimate columns 1 and 6, respectively, utilizing a (more restrictive) definition of state suppliers excluding utility SOEs. Control variables are firms-specific and consist of age, foreign ownership, stock exchange listing, and lagged firm size (as measured by turnover and total assets). We also include fixed effects by by combinations of industry (2-digit NACE), region (NUTS-3), and year. Standard errors are clustered by industry-year combinations. t statistics in parentheses. * $p < 0.01$, ** $p < 0.05$, *** $p < 0.01$

Table 7: State suppliers and TFP: estimation results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All state suppliers						Excl. utility state suppliers	
State suppliers $(t-1)$	-0.0613***				-0.0608***	-0.0607***	-0.0597***	-0.0608***
	(-7.60)				(-6.91)	(-6.84)	(-6.99)	(-6.35)
# of state suppliers $(t-1)$		-0.0201***						
		(-8.72)						
State suppliers $(t-1)$ with $0 \leq$ Input share < 10			-0.0635***					
			(-7.98)					
State suppliers $(t-1)$ with Input share ≥ 10			-0.0108					
			(-0.69)					
Politically connected $(t-1)$				-0.0752***	-0.0590***	-0.0519**		-0.0577**
				(-7.71)	(-6.20)	(-2.32)		(-2.54)
Politically connected $(t-1)$ x State suppliers $(t-1)$						-0.00879		-0.00376
						(-0.37)		(-0.15)
Industry x region x year FE	Y	Y	Y	Y	Y	Y	Y	Y
Control variables	Y	Y	Y	Y	Y	Y	Y	Y
N	159713	159713	159713	129506	128440	128440	142447	112753

NOTES: TFP is the total factor productivity estimated by WLP-methodology, defined in natural logarithm. Coefficients are derived from OLS models. # of state suppliers $(t-1)$ is a discrete variable, other explanatory variables shown in the table are binary indicators. Columns 7 and 8 re-estimate columns 1 and 6, respectively, utilizing a (more restrictive) definition of state suppliers excluding utility SOEs. Control variables are firms-specific and consist of age, foreign ownership, stock exchange listing, and lagged firm size (as measured by turnover and total assets). We also include fixed effects by by combinations of industry (2-digit NACE), region (NUTS-3), and year. Standard errors are clustered by industry-year combinations. t statistics in parentheses. * $p < 0.01$, ** $p < 0.05$, *** $p < 0.01$

6 Political connections and firm behavior

Previous sections treated the characteristics and performance impact of private firms purchasing inputs from SOE suppliers with the hypothesis that this way, governments exert a degree of influence over private firms. However, this may not be the only channel through which governments steer the private economy. More commonly discussed in the literature is the direct presence of politicians on firm's boards. In this section, we discuss the interplay between these two channels. Indeed, one may argue that businesses with direct political connections are more likely to purchase inputs from SOE suppliers, for instance, to advance the goals of the government, to 'do a favor' to other politicians, or to gain political popularity by ensuring employment in SOEs. We discuss this relationship in section 6.1. Furthermore, if these two channels of political influence are indeed linked, state suppliers may simply proxy for the more established channel of political connections through the presence of politicians in firm's boards. To that avail, as we will discuss in section 6.2, we jointly include both channels into our models.

6.1 Political connections as predictor for SOE suppliers

Government level and region Private firms are subject to varying degrees of political connections and purchases from state suppliers. In this section, we attempt to shed light on the correlation between political connections in private firms and the importance of SOE suppliers for these firms. We believe that these two channels of government influence on the private economy may indeed be linked. For example, we hypothesize that politicians present on the board of a private firm are more likely to stimulate the firm to purchase inputs from SOE suppliers (e.g. to advance government ob-

jectives or gain popularity among colleague-politicians and voters). We estimate models, similar to those from section 4.2 on heterogeneity between firms with/without SOE suppliers, again including size controls, industry fixed effects and year fixed effects. Table 8 presents results. We convert the coefficients in the tables to average marginal effects in the text below. The first column contains results from specifications with a dummy as dependent variable indicating whether a private firm has at least one state supplier. The remaining two columns exploit the non-linearity in this relationship by distinguishing groups of firms with state suppliers for which the proportion of inputs purchased from such suppliers is lower than 10% and higher than 10%.

First, we estimate the relationship between political connections in private firms and SOE suppliers, and find that connected firms are indeed more likely to purchase inputs from state suppliers. This association, while significant, is relatively small (2.76%, t = 6.62), and increases with input purchase shares. This implies that political connections are more substantially related to a higher likelihood that private firms purchase inputs from state-owned suppliers for large input shares.

Second, we observe whether this general relationship is driven by a particular level of government connections. Privately-owned firms with federal political connections are significantly more likely to purchase SOE inputs (4.14%, t = 5.91) than firms with municipal (2.07%, t = 3.36) or regional connections (1.93%, t = 3.34). This provides evidence for the fact that mostly firms with high-level connections portray different behavior. This could be due to politicians on higher levels being able to exert more influence, as well as due to monitoring being more difficult on these levels. For federal and regional connections, the effect is again larger for greater input purchase shares, while it is relatively stable regarding municipal connections, again confirming the hypothesis that firms with high-level connections are of a peculiar nature.

Third, we exploit the fact that the political system in Belgium is very fragmented. Political parties are linked to language communities, such that there exist Flemish and Walloon parties, with relatively limited interaction or media coverage between these groups. It is therefore possible that the political culture differs between these two regions, implying that the effects of political connections on private firms based in these regions may also differ. We indeed find that mostly firms based in Wallonia are associated with a higher likelihood of purchasing inputs from SOE suppliers (4.19%, t = 5.59), while Flanders-based firms are associated with substantially smaller likelihoods (2.04%, t = 4.13). Both associations are again more pronounced with regard to larger input purchase shares.

Fourth, we evaluate the relationship between political connections and firm performance jointly by region and level of connections. We find the largest associations for Wallonia-based firms with both federal and regional connections (5.83%, t = 4.61 and 3.10%, t = 3.21 respectively). We continue to find that Flemish firms with political connections are associated with lower likelihoods to have SOE suppliers than Walloon firms, but do observe a relatively large positive association between federal connections and the importance of state suppliers for Flemish firms (3.32%, t = 3.79). This is consistent with the fact that the federal government level is the only level equal for both Flemish and Walloon firms. Furthermore, we find a relatively large, significant positive relationship for municipal connections on the likelihood Flemish firms have state suppliers (2.09%, t = 3.02), while we do not find this relationship in Wallonia (not significant).

Table 8: Political connections and SOE suppliers - government level and region: estimation results

	(1) State-owned suppliers Probit	(2) $0 \leq$ Input share < 10 Probit	(3) Input share ≥ 10 Probit
Private firm with political connections	0.124*** (6.90)	0.108*** (6.00)	0.295*** (10.80)
Private firm with municipal connections	0.0939*** (3.48)	0.108*** (4.17)	0.109*** (2.62)
Private firm with regional connections	0.0880*** (3.43)	0.0504* (1.95)	0.323*** (8.00)
Private firm with federal connections	0.183*** (6.26)	0.178*** (5.91)	0.257*** (5.06)
Flanders x Private firm with political connections	0.0928*** (4.26)	0.0905*** (4.15)	0.171*** (4.99)
Wallonia x Private firm with political connections	0.185*** (5.92)	0.148*** (4.51)	0.491*** (11.17)
Flanders x Private firm with municipal connections	0.0948*** (3.12)	0.107*** (3.64)	0.102** (2.24)
Flanders x Private firm with regional connections	0.0483* (1.72)	0.0268 (0.95)	0.184*** (3.09)
Flanders x Private firm with federal connections	0.148*** (3.96)	0.155*** (3.92)	0.171** (2.50)
Wallonia x Private firm with municipal connections	0.0827 (1.58)	0.0809 (1.51)	0.255*** (2.67)
Wallonia x Private firm with regional connections	0.139*** (3.35)	0.0974** (2.19)	0.453*** (7.42)
Wallonia x Private firm with federal connections	0.252*** (4.96)	0.227*** (4.28)	0.363*** (4.65)

NOTES: Each cell contains results from separate regressions. E.g. 2nd row, 2nd column is a regression of "Private firm with political connections" on "State-owned suppliers". Specifications include size (turnover and total assets), industry (2-digit level) and year controls. Standard errors are clustered by industry-year combinations. t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Government and political ideology Politicians belong to specific political parties, which may or may not be in government. It is likely that the extent to which political connections have the capacity to exert an influence on decisions of private firms, depends on whether their party is in power at the given moment. Similarly, political ideology may partly shape the relationship between politicians and firms. However, the effect of this is not clear *a priori*. One could argue, for example, that left-wing parties are more keen on playing an active role in private firms given their overall more interventionist stance. In the context of this paper, firms subject to such political connections may therefore be more likely to purchase inputs from state-owned suppliers. On the other hand, right-wing politicians are typically (ideologically) closer to the corporate economy through their belief in the importance of private initiative for economic growth, which makes it plausible that they are better able to exert influence over private businesses. As discussed in our introduction of the data in section 3, we are only able to identify and categorize political parties for certain groups of political connections. We do so for the regional and federal elections of 2014 and 2018, as well as for the 2010 federal elections.

Results are presented in Table 9. First, given that we only possess information on the party affiliation of politicians for a limited number of elections, to establish a benchmark, we first correct the estimates with regard to overall political connections for the non-inclusion of elections for which we do not observe (groups of) parties. By doing this, we obtain marginal effects around double the size of those without correction (i.e. firms with political connections are 9.00% more likely to purchase inputs from SOE suppliers, t = 8.95). One possible reason for this observation is that we previously identified the strongest association for federal connections, which now constitute the largest portion of political connections retained.

Second, we find that firms with political connections from in-government parties are associated with

Table 9: Political connections and SOE suppliers - government and political ideology: estimation results

	(1) State-owned suppliers Probit	(2) 0 ≤ Input share < 10 Probit	(3) Input share ≥ 10 Probit
Private firm with political connections (political parties identified)	0.376*** (9.91)	0.366*** (8.99)	0.517*** (8.82)
Private firm with political connections from an in-government party	0.446*** (10.51)	0.441*** (10.06)	0.597*** (8.09)
Private firm with political connections from an out-of-government party	0.169*** (2.81)	0.152** (2.45)	0.254** (2.16)
Private firm with political connections from a left-wing party	0.229*** (4.83)	0.228*** (4.65)	0.275*** (3.32)
Private firm with political connections from a right-wing party	0.328*** (6.25)	0.325*** (6.12)	0.373*** (4.28)
Private firm with political connections from a left-wing in-government party	0.325*** (3.95)	0.308*** (3.66)	0.467*** (3.62)
Private firm with political connections from a right-wing in-government party	0.478*** (7.70)	0.476*** (7.70)	0.537*** (5.07)
Private firm with political connections from a left-wing out-of-government party	0.153** (1.99)	0.169** (2.17)	0.0310 (0.19)
Private firm with political connections from a right-wing out-of-government party	0.109 (1.00)	0.0606 (0.53)	0.480*** (2.59)
Flanders x Private firm with political connections from a left-wing party	0.178** (2.21)	0.208** (2.52)	-0.0840 (-0.55)
Flanders x Private firm with political connections from a right-wing party	0.208*** (2.69)	0.227*** (2.87)	0.0727 (0.51)
Wallonia x Private firm with political connections from a left-wing party	0.282*** (3.81)	0.252*** (3.19)	0.479*** (3.79)
Wallonia x Private firm with political connections from a right-wing party	0.536*** (5.17)	0.533*** (5.12)	0.561*** (3.26)

NOTES: Each cell contains results from separate regressions. E.g. 2nd row, 2nd column is a regression of "Private firm with political connections" on "State-owned suppliers". Specifications include size (turnover and total assets), industry (2-digit level) and year controls. Standard errors are clustered by industry-year combinations. t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

substantially higher likelihoods of purchasing inputs from SOE suppliers (10.4%, t = 9.25) than those with connections from out-of-government parties (3.60%,t = 2.65). We again observe that the positive associations found for both connections from in-government and out-of-government parties, are stronger for input shares of at least 10% than for those below 10%. Third, contrary to our hypothesis, firms with only right-wing political connections are associated with higher likelihoods of having at least one SOE supplier (7.74% more likely, t = 5.72 instead of 5.25%, t = 4.52). The difference between these estimation results, however, is not significant.

Fourth, we interact the political connection's ideology (left/right) with variables indicating whether the connection is from an in-government or out-of-government party. We continue to find that firms with in-government connections are significantly more likely to purchase inputs from SOE suppliers, and this especially for right-wing connections (11.75%, t = 6.87, versus 7.66% for left-wing connections, t = 3.62). The estimate for right-wing out-of-government connections, on the other hand, is not significant, while that of left-wing out-of-government parties is (3.43%, t = 1.90). This indicates that left-wing parties are better able to exert influence over the business economy if they are out of government than right-wing parties.

Finally, interacting the firm's locations and ideological positioning of their political connections, the result that political connections matter more for Walloon firms, prevails: again, both left-wing (6.57%, t = 3.52) and right-wing (13.34%, t = 4.57) connections in Wallonia are associated with higher likelihoods of purchasing inputs from SOE suppliers. However, the gap between left-wing and right-wing connections is substantially wider (i.e. we find a stronger effect on the likelihood a firm has a SOE supplier) for Walloon firms than for Flemish firms: 4.03% (t = 2.10) for left-wing, and 4.75% (t = 2.53) for right-wing connections, respectively.

Alternative specification In the spirit of Boubakri et al. (2008), in the appendix (Table A10), for select types of political connections, we estimate alternative specifications using the (continuous) proportion of input purchases from state-owned suppliers relative to total input purchases. In the first column, we estimate OLS models, whereas in the second column, we include results from Tobit models. Results indicate that politically connected firms purchase inputs from SOE suppliers with a value 0.748 percentage points higher (Tobit, t = 3.33), as a percentage of total input purchases. We find that regional political connections, as well as political connections from in-government parties and right-wing parties, are the most strongly associated with larger SOE input shares.

6.2 Firm performance estimations

In section 5, we estimated the relationship between state suppliers and firm performance. However, we found in the previous section (section 6.1) that the two channels of political influence (i.e. through state-owned suppliers and by the presence of politicians on the boards of firms) are linked. Therefore, one may assert that state suppliers simply proxy for the presence of politicians on firm's boards, without adding additional value. To this avail, we first estimate the relationship between political connections and firm performance similar to that of state suppliers, by including a dummy variable indicating whether a firm has a politician as director, administrator, or other individual exerting control over the management of the company. We then estimate specifications jointly including both explanatory variables. This allows us to evaluate whether one of these explanatory factors loses significance when controlling for the other. We finally interact state supplier and political connection variables to test whether there is an interplay between these two aspects of potential political influence on firms.

$$Productivity/Profitability_{i,j,k,t} = \beta_1 StateSuppliers_{i,j,k,t-1} + \beta_2 PoliticallyConnected_{i,j,k,t-1} + \beta_3 StateSuppliers_{i,j,k,t-1} * PoliticallyConnected_{i,j,k,t-1} + \boldsymbol{X'_{i,j,k,t}}\beta_4 + \gamma_j\gamma_k\gamma_t + \epsilon_{i,j,k,t} \quad (3)$$

with firm i, industry j, NUTS-3 region k, and year t, and $\boldsymbol{X'_{i,j,t}}$ a vector of firm-specific control variables: firm age, foreign ownership, stock exchange listing, and lagged firm size (as measured by turnover and total assets).

6.2.1 Results

The results of this exercise were included in columns 4 to 6 and 10 to 12 of the previous tables (Table 4 for ROA, Table 5 for leverage, Table 6 for number of employees, and Table 7 for TFP). Column 4 includes dummy variables indicating whether a firm is politically connected in the preceding year. In column 5, we jointly include both aspects of (potential) government support. In columns 6 and 8, we additionally interact these two potential channels of government influence. As before, columns 1 to 6 utilize input purchases from all state suppliers in our sample, whereas columns 7 and 8 restrict this to input purchases from non-utility SOEs.

We find that political connections are significantly negatively associated with profitability (ROA:

-1.67 percentage points, t = -6.85), and positively associated with leverage (9.99%, t = 5.08)[25] and number of employees (22.4%, t = 10.11). Furthermore, we also find a negative association with productivity. (TFP: -7.52%, t = -7.71). These results may again indicate that political influence on private firms occurs by allowing poorly performing firms to survive by means of government-provided debt. It could also signify greater attention to non-economic motives among such firms (i.e. beyond profit-seeking, e.g. ensuring employment), or potentially greater risk-taking. When we jointly include both state supplier and political connection indicator variables, we continue to find effects of similar significance and magnitude (albeit marginally smaller for the political connections dummies). These results imply that government support affects a firm's productivity, profitability, leverage, and employment, both by means of state-owned suppliers, as well as by being directly present on the boards of firms, and that both of these methods play a sizable role simultaneously. We also find that both the base coefficients and the interaction terms are significant with the same signs for ROA and employment, though not for leverage and TFP. This finding indicates that state suppliers and political connections do not only adversely affect firm performance separately, but also reinforce each other in their impact on the ROA and employment of firms. This can be rationalized by the hypothesis that politicians on the boards of firms can more easily support this firm through SOE suppliers rather than providing direct assistance (as state support is often controversial and/or illegal).

7 Conclusion

Amid a global trend towards deregulation and liberalization, governments continue to exert a sizeable influence on the private economy. In this paper, we investigate the prevalence, characteristics, and relationship with firm performance of one channel of governmental influence: state ownership among the suppliers of private firms. Utilizing firm-level transaction data pertaining to Belgian enterprises, our study provides a more direct and precise estimation of the relationship between government ownership in upstream industries and the performance metrics of privately-owned buyers.

Larger firms, as well as politically connected firms (i.e. firms with politicians on their boards), especially those linked to in-government parties and with federal connections, are more likely to purchase inputs from state-owned suppliers. Importantly, the presence of state suppliers is associated with lower firm profitability and productivity, as well as higher leverage and employment, underscoring the influence of government involvement on private enterprise behavior and financial performance. This relationship continues to hold after controlling for the presence of politicians on the firm's boards, which is a more established channel of government intervention in the private economy.

This research not only advances our understanding of the mechanisms through which political influence operates within the private sector but also underscores the importance of considering both the presence of state suppliers and political connections when analyzing the full impact of government involvement in businesses. By shedding light on these two channels, this study contributes to the ongoing dialogue surrounding economic liberalization, state ownership, political influence, and their implications for the performance of firms in today's dynamic economic landscape. More specifically,

[25] In the appendix (Table A8), we show that political connections are not associated with higher levels of trade credit received, relative to total assets. This contrasts with the earlier finding that firms with (more) state suppliers typically have higher levels of trade credit on their balance sheets.

it extends and estimates more directly the existing literature on anti-competitive regulations in upstream product markets (e.g. Bourlès et al., 2013 and Cette et al., 2016).

Nevertheless, this study suffers from some limitations. First, while robust, the results obtained cannot be considered causal impacts given potential simultaneity concerns. Therefore, this paper mainly serves as a first exploratory analysis of the characteristics of private firms with state-owned suppliers. Second, findings from Belgium may not easily be generalized to other institutional contexts, which may limit the policy relevance of this research for countries with substantially different political and legal systems. Third, the number of state-owned suppliers, as well as political connections, is found to be limited for Belgium. Although these firms, often characterized by their larger scale, constitute a substantial portion of the economy, it is plausible that we have not fully grasped the complete spectrum of political influence exerted on the private sector.

A causal analysis could utilize the timing of elections, combined with the election tightness, to address simultaneity concerns in estimating the relationship between SOE suppliers and firm behavior. Firms connected to the incumbent government are more likely to purchase from well-staffed but less efficient SOEs before closely contested elections. This strategy significantly boosts the chances of reelection, as the negative impacts on productivity, market share, and return on assets (ROA) will be felt only after the elections. The opposite reasoning is true for connections linked to the opposition, as these would benefit from making the incumbent government look unfavorable by stimulating employment reductions. Furthermore, one could also exploit regional shocks, as politicians in regions affected by large shocks, may turn to connected firms to source more from SOEs to increase employment in these SOEs. Finally, one could exploit variation in election outcomes to establish a relationship between SOE sourcing before the elections, and more favorable treatment after the election. Such rewards would only surface if the incumbent party indeed wins the election.

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A Appendix

A.1 Tables

Table A1: Overview of elections incorporated in dataset

Local elections (municipal, municipal district, OCMW/CPAS, provinces)																		
VL	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
WL	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
BRU	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
DE	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Regional elections (communities, regions)																		
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Federal elections																		
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
EU elections																		
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019

NOTES: Green cells indicate elections incorporated in the dataset. Grey cells indicate elections not included.

Table A2: Overview of politically connected firms in Belgium

Politically connected firms	21,546 of 545,427 (3.95%)
Firms with federal government connections	2,687
Firms with regional government connections	4,699
Firms with municipal government connections	18,438
Firms with identified in-government connections	1,455
Firms with identified out-of-government connections	1,237
Firms with identified left-wing connections	2,518
Firms with identified right-wing connections	3,316

NOTES: For unique firms. Aggregated by identifying the number of firms with political connections in at least one year of their existence.

Table A3: Summary statistics of key financial variables

Variable	Mean	N	Min	p25	p75	Max
Log number of employees	1.341355	1981729	-4.60517	0.00995	2.080691	12.2387
Log total assets	12.47642	5215724	-4.60517	11.37555	13.57479	26.21636
Log turnover	11.64193	2529703	-4.60517	10.45454	12.95858	27.68118
Log TFP	7.58931	184531	-0.782	7.089351	8.008365	14.32184
Log labor productivity	11.54389	434696	-4.60517	10.99711	11.96753	20.69435
Log wage cost per employee	10.50599	1922082	-4.60517	10.27378	10.82089	20.5201
RoA	-0.0123	5279807	-2.21264	-0.02476	0.086725	0.711259
Tax rate	0.210308	4267277	-22879.1	0	0.342094	41847.86
Leverage ratio	33.61064	4846359	0	0.354086	0.884743	8037154
Implicit interest rate	0.020661	251353	1.34E-05	0.004721	0.028279	0.191868
Financial constraints (ASCL) score	2.177268	3706863	0	1	3	4
Log trade credit provided	7.081815	5315058	-4.60517	6.415113	11.15111	25.34008
Log trade credit received	8.449849	5306155	-4.60517	7.472507	10.98986	25.08705
Foreign firms	97,868 of 5,410,930 firm-year combinations					
Listed firms	2,256 of 5,410,614 firm-year combinations					
Manufacturing firms	395,631 of 5,410,930 firm-year combinations					
Transportation firms	200,611 of 5,410,930 firm-year combinations					
Utility firms	23,556 of 5,410,930 firm-year combinations					

Table A4: Stability: number of year-on-year changes

Number of changes in having at least one SOE supplier	722,845 of 4,293,520 (8.73%)
Number of changes in having at least one non-utility SOE supplier	364,173 of 3,798,338 (9.59%)

Table A5: Stability: AR(1) models

	(1) SOE suppliers (0/1)	(2) # of SOE suppliers	(3) # of SOE suppliers if # ≥ 1	(4) SOE suppliers (0/1)	(5) # of SOE suppliers	(6) # of SOE suppliers if # ≥ 1
	All state suppliers			Excluding utility state suppliers		
SOE suppliers (0/1) $(t-1)$	0.568*** (1394.78)			0.648*** (1613.44)		
# of SOE suppliers $(t-1)$		0.718*** (2031.43)	0.879*** (1138.13)		0.743*** (2067.07)	0.885*** (994.85)
N	4293520	4293520	456886	3798338	3798338	320376

NOTES: Coefficients are derived from OLS (including linear probability) models. t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A6: State suppliers and labor productivity: estimation results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All state suppliers						Excl. utility state suppliers	
State suppliers $(t-1)$	-0.161***				-0.155***	-0.154***	-0.181***	-0.174***
	(-18.23)				(-14.14)	(-14.12)	(-18.57)	(-14.37)
# of state suppliers $(t-1)$		-0.0627***						
		(-18.88)						
State suppliers $(t-1)$ with $0 \leq$ Input share < 10			-0.166***					
			(-18.61)					
State suppliers $(t-1)$ with Input share ≥ 10			-0.0780***					
			(-4.64)					
Politically connected $(t-1)$				-0.0684***	-0.0573***	-0.0140		-0.0137
				(-3.53)	(-2.83)	(-0.52)		(-0.50)
Politically connected $(t-1)$ x State suppliers $(t-1)$						-0.0607		-0.0688*
						(-1.60)		(-1.66)
Industry x region x year FE	Y	Y	Y	Y	Y	Y	Y	Y
Control variables	Y	Y	Y	Y	Y	Y	Y	Y
N	367051	367051	367051	258122	254935	254935	335430	228287

NOTES: Labor productivity is turnover per employee, defined in natural logarithm. Coefficients are derived from OLS models. # of state suppliers $(t-1)$ is a discrete variable, other explanatory variables shown in the table are binary indicators. Columns 7 and 8 re-estimate columns 1 and 6, respectively, utilizing a (more restrictive) definition of state suppliers excluding utility SOEs. Control variables are firms-specific and consist of age, foreign ownership, stock exchange listing, and lagged firm size (as measured by turnover and total assets). We also include fixed effects by by combinations of industry (2-digit NACE), region (NUTS-3), and year. Standard errors are clustered by industry-year combinations. t statistics in parentheses. * $p < 0.01$, ** $p < 0.05$, *** $p < 0.01$

Table A7: State suppliers and leverage (excluding trade credit): estimation results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All state suppliers						Excl. utility state suppliers	
State suppliers $(t-1)$	0.142***				0.158***	0.156***	0.140***	0.157***
	(26.53)				(24.41)	(24.20)	(24.27)	(21.82)
# of state suppliers $(t-1)$		0.0715***						
		(29.71)						
State suppliers $(t-1)$ with $0 \leq$ Input share < 10			0.150***					
			(26.62)					
State suppliers $(t-1)$ with Input share ≥ 10			0.0587***					
			(6.23)					
Politically connected $(t-1)$				0.157***	0.141***	0.0721***		0.0759***
				(7.30)	(6.24)	(2.71)		(2.84)
Politically connected $(t-1)$ x State suppliers $(t-1)$						0.147***		0.141***
						(4.41)		(3.96)
N	2118076	2118076	2118076	1570997	1421042	1421042	2007108	1330647
Industry x region x year FE	Y	Y	Y	Y	Y	Y	Y	Y
Control variables	Y	Y	Y	Y	Y	Y	Y	Y
N	367051	367051	367051	258122	254935	254935	335430	228287

NOTES: Leverage (excluding trade credit) is calculated as long-term debt and current liabilities (excluding trade credit) over total assets, as defined by Kalemli-Özcan et al. (2022), defined in natural logarithm. Coefficients are derived from OLS models. # of state suppliers $(t-1)$ is a discrete variable, other explanatory variables shown in the table are binary indicators. Columns 7 and 8 re-estimate columns 1 and 6, respectively, utilizing a (more restrictive) definition of state suppliers excluding utility SOEs. Control variables are firms-specific and consist of age, foreign ownership, stock exchange listing, and lagged firm size (as measured by turnover and total assets). We also include fixed effects by by combinations of industry (2-digit NACE), region (NUTS-3), and year. Standard errors are clustered by industry-year combinations. t statistics in parentheses. * $p < 0.01$, ** $p < 0.05$, *** $p < 0.01$

Table A8: State suppliers and trade credit ratio: estimation results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All state suppliers						Excl. utility state suppliers	
State suppliers $(t-1)$	0.400***				0.392***	0.392***	0.457***	0.456***
	(26.20)				(23.82)	(23.72)	(25.44)	(22.80)
# of state suppliers $(t-1)$		0.137***						
		(19.62)						
State suppliers $(t-1)$ with $0 \leq$ Input share < 10			0.422***					
			(25.98)					
State suppliers $(t-1)$ with Input share ≥ 10			0.159***					
			(10.48)					
Politically connected $(t-1)$				-0.0378**	-0.0588***	-0.0473***		-0.0450***
				(-2.34)	(-4.08)	(-2.91)		(-2.76)
Politically connected $(t-1)$ x State suppliers $(t-1)$						-0.0247		-0.0241
						(-1.03)		(-1.02)
N	2168485	2168485	2168485	1603245	1445440	1445440	2056206	1354041
Industry x region x year FE	Y	Y	Y	Y	Y	Y	Y	Y
Control variables	Y	Y	Y	Y	Y	Y	Y	Y
N	367051	367051	367051	258122	254935	254935	335430	228287

NOTES: Trade credit ratio is calculated as trade credit received over total assets, defined in natural logarithm. Coefficients are derived from OLS models. # of state suppliers $(t-1)$ is a discrete variable, other explanatory variables shown in the table are binary indicators. Columns 7 and 8 re-estimate columns 1 and 6, respectively, utilizing a (more restrictive) definition of state suppliers excluding utility SOEs. Control variables are firms-specific and consist of age, foreign ownership, stock exchange listing, and lagged firm size (as measured by turnover and total assets). We also include fixed effects by combinations of industry (2-digit NACE), region (NUTS-3), and year. Standard errors are clustered by industry-year combinations. t statistics in parentheses. * $p < 0.01$, ** $p < 0.05$, *** $p < 0.01$

Table A9: State suppliers: estimation results using additional control variables

	(1) RoA	(2) Leverage	(3) Employees	(4) TFP	(5) RoA	(6) Leverage	(7) Employees	(8) TFP
State suppliers $(t-1)$	-0.00654***	0.0753***	0.155***	-0.0623***				
	(-7.13)	(22.62)	(13.79)	(-8.21)				
# of state suppliers $(t-1)$					-0.00491***	0.0377***	0.111***	-0.0236***
					(-13.88)	(24.11)	(20.29)	(-10.91)
N	1019076	1017301	970982	157868	1019076	1017301	970982	157868

NOTES: TA is total assets. ROA is return on assets calculated as net income over total assets. $Leverage$ is calculated as long-term debt and current liabilities over total assets, as defined by Kalemli-Özcan et al. (2022). TFP is the total factor productivity estimated by WLP-methodology. TA, $Turnover$, $Employees$, $Leverage$, and TFP are in natural logarithms. Coefficients are derived from OLS models. Control variables are firms-specific and consist of age, foreign ownership, stock exchange listing, lagged firm size (as measured by turnover and total assets), lagged capital/labor ratio (measured by fixed assets per worker), and lagged material input expenses. We also include fixed effects by by combinations of industry (2-digit NACE), region (NUTS-3), and year. Standard errors are clustered by industry-year combinations. t statistics in parentheses. * $p < 0.01$, ** $p < 0.05$, *** $p < 0.01$

Table A10: Political connections and SOE suppliers: OLS and Tobit estimation results

	(1) Input share OLS	(2) Input share Tobit
Private firm with political connections	0.620*** (6.46)	0.748*** (3.33)
Private firm with municipal connections	0.0666 (1.46)	-0.000201 (-0.00)
Private firm with regional connections	0.209*** (6.46)	0.337*** (7.52)
Private firm with federal connections	-0.00910 (-0.15)	-0.0596 (-0.58)
Private firm with political connections from an in-government party	1.927*** (4.97)	3.318*** (7.07)
Private firm with political connections from an out-of-government party	0.215 (0.79)	0.448 (0.78)
Private firm with political connections from a left-wing party	0.444** (2.16)	1.227*** (3.09)
Private firm with political connections from a right-wing party	1.085*** (3.13)	2.174*** (4.05)

NOTES: Alternative specifications using the (continuous) proportion of input purchases from state-owned suppliers relative to total input purchases. Specifications include size (turnover and total assets), industry (2-digit level) and year controls. Standard errors are clustered by industry-year combinations. t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

A.2 SOEs in Belgium

This section briefly discusses the characteristics of Belgian SOEs, and the relationship between their government ownership and firm size and performance. Tables A11 and A12 provide information on the prevalence of state-owned firms in Belgium. We identify 2472 firms that were state-owned at least once in their existence, most of which were majority-owned (2041) in at least one year. We observe a large proportion of change in ownership during the lifespan of firms, with only a small proportion of firms (157) always state-owned. We observe more firms subject to full nationalization (1515) and partial nationalization (1919) than full privatization (1134) and partial privatization (613). Finally, government ownership is especially strong in utility industries, though every industry has a certain number of SOEs, indicating their widespread importance.

Table A13 provides evidence for Belgian SOEs being substantially larger, both in terms of total assets (143.7%, t = 39.78) and turnover (46.7%, t = 5.72), than their privately-owned counterparts. Controlling for firm size, we also find a negative relationship between government ownership and performance/productivity, as measured by ROA (-2.45 percentage points, t = -6.93) and TFP (-8.35%, t = -5.32). We find that Belgian SOEs employ 3.42% (t = 1.74) more workers. We do not detect a significant relationship regarding leverage.

Table A11: Number and type of SOEs in Belgium

Firms with state ownership	2472
Firms with majority state ownership	2041
Firms with minority state ownership	495
Firms always state-owned	157
Firms fully nationalized	1515
Firms fully privatized	1134
Firms partially nationalized	1919
Firms partially privatized	613

NOTES: A firm fits in a certain category when it applies to the description for at least one year in its existence. Consequently, a given firm may be included in several categories: e.g. a firm can first be fully nationalized, and subsequently partly privatized.

Table A12: Number and percentage of Belgian SOEs by industry

Industry		# of SOEs	% of SOEs
CA	Manufacture of food products, beverages and tobacco products	29	0.54%
CB	Manufacture of textiles, apparel, leather and related products	6	0.27%
CC	Manufacture of wood and paper products, and printing	21	0.41%
CE	Manufacture of chemicals and chemical products	24	2.32%
CF	Manufacture of pharmaceuticals, medicinalchemical and botanical products	4	1.02%
CG	Manufacture of rubber and plastics products, and other non-metallic mineral products	20	0.78%
CH	Manufacture of basic metals and fabricated metal products, except machinery and equipment	56	0.93%
CI	Manufacture of computer, electronic and optical products	23	2.72%
CJ	Manufacture of electrical equipment	11	1.43%
CK	Manufacture of machinery and equipment n.e.c.	24	1.22%
CL	Manufacture of transport equipment	13	2.26%
CM	Other manufacturing, and repair and installation of machinery and equipment	14	0.33%
D	Electricity, gas, steam and air-conditioning supply	147	21.15%
E	Water supply, sewerage, waste management and remediation	133	10.66%
F	Construction	205	0.30%
G	Wholesale and retail trade, repair of motor vehicles and motorcycles	205	0.18%
H	Transportation and storage	261	1.52%
I	Accommodation and food service activities	24	0.07%
JA	Publishing, audiovisual and broadcasting activities	34	0.73%
JB	Telecommunications	48	3.54%
JC	IT and other information services	101	0.53%
K	Financial and insurance activities	372	1.25%
L	Real estate activities	235	0.58%
MA	Legal, accounting, management, architecture, engineering, technical testing and analysis	296	0.34%
MC	Other professional, scientific and technical activities	2	0.04%
N	Administrative and support service activities	162	0.63%

Table A13: Size and performance of Belgian SOEs

	(1) TA	(2) Turnover	(3) RoA	(4) Leverage	(5) Employees	(6) TFP
	Size		Performance			
SOE	1.437***	0.467***	-0.0245***	-0.00308	0.0342*	-0.0835***
	(39.78)	(5.72)	(-6.93)	(-0.36)	(1.74)	(-5.32)
Industry x region x year FE	Y	Y	Y	Y	Y	Y
Control variable	Y[(1)]	Ys[(1)]	Y	Y	Y	
N	705562	404187	396139	394909	269070	117973

NOTES: TA is total assets. ROA is return on assets calculated as net income over total assets. *Leverage* is calculated as long-term debt and current liabilities over total assets, as defined by Kalemli-Özcan et al. (2022). TFP is the total factor productivity estimated by WLP-methodology. TA, *Turnover*, *Employees*, *Leverage*, and TFP are in natural logarithms. Coefficients are derived from OLS models. Control variables are firms-specific and consist of age, foreign ownership, stock exchange listing, and lagged firm size (as measured by turnover and total assets). We also include fixed effects by by combinations of industry (2-digit NACE), region (NUTS-3), and year. [(1)]Control variables do not include lagged firm size. Standard errors are clustered by region-industry-year combinations. t statistics in parentheses. * $p < 0.01$, ** $p < 0.05$, *** $p < 0.01$

A.3 Alternative assumptions

In table A14, we present results re-estimating columns 1 in the baseline tables in section , exploiting cross-sectional variation between firms regarding state suppliers. First, we adopt a definition of state suppliers in which a firm is assumed to have a state supplier in every year when it had such supplier in at least one year of its existence. We continue to find positive signs for leverage and number of employees, and a negative association for TFP. The estimate regarding ROA, however, is now significantly positive. Nevertheless, it is of small size and turns insignificant when we exclude utility state suppliers (panel B).

Second, we label a firm as having state suppliers when it does so in at least 75% of the years for which information is available for this firm. This way, we are able to reduce the impact of firms occasionally not purchasing inputs from such suppliers, for instance because they are not needed in a given year, but nevertheless remaining in contact with them. We find results of similar magnitude compared to the baseline results, with the exception of the estimate for employment, which is now almost double the size.

Table A14: State suppliers: estimations using alternative assumptions

Panel A: **All state suppliers**

	(1) ROA	(2) ROA	(3) Leverage	(4) Leverage	(5) Employees	(6) Employees	(7) TFP	(8) TFP
State supplier at least one year	0.00640***		0.225***		0.132***		-0.0911***	
	(4.73)		(27.06)		(15.75)		(-5.99)	
State supplier most of years		-0.0141***		0.121***		0.462***		-0.0513***
		(-6.46)		(5.85)		(42.52)		(-6.22)
Industry x region x year FE	Y	Y	Y	Y	Y	Y	Y	Y
Control variables	Y	Y	Y	Y	Y	Y	Y	Y
N	2352114	2409394	2321067	2375918	1102940	1109694	161116	161441

Panel B: **Excluding utility state suppliers**

	(1) ROA	(2) ROA	(3) Leverage	(4) Leverage	(5) Employees	(6) Employees	(7) TFP	(8) TFP
State supplier at least one year	0.00145		0.195***		0.189***		-0.0364***	
	(1.57)		(35.24)		(21.27)		(-3.51)	
State supplier most of years		-0.0145***		0.101***		0.470***		-0.0433***
		(-5.91)		(4.43)		(41.00)		(-5.28)
Industry x region x year FE	Y	Y	Y	Y	Y	Y	Y	Y
Control variables	Y	Y	Y	Y	Y	Y	Y	Y
N	2351584	2409394	2320550	2375918	1102619	1109694	161085	161441

NOTES: Coefficients are derived from OLS models. State supplier most of years: at least 75% of the years with available information for a given firm. Control variables are firms-specific and consist of age, foreign ownership, stock exchange listing, and lagged firm size (as measured by turnover and total assets). Dependent variables Leverage, Employees, and TFP are defined in natural logarithm. Standard errors are clustered by industry-year combinations. t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

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