What Happens When the State Is Bossing around Markets?

An Analysis of the Performance Differentials between Businesses of the State (BOS) and Private-Owned Enterprises (POEs)

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Abstract

This paper studies the performance differentials between privately-owned enterprises and businesses of the state. Businesses of the State (BOS) are firms with 10 percent or more direct or indirect state participation. By analyzing firm-level data across 16 European countries between 2011 and 2020, the paper finds evidence that state ownership matters for operational and financial performance and sheds light on how and when it matters. The analysis disentangles the multiple forms of state participation and its effects on firms' performance by exploring the heterogeneity across sector type, levels of state participation, and degree of separation (direct versus indirect shareholding). It also analyzes the early response of businesses of the state to the COVID-19 shock. The results suggest that businesses of the state underperform in terms of labor productivity, profitability, and return on investments, although the effects are heterogeneous depending on the level of state participation,

degree of separation, and type of sector. Businesses of the state appear to be more financially leveraged vis-à-vis their private counterparts, suggesting potential soft budget constraints. Wider differentials in profitability and return on investments are evidenced when the state operates in fully competitive sectors that are viable for private participation, underscoring the opportunity costs of state ownership in those sectors. Furthermore, the findings show that mixed ownership with the private sector can drive better results when compared to fully owned businesses of the state. Similarly, a higher degree of separation from the state seems to improve performance, highlighting the role of corporate governance and ownership reforms to foster independence. Finally, businesses of the state demonstrated greater resilience in preserving jobs in the short term during the COVID-19 pandemic in 2020.

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INTRODUCTION

Despite decades of privatization and reforms to rationalize the role of the state in the economy, the state remains as a large and significant market player in the global economy. Firms with 10% or more state participation account for a significant share of the economic activity worldwide with an average of up to 17% of the GDP in developing economies (World Bank, 2023). State-owned enterprises mobilize 20% of the global investment and drive 11% of the global FDI inflows (WBG-IEG, 2018).

Although state ownership in markets is not new, evidence suggests that economic shocks such as the financial crisis of 2007-2008 and more recently the COVID-19 pandemic can trigger the rise of state ownership and reorientation of state property policies (Szanyi, 2016) (OECD, 2020). This paper explores whether state ownership matters for firm operational and financial performance and to what degree the level of private participation (e.g., minority vs. full state ownership), the type of sector of operation (e.g., competitive activities vis-à-vis natural monopolies), and proximity to the government (e.g., direct vs. indirect shareholding) can explain potential performance gaps, aiming to shed light on policy implications for future reforms.

For this purpose, this paper compares the performance between privately-owned enterprises (POEs) and the Businesses of the State (BOSs) on two main dimensions. First, it measures operational performance through labor productivity. Second, it evaluates financial performance through indicators of profitability, liquidity, and return on investments. Businesses of State (BOS) are defined as legally separated entities, engaged in market production in which either national or subnational governments hold 10% or more participation through direct and indirect ownership (Dall'Olio, et al., 2022). By using this broader definition, we are able to capture a wider set of entities in which the state can have a certain degree of influence and go beyond the conventional State-Owned Enterprises (SOEs) approach, which is often associated to majority and directly owned firms. This allows us to explore how state ownership matters for operational and financial performance even through minority and indirect participation.

While state ownership has been widely studied to understand its effects on firm performance, surprisingly most studies follow either a country-specific or a sectoral approach and focus on directly and majority-owned firms. Nonetheless, these studies tend to overlook the ability of the state to influence firms' performance through other channels including indirect shareholding and minority participation (World Bank, 2023). Moreover, not all markets in which the state operates are the same. The state can serve competitive sectors that are viable for private provision and exhibit low entry barriers such as the manufacturing of food or textiles, in partially contestable sectors featured by market failures (e.g., externalities) such as air transportation, or natural monopolies such as energy transmission. Yet, there is a significant gap in the literature regarding the role of state ownership in competitive sectors and how heterogeneous the effect is when operating in areas that are often served by the private sector.[2]

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[2] Although the state has different channels to intervene in the markets beyond shareholding, including regulation and support packages, this paper studies only the ownership channel in line with the analytical approach of Le (2021).

The contribution of this paper to the existing literature is fivefold. First, it offers a cross-country approach and employs a harmonized definition that ensures comparability using the new World Bank's Businesses of the State (BOS) database (Dall'Olio, et al., 2022). Second, it studies the differences in firm performance by the type of sector and potential opportunity costs of state ownership in sectors where the economic rationale is less clear by implementing the World Bank BOS sector taxonomy (Dall'Olio, et al., 2022b). Thus, we differentiate the role of state ownership in competitive sectors such as the manufacturing of textiles or accommodation services vis-à-vis natural monopolies (e.g., electricity transmission) and partially contestable sectors (e.g., extraction of gas). Third, this study shows how performance differential varies by the level of state participation and how mixed and private ownership can explain better financial and operational outcomes vis-à-vis cases where the state is the sole owner. Fourth, this paper unveils performance differentials between directly and indirectly owned BOS and explores to what extent a higher degree of separation or autonomy from the state can drive better operational and financial results. Finally, we explore how POEs and BOSs respond to economic shocks in the short-term (e.g., COVID-19).

The remainder of the paper is organized as follows. Section 1 discusses the analytical framework of principal-agent theory to understand the role of state ownership in firms' operational and financial performance. Section 2 presents the review of the existing literature. Section 3 presents the data sources followed by some descriptive statistics in section 4. Section 5 describes the empirical methodology. Our empirical results are presented and examined in Section 6, followed by Section 7, which discusses policy implications and concludes.

1. PRINCIPAL-AGENT THEORY TO UNDERSTAND THE ROLE STATE OWNERSHIP IN FIRMS' PERFORMANCE

The principal-agent problem proposed by Jensen & Meckling (1976) underscores potential issues that can arise when one or more principals engage an agent to perform a service on their behalf. The delegation of decision-making authority from the principal (owner of the enterprise) to the agent (enterprise's management) creates an agency problem due to differing interests between the two parties. Discrepancies in incentives can emerge as the agent is motivated by utility maximization, which may not always align with the best interests of the principal (Jensen & Meckling, 1976). This divergence in interests can result in poor performance and suboptimal decision-making in enterprises.

While both BOSs and POEs can experience these issues, the literature suggests that firms with state participation are more vulnerable to be captured by certain interest groups, notably political parties (Boycko, Shleifer, & Vishny, 1996); (Campos & Esfahani, 1996). Some issues might stem from the appointment of board members, who can relate to political parties or decision-making that serves the interests of certain politically connected firms. Furthermore, appointments linked to political patronage can cause financial costs related to severance payments, loss of experienced personnel, discontinuation of projects, and sudden changes in management strategies, and investment plans (Totleben & Kardziejonek, 2019). These factors can result in lower financial results, reduced competitiveness, and uncertainty for the firm and its partners.

To address this issue, the principal can limit deviations from their interests by providing suitable incentives for the agent and incurring monitoring costs that aim to curb rent-seeking behavior. This includes potential solutions through corporate governance mechanisms that can reduce agency costs and ownership problems (McColgan, 2001; Hermuningsih et al., 2020). Beyond corporate governance, some authors suggest it is important to bring in the private sector through mixed ownership that can help to mitigate principal-agent problems by strengthening supervisory power and weakening the executive's control power (Shang, Yuan, Li, & Fan, 2022). Through mixed ownership, non-state shareholders can restrain and supervise the behavior of state shareholders reducing the discretion of executives, which can ultimately impact firm performance. Recent assessments suggest that private shareholding can help reduce the power of the chair and improve internal governance, particularly in monopoly sectors as competitive sectors are more exposed to market forces (Guan, et al, 2021; Lazzarini & Mussacchio, 2018).

2. LITERATURE REVIEW

When assessing firm operational and financial performance, one key assumption is that firms have profit-maximizing objectives that guide their strategic decisions. However, this might not be the case when governments act as market players to achieve non-economic objectives (Andrews & Dowling, 1998). For instance, state ownership is often justified as a policy strategy to control natural resources, provide employment, and develop specific economic sectors or regions (Grout & Stevens, 2003).

Since the late 1970s, both theoretical and empirical studies have assessed the role of state ownership in firm performance. Early studies discussed the effect of state ownership on performance using variables such as the costs or price of goods and services to compare SOEs and POEs (Davies, 1977) (Bennett & Johnson, 1979).[3] Although there seems to be consensus and increasing evidence on the significant effect of the state ownership over firm's performance, there is no consensus on the direction of such effects.

One strand of research suggests that state participation may improve firm performance as it broadens business opportunities and increases financial leverage. Some authors argue that state participation has a signaling effect indicating that the firm is backed up by the government, reducing information asymmetries, and providing comparative advantages. These can translate into access to finance (Nguyen, Do, & Le, 2021), favorable interest rates (Dewenter & Malatesta, 2001), access to essential infrastructure, direct subsidies, or even preferential regulatory treatment (Le T. , 2021). Some authors propose state participation can increase profitability in sectors in which state dominance is high and competition is low (Liljeblom, Maury, & Hörhammer, 2020) or in case the state holds a golden share (Kočenda & Svejnar, 2003). However, as highlighted by (Le, & Buck, 2011), it is not clear whether the positive relationship between state shareholding and firm performance is driven by efficiency or power given the benefits of government support and political connections (Yu, 2013) (Le & Buck, 2009).

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[3] For instance, Bennett and Johnson (1979) found that private garbage collection enterprises were more efficient than their public counterparts by comparing the prices of private and public garbage collection enterprises in jurisdictions where private and public actors coexisted. (Davies, 1977) analysis found that the Australian private transcontinental airline had higher productivity -measured by mail, passenger, and revenues per employee- than the Australian state-owned airline.

Another strand of the literature sustains that firms with state participation underperform vis-à-vis private peers. It argues that state ownership poses important challenges for a firm performance, particularly when measured in terms of profitability as it is often paired with social mandates such as employment protection and provision of public goods, which are not necessarily aligned with profit maximization behavior (Sun, Zhang, & Li, 2005). Evidence suggests firms with state ownership are more financially leveraged, more labor-intensive, and less profitable (Dewenter & Malatesta, 2001). Furthermore, several studies find that state participation can impact performance as the state can influence strategies resulting in less risk-averse behavior, which ultimately impacts profitability, returns to capital (Dollar & Wei, 2007), R&D investments, and internationalization plans (Tihanyi, et al., 2019).

Nonetheless, most empirical studies are country-specific. A vast set of studies are found on China (Dollar & Wei, 2007), (Chun, 2009), (Lu, Siu, Au, & Leung, 2009), (Amighini, Rabellotti, & Sanfilippo, 2013), (Shahab, Ntim, & Ullah, 2019), (Chen, Xie, & Van Essen, 2021). Additional studies that find a negative relationship between state ownership and firm performance are found on the Russian Federation (Abramov et al. 2017) (Liljeblom, Maury, & Hörhammer, 2020) and Malaysia (Isa & Lee, 2016), highlighting decreasing returns on assets in Greece (Halkos, 2002), and lower productivity in Türkiye (Zaim & Taskin, 1997), among others.

Other studies have approached a similar question through a sector-specific focus analyzing the role of state ownership in the financial sector (Cornett, Guo, Khaksari, & Tehranian, 2010), state-owned commercial banks (Panizza, 2021), natural monopolies or regulated oligopolies (Vining & Boardman, 1992), and network sectors (Bogart & Chaudhary, 2015). Fewer studies provide a cross-country and cross-sector analysis, especially in competitive sectors, which are particularly relevant for private-sector development. Some studies on competitive sectors include Funkhouser & MacAvoy (1979), Boardman & Vining (1989), and Picot & Kaulmann (1989). Some recent studies with firm-level data across countries include Dewenter & Malatesta (2001), Kabaciński, Kubiak, & Szarzec (2020), Phi, et al., (2019), IMF (2019) and Le (2021).

3. DATA SOURCES

The data employed for the analysis corresponds to a combination of two firm-level datasets: (i) the World Bank Businesses of the State (BOS) database (Dall'Olio, et al., 2022), and (ii) the Bureau van Dijk (BvD) ORBIS financial module.

3.1 World Bank Businesses of the State (BOS) database

First, we use the World Bank Global Businesses of the State (BOS) database that provides firm-level information on companies in which the state holds 10 percent or more direct and indirect participation. Although there is no academic consensus on the definition of state-owned enterprises (SOEs), they are often associated with directly and fully or majority-owned firms by the state.[4] In this paper, we cover a much broader set of entities to capture other channels of state ownership including minority and indirect ownership following the WB BOS definition (Dall'Olio, et al.,

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[4] The SOE definition can vary across countries depending on the different legal forms (e.g., corporatized vs. non-corporatized, level of participation (%)), and local definition of control.

2022). By doing so, we can study how state ownership and its different shapes and forms can potentially influence firm decisions even without having full control and measure how this can affect firm performance.

The WB BOS database provides information on entities with state participation across more than 90 countries. It collects firm-level data including characteristics such as age, sector of operation, and size, as well as financial indicators of revenues and profits. It also provides detailed ownership information to differentiate between directly and indirectly owned companies, the level of state participation, and the degree of proximity with the state (i.e., layers of the ownership tree). Following Abramov, Radygin, & Chernova (2017), we differentiate between firms directly owned by the state vis-à-vis those in which the state owns shares through other organizations or chains of firms (i.e., indirectly owned). For the latter, the BOS database informs how many firms or layers connect a firm with the state.[5] Finally, the WB BOS database provides information on the level of state participation to differentiate by minority shareholding (10-24.9%), blocking minority (25-49.9%), majority shareholding (50-99.9%), and full state participation (Dall'Olio, et al., 2022).[6]

3.2 ORBIS financial module - Bureau van Dijk (BvD)

The second source of information is the raw financial module of ORBIS compiled by the Bureau van Dijk Electronic Publishing (BvD). The raw data was processed and cleaned implementing the protocol in the literature following Kalemli-Ozcan et al. (2015) and Cusolito (2020). This dataset provides a rich set of financial indicators for both privately and government owned entities. However, it does not have an indicator to differentiate whether a firm is a BOSs or a private firm.[7]

To identify which firms in the ORBIS financial module can be defined as Businesses of the State (BOS), we merge the WB BOS database with the ORBIS financial module. BOSs are defined as firms with 10% or more state direct or indirect participation, whereas POEs are defined as those with no state participation or state shareholding below 10%.

This paper focuses on European countries in which there is consensus in the literature on having a higher coverage in the ORBIS financial data despite the caveats of completeness of information (Kalemli-Ozcan et al., 2015), (Bajgar et al., 2020), (Cusolito, et al., 2022). We cover a subset of 16 European countries over the period 2011-2020 for which we have simultaneously i) ORBIS firm-level data, ii) the WB BOS database for the specific country, and iii) representativeness of at least 60% of the national employment in the financial module in ORBIS.[8]

We compare the performance of BOSs and POEs through a multivariate approach following Kabaciński, Kubiak, & Szarzec (2020) and Chan, Chen, & Wong (2018) analyzing operational performance measured by labor productivity and three aspects of financial performance: profitability, financial liquidity, and return on investments. We measure labor productivity as operating revenues per worker. Financial performance is assessed through financial liquidity using

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[5] For instance, C is considered as a BOS through 3 layers of ownership in the case where the Ministry of Finance owns (by 10% or more) a company A, which owns company B (by 10% or more), which also owns company C.

[6] The WB BOS database does not provide information on golden shares or veto powers, so the level of participation and thresholds proposed are used as a proxy of control and influence of the state over the firms.

[7] The ORBIS dataset does not provide a variable to directly identify those with state participation Although a proxy variable in ORBIS denoted as the Global Ultimate Owner can serve to identify some companies with state shareholding, it provides an underestimation of the real footprint of the state in the markets and suffer from omission errors that could misclassify SOEs as private firms (Dall'Olio, et al., 2022).

[8] Yet, there is also variation of coverage within these countries as documented by (Bajgar, Berlingieri, Calligaris, Criscuolo, & Timmis, 2020).

the current ratio and liquidity ratio. These indicators provide an estimate of the firm capability to meet its short-term and long-term obligations, respectively. Additionally, we assess profitability in terms of profit margins and return on investments using the return on assets (ROA) and returns on equity (ROE).

4. DESCRIPTIVE STATISTICS

Table 1 summarizes the sample distribution over time. Our sample covers approximately 2 million firms across 16 European countries between 2011 and 2020[9] operating across sectors such as agriculture, manufacturing, construction, to wholesale and trade services. Nonetheless, the sample excludes public administration, health, education and activities of households, and membership organizations following the WB BOS approach.[10] Our sample includes more than 27,000 BOS firms, which on average account for approximately 1.4% of the total number of firms in the sample. These firms with state participation contribute to 14% of the total revenues and 15% of the total employment (Table 1). Further details to document variations across countries are described in Annex 1.[11]

Table 1. Distribution of the sample by firm type and year

Firm type	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Average
Number of firms											
POEs	98.3%	98.4%	98.5%	98.6%	98.7%	98.7%	98.6%	98.7%	98.8%	98.8%	98.6%
BOSs	1.7%	1.6%	1.5%	1.4%	1.3%	1.3%	1.4%	1.3%	1.2%	1.2%	1.4%
Revenues											
POEs	84.9%	84.3%	84.8%	85.7%	86.3%	86.6%	86.4%	86.2%	87.3%	87.4%	86.0%
BOSs	15.1%	15.7%	15.2%	14.3%	13.7%	13.4%	13.6%	13.8%	12.7%	12.6%	14.0%
Employment											
POEs	83.3%	84.0%	84.3%	85.0%	86.5%	87.5%	84.2%	84.7%	86.1%	85.7%	85.1%
BOSs	16.7%	16.0%	15.7%	15.0%	13.5%	12.5%	15.8%	15.3%	13.9%	14.3%	15.0%

Source: Author's calculations using WB BOS database and ORBIS.

Table 2 describes some summary statistics by country and shows some indications of performance gaps between BOSs and POEs. BOSs seem to be older and larger than POEs when measured by number of years in the market and number of workers across all countries in the sample. Yet, in most countries BOSs seem to be less profitable than POEs and obtain lower returns of investments -measured by assets and equity. BOSs also seem to achieve lower revenues per worker compared to POEs, except for four countries -Estonia, Spain, Italy, and Portugal. In terms of financial leverage, in about 90 percent of the countries, BOSs have a lower ability to cover short-term and long-term liabilities, measured by the current ratio and solvency ratio, respectively.

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[9] The total sample includes over 19.9 million observations.
[10] The sectors include those covered by the WB BOS database (Dall'Olio, et al., 2022b).
[11] The countries covered are Bosnia and Herzegovina, Bulgaria, Estonia, Spain, Croatia, Italy, Lithuania, Latvia, North Macedonia, Poland, Portugal, Romania, the Russian Federation, Serbia, Slovenia, and Ukraine.

Table 2. Summary statistics: BOSs vis-à-vis POEs (median representative firm) in sample by country 2011-2020

Country (ISO)	Number of firms		Age (years)		Employment		Profit margin		Labor Productivity *		Current ratio		Solvency Ratio (%)		ROA		ROE	
	POE	BOS	POE	BOS	POE	BOS	POE	BOS	POE	BOS	POE	BOS	POE	BOS	POE	BOS	POE	BOS
BA	6,647	271	14	17	21	50	4.3	0.9	10.6	9.7	1.3	1.3	47.5	55.7	3.3	0.2	10.2	0.5
BG	63,363	344	8	16	18	55	4.5	1.4	9.8	9.3	1.8	1.7	55.4	71.3	3.7	0.7	13.4	1.3
EE	63,343	124	5	16	18	25	11.5	5.2	10.8	10.9	2.2	1.6	92.2	73.8	1.3	2.0	3.1	3.7
ES	288,776	1,324	13	17	18	43	2.9	2.0	11.6	11.6	1.4	1.5	43.3	49.8	0.8	0.6	3.0	1.6
HR	32,309	499	9	14	18	38	4.2	0.9	10.9	10.5	1.3	0.9	34.1	39.9	0.4	0.4	5.7	1.6
IT	401,118	3,448	10	13	17	44	3.8	2.7	11.9	12.1	1.4	1.3	25.6	29.2	0.5	0.5	3.2	2.4
LT	14,549	95	12	21	20	82	3.3	3.7	10.5	10.4	1.7	1.8	50.7	77.2	5.0	1.4	12.2	2.3
LV	19,352	271	8	21	19	46	3.5	0.6	10.4	10.1	1.2	1.3	44.5	43.5	0.7	0.2	8.6	0.5
MK	10,018	126	11	18	19	65	4.5	2.1	10.2	9.5	1.4	1.6	62.1	63.8	2.2	0.5	6.2	0.9
PL	128,157	2,703	8	16	41	94	3.6	2.2	11.3	10.9	1.5	1.3	51.8	65.3	3.4	0.8	11.6	1.5
PT	64,708	406	12	15	18	51	3.3	3.7	11.1	11.5	1.6	1.3	36.1	44.0	1.4	0.8	5.6	3.1
RO	213,884	762	7	10	19	58	11.2	2.0	10.1	9.5	1.2	1.9	41.3	49.6	0.7	1.4	17.8	4.8
RS	33,788	594	10	18	19	78	3.4	2.0	10.5	9.6	1.1	1.0	35.7	54.6	2.1	0.4	12.3	1.3
RU	453,193	13,369	7	14	25	49	4.4	1.7	9.5	9.4	1.4	1.3	39.3	56.2	3.5	0.6	19.7	2.3
SI	50,483	364	7	22	18	62	9.8	1.5	11.5	11.4	2.0	1.4	65.1	48.7	4.9	1.2	14.6	3.0
UA	125,312	2,637	11	15	22	41	2.8	0.4	9.4	8.5	1.2	1.2	54.5	75.2	2.4	0.2	10.4	0.5

*Note: *Labor productivity is measured as the logarithm of operating revenues per worker.*
Source: Author's calculations using WB BOS database and ORBIS.

Some authors argue that firms owned by the state are not always operating under a profit-maximizing behavior as they may pursue public mandates (Matuszak & Kabaciński, 2021). Hence, some performance differentials are expected (Lawson, 1994) (Bozec, Breton, & Coté, 2002). Previous studies have tried to account for commercial and non-commercial mandates assigned to SOEs. However, there are two caveats on former attempts to do so.

First, most studies are country-specific hindering external validity and comparability of the findings. Second, the differentiation of the type of sectors to determine whether state-owned firms have commercial and non-commercial functions has been based on profitability, sector-specific regulations, and president announcements (Bozec, Breton, & Coté, 2002). These approaches might raise potential endogeneity issues since the distinction between commercial and non-commercial activities would be linked to underlying performance issues rather than the economic nature of the sector where the state operates. For example, a loss-making BOS could be resulting from inadequate management or insufficient market incentives even when performing fully commercial functions such as manufacturing of textiles. Similarly, using policy regulations and presidential interventions to differentiate between commercial and non-commercial functions could be linked to other interrelated policy objectives that are not necesarilly related to the technology or economic characteristics of a specific sector.[12]

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[12] Some companies could be not-profit maximizing as per the legal framework, but still operate under management contracts that set profit targets. In these cases, it is not clear whether not-profit companies could be categorized as non-commercial given their low performance. Hence, some endogeneity issues might emerge. As indicated by (Megginson & Netter, 2001), assessment on performance might itself be linked to the system that includes both political and performance goals.

The WB sector taxonomy serves to overcome these limitations.[13] It builds on the industrial organization literature to classify the economic activities (Table 3) into competitive, natural monopolies, and partially contestable sectors based on the market failures, technology and intrinsec economic characteristics (e.g., externalities, public goods, etc.).

Table 3. Sector taxonomy to differentiate by the degree of contestability of sectors and rationale for state ownership.

Sector type	Definition
Competitive Sectors	Economic activities with little to no entry barriers that are commercially viable for multiple firms to operate. Inherent market features, such as cost structure, technology, or demand characteristics, make entry into these sectors largely unproblematic. Some examples are the manufacturing of food and beverages, textiles and apparel, wholesale, and retail trade. In these sectors, the economic rationale for state ownership is less clear as those sectors can be viable and efficiently provided by the private sector.
Partially contestable sectors	Economic activities are characterized by some form of market power, externalities, or other market failures that could be addressed -although not uniquely- by state ownership. Some examples include the production of electricity, extraction of natural gas, and air passenger transportation services.
Natural monopoly sectors	Economic activities that exhibit high entry barriers, scale economies, or sub-additivity cost structures (i.e., when a single firm can produce a product at a lower cost than the combined cost of two or more firms producing identical products), thus making them more efficient for just one producer to operate. Some examples include water utilities, energy transmission, and postal activities with universal obligation.

Source : (Dall'Olio, et al., 2022b)

We implement the WB sector taxonomy to classify the economic activities using the NACE 4-digit code for the 16 European countries studied. In total, 95% of the firms in our sample operate in competitive sectors. Table 4 shows the distribution by sector type between BOSs and POEs by sector type. On average, 67% BOSs are found in competitive sectors for which the economic rationale for state ownership is less clear as can be often served by the private sector. The remaining 17% of BOSs are found in partially contestable sectors such as passenger transportation, and 16% in natural monopolies such as energy transmission.

Table 4. Share of POEs and BOSs by sector type and year

	2011	2012	2013	2014	2015	2016	2017	2018	2019	**2020**
POEs										
Competitive	95.8%	95.7%	95.6%	95.6%	95.5%	95.7%	95.6%	95.7%	95.7%	95.7%
Natural Monopoly	0.8%	0.8%	0.8%	0.9%	1.0%	0.9%	0.8%	0.8%	0.7%	0.8%
Partially Contestable	3.5%	3.5%	3.6%	3.6%	3.5%	3.4%	3.6%	3.6%	3.5%	3.6%
BOSs										
Competitive	68.1%	68.0%	67.9%	68.0%	68.4%	68.1%	67.5%	67.4%	67.6%	67.3%
Natural Monopoly	15.3%	15.4%	15.4%	15.6%	15.7%	16.1%	16.7%	16.7%	17.0%	17.1%
Partially Contestable	16.6%	16.6%	16.6%	16.4%	15.9%	15.8%	15.9%	15.9%	15.4%	15.6%

Source: Author's calculations for 16 ECA countries

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[13] This taxonomy offers a harmonized approach to differentiate by the type of sector where SOEs operate independently of the country or political and economic system. For more details see (Dall'Olio, et al. 2022). We used the main sector of operation of the firm using the NACE 4-digit classification and combine it with the sector taxonomy that follows the same sector disaggregation and classification.

We argue potential performance gaps between BOSs and POEs depend on the degree of contestability in the sector. We expect BOS performance to be closer to that of private peers in competitive sectors as those firms might be subject to higher entry and competition from private providers and are less likely to fulfill public service obligations in such activities.[14] On the contrary, we expect higher differentials in natural monopoly activities that are usually linked to public service obligations (PSOs) such as water, sewage, electricity transmission, and postal services. In partially contestable sectors, important externalities might also require BOSs to fulfill a public mandate such as ensuring connectivity (cargo and passenger) services. In other words, we argue the likelihood of BOSs having a PSO that justifies a potential performance differential is lower for those operating in competitive sectors. We explore this in more detail in the next section.

Finally, we differentiate by the level of state participation and degree of separation between the BOS firm and the government. In our sample, 58% of the BOSs are fully owned by the state (100%), but we also observe majority-owned entities that account for 16% of the BOS, as well as minority state shareholdings (Table 5). Minority shareholdings account for about a quarter of the BOS firms in our sample segmented by minority participation (13%) and blocking minority (14%). In our sample, we also observe firms that are directly owned by the government vis-à-vis those owned through another firm or chain of firms (i.e., indirectly owned) and to what degree they can be linked to the state.[15]

Table 5. Degree of state ownership – WB BOS database

Degree of State participation	Definition
Minority	Firms in which the state holds 10-24.9% of the stakes
Blocking minority	Firms in which the state holds 25-49.9% of the stakes
Majority ownership	Firms in which the state holds 50-99.9% of the stakes
Full ownership	Firms in which the state holds 100% of the stakes
Direct	Firms directly owned by a Public Authority (national or subnational), which holds at least 10% participation.
Indirect	Firms participated by the government through another firm or chain of firms owned by the State where it holds at least 10% participation.

Source: Author's elaboration based on World Bank (BOS) database and (Dall'Olio, et al., 2022).

5. EMPIRICAL METHODOLOGY

This paper explores two main econometric exercises. First, it estimates the conditional correlation of the state participation and the performance differentials between BOSs and POEs. For this purpose, we analyze the role of state ownership on firm performance through the following specification:

$$(1)\ Yit = \alpha + \beta_1 BOS_i + \beta_2 \boldsymbol{X}_{it} + \partial_c + \partial_s + \partial_t + \varepsilon_{ijt}$$

Where, Yi denotes the performance indicator for the firm i using several performance measurements to have a comprehensive overview of the soundness of BOSs vis-à-vis POEs. First, we assess the operational performance in terms of productivity, followed by the financial performance measured by indicators of profitability, liquidity, and returns on investment. Thus,

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[14] Alternative government interventions in the form of regulation can be suitable in these sectors to achieve public objectives.
[15] This is denoted as the layer of ownership. For instance, a firm linked to the state through another BOS has 2 layers or degree of connection to the state.

the outcomes of interest are: i) labor productivity (operating revenues per workers), ii) profit margins, iii) liquidity based on the current ratio (short-term) and solvency ratio (long-term), and iv) return on investments measured by the returns on assets (ROA) and return on equity (ROE).

The explanatory variable -**BOS**- denotes the measurement of the state participation in the firm i and is the main parameter of our analysis. The state participation is tested in two ways to measure both the extensive and intensive margins.

First, it takes the form of a dichotomic variable that takes the value of 1 when the firm has state participation -either direct or indirect- of at least 10 percent, and 0 otherwise. It serves to measure the state participation as the extensive margin. Second, we include a measurement of the intensive margin by breaking down the state participation in the form of a categorical variable to differentiate between minority-owned companies [10-25%), blocking minority [25%, 50%), majority participation [50%, 100), and fully owned firms by the state [100%]. When interpreting the results, the reference (excluded) category refers to privately owned enterprises (POEs) defined as firms with no state participation or in which the state has a non-controlling participation of less than 9.9%.

As explanatory variables, the vector X_i denotes firm-level controls including age, sector, size (measured by total fixed assets and number of workers), and listing status.[16] Additionally, $\partial_c, \partial_s, \partial_t,$ refer to the fixed effects by country j to remove any country-specific unobserved characteristics such as governance arrangements, sectoral and time-bound shocks. Additionally, we control for potential country, sector, and time-varying shocks. Finally, we include country-sector-year ∂_{cst} fixed effects, which allow to demean the results, so the coefficients can be interpreted as the distance to the country-sectoral mean and therefore be comparable across countries.[17]

Furthermore, we explore the heterogeneous response between BOSs and POEs to economic shocks, particularly to the short-term shock of the COVID-19 pandemic. For this purpose, we evaluate both levels and growth of labor force and fixed assets as a proxy of capital investments using the specification below following Brolhato, Cirera, & Martins-Neto (2023) and Ferro & Patiño-Peña (2023):

$$(2)\ Yit = \alpha + \beta_1 BOS_i + \beta_1 BOS_i * 2020 + \beta_2 X_{it} + \partial_c + \partial_s + \partial_t + \varepsilon_{ijt}$$

Thus, we evaluate whether state ownership can play a role as a stabilizer during periods of crisis. As before, the BOSs variable takes value 1 if the state holds 10% or more state participation, and we also delve deeper into whether there are differences in the response to the shock by the level of state participation.

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[16] Both size and age variables are included as lagged values in t-1.

[17] Since the BOS variable from the WB BOS database is time-invariant in the sample period, we cannot control for firm-level fixed effects in the assessment. Hence, these results do not claim causality between state ownership and firm performance. Nonetheless, we perform different robustness checks to test different specifications that can help minimize the effect of unobserved firm-level characteristics. The results hold when using shorter timeframes 5-years and 3-years, and when using the subset of firms fully owned by the state. These exercises are conducted to test the robustness of the results in the event some changes in ownership have occurred in the sample period. Estimations are conducted using OLS.

6. RESULTS

Our results shed light on the role of state participation in firms' performance. Although this analysis does not claim causality, the findings provide new evidence on the relationship between state ownership and operational and financial outcomes shedding light on the multi-faceted role of the state in markets. In this section, we explore the role of the state in multiple economic sectors, the level of state participation, degree of separation of the state, among others.

The results are structured as follows. First, we explore the extensive margin to assess to what extent state participation matters for firms' performance in the four dimensions proposed -productivity, profitability, liquidity, and return on investments. Subsequently, we explore the intensive margin to study how these gaps might vary by the degree of state ownership. Finally, we analyze to what extent proximity to the state measured by the degree of separation to the public authority (i.e., direct, or indirect participation) is linked to performance gaps.

6.1 Extensive margin: Does state participation matter for operational and financial performance?

The short answer is yes. Evidence suggests there is a performance gap between BOSs and POEs. However, the differences depend on the outcome analyzed, the type of sector in which BOSs operate, and whether there is mixed ownership with the private sector. Operational performance is measured by the labor productivity, whereas financial performance is assessed through the profit margins, current ratio, solvency ratio, ROA and ROE.

6.1.1 Labor productivity

In terms of operational performance, results in Table 6 suggest that BOSs achieve, on average, lower labor productivity outcomes compared to private peers. Results in columns (6-9) indicate that BOS are, on average, 32% less productive than the median POEs within the same industry.[18] These results are robust and statistically significant when controlling by firm's size, age, listing status, country, sector of operation, and fixed effects to remove potential country, sector, time varying and time-specific shocks.

Table 6. Results for labor productivity

					Log (Labor productivity)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
BOS	-0.449***	-0.409***	-0.401***	-0.401***	-0.399***	-0.389***	-0.386***	-0.386***	-0.386***
	(0.00291)	(0.00299)	(0.00298)	(0.00302)	(0.00298)	(0.00304)	(0.00304)	(0.00679)	(0.0184)
Size (Log Capital)	0.433***	0.452***	0.454***	0.442***	0.437***	0.435***	0.432***	0.432***	0.432***
	(0.000308)	(0.000319)	(0.000320)	(0.000322)	(0.000320)	(0.000326)	(0.000327)	(0.000603)	(0.00863)
Age		-0.0149***	-0.0148***	-0.0151***	-0.0150***	-0.0157***	-0.0156***	-0.0156***	-0.0156***
		(4.49e-05)	(4.49e-05)	(4.43e-05)	(4.41e-05)	(4.45e-05)	(4.45e-05)	(9.03e-05)	(0.000739)
Listed			-0.685***	-0.658***	-0.647***	-0.633***	-0.633***	-0.633***	-0.633***
			(0.00861)	(0.00861)	(0.00860)	(0.00878)	(0.00881)	(0.0210)	(0.0285)
Constant	4.554***	4.496***	4.479***	4.636***	4.702***	4.739***	4.769***	4.769***	4.769***
	(0.00412)	(0.00415)	(0.00415)	(0.00418)	(0.00415)	(0.00422)	(0.00424)	(0.00767)	(0.105)

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[18] Since only the dependent variable is log transformed, the coefficient should be interpreted as $(exp(\beta_1) - 1) * 100 = (exp(-0.386) - 1) * 100 = -32.02\%$. Therefore, in companies where SOE=1, the labor productivity is 32% lower compared to POEs.

Observations	6,612,011	6,459,551	6,459,551	6,459,551	6,459,534	6,459,468	6,452,778	6,452,778	6,452,778
R-squared	0.685	0.689	0.689	0.697	0.702	0.715	0.718	0.718	0.718
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	No	No	No	No	No	Yes	Yes	Yes	Yes
Country-Sector-Year FE	No	No	No	No	No	No	Yes	Yes	Yes
Clustered errors	No	No	No	No	No	No	No	Firm	Sector 2d

Robust standard errors in parentheses

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

Note: Labor Productivity is estimated as the log of total revenues per worker. The reference (excluded category) refers to Privately-owned Enterprises (POEs), so results should be interpreted as compared to private firms within the same sector, size, and age, and sector and controlling by the respective fixed effects. Capital refers to lagged values of the log of total assets of the firm (year t-1), age refers to the lagged number of years in the market in t-1. Listed status is a dichotomous variable that takes value 1 if the company is listed in the stock market, 0 otherwise. Fixed effects are included to absorb for potential shocks including time-bound shocks (year-FE), sectoral shocks (sector-FE), time-varying sectoral shocks (sector-year FE), country specific shocks (country-FE), country time varying shocks (country-year FE), and country, sector specific and time varying shocks (country-sector-year, FE). Clustered standard errors are used to control for potential autocorrelation within firms (column 8 to capture potential serial correlation) and sector (column 9).

6.1.2 Profitability: Profit margin

When comparing financial performance, results in Table 7 highlight that BOSs achieve, on average, relatively lower profit margins when compared to private counterparts. After controlling for the firm' size, age, and listing status, results in column (6-9) indicate that BOS profits are, on average, 6.3 percentage points lower compared to private peers. Listing status, however, does not seem to have a statistically significant effect on performance differentials. These findings are aligned with former empirical analyses that confirm government-owned firms tend to be significantly less profitable than privately owned firms (Kathryn, Dewenter, & Malatesta, 2001) (Phi, Taghizadeh-Hesary, Tu, Yoshino, & Kim, 2019) (Panizza, 2021).

Table 7. Results for profit margins

	Profit margins								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
BOS	-6.018***	-6.238***	-6.232***	-6.213***	-6.094***	-6.346***	-6.318***	-6.318***	-6.318***
	(0.0548)	(0.0561)	(0.0562)	(0.0561)	(0.0560)	(0.0570)	(0.0572)	(0.110)	(0.323)
Size	-0.539***	-0.611***	-0.609***	-0.620***	-0.605***	-0.597***	-0.599***	-0.599***	-0.599***
	(0.0071)	(0.0075)	(0.0075)	(0.0075)	(0.0075)	(0.0076)	(0.0076)	(0.013)	(0.058)
Age		0.0281***	0.0282***	0.0287***	0.0270***	0.0157***	0.0160***	0.0160***	0.0160***
		(0.00077)	(0.00077)	(0.00077)	(0.00077)	(0.00078)	(0.00078)	(0.0013)	(0.0061)
Listing status			-0.610***	-0.600***	-0.637***	-0.0725	-0.0301	-0.0301	-0.0301
			(0.183)	(0.183)	(0.182)	(0.186)	(0.185)	(0.356)	(0.285)
Constant	7.513***	7.389***	7.380***	7.411***	7.380***	7.510***	7.512***	7.512***	7.512***
	(0.0259)	(0.0269)	(0.0270)	(0.0270)	(0.0269)	(0.0271)	(0.0271)	(0.0443)	(0.169)
Observations	6,500,636	6,354,633	6,354,633	6,354,633	6,354,614	6,354,541	6,347,824	6,347,824	6,347,824
R-squared	0.068	0.064	0.064	0.066	0.074	0.096	0.105	0.105	0.105
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	No	No	No	No	No	Yes	Yes	Yes	Yes
Country-Sector-Year FE	No	No	No	No	No	No	Yes	Yes	Yes
Clustered errors	No	No	No	No	No	No	No	Firm	Sector 2d

Robust standard errors in parentheses

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

Note: Profit margin is estimated as the profit before tax over operating revenue (%). The reference (excluded category) refers to Privately-owned Enterprises (POEs), so results should be interpreted as compared to private firms within the same sector, size, and age, and sector and controlling by the respective fixed effects. Capital refers to lagged values of the log of total assets of the firm (year t-1), age refers to the lagged number of years in the market in t-1. Listed status is a dichotomous variable that takes value 1 if the company is listed in the stock market, 0 otherwise. Fixed effects are included to absorb for potential shocks such as temporary shocks (year-FE), sectoral shocks (sector-FE), time-varying sectoral shocks (sector-year FE), country specific shocks (country-FE), country time varying events (country-year FE), and country and sector specific and time varying shocks (country-sector-year, FE). Clustered standard errors are used to control for potential autocorrelation within firms (column 8 to capture potential serial correlation) and sector (column 9).

6.1.3   Liquidity: Current ratio and solvency ratio

Next, we analyze the ability to cover short-term and long-term financial obligations. First, by using the current ratio we assess how much the financial obligations due within a year are covered by the current assets. Results in Table 8 show negative and significant differences in terms of liquidity between BOSs and POEs. These results are robust when controlling by firm size, age, fixed effects, and clustered-standard errors and suggest BOSs are more leveraged or assume higher levels of debt compared to private peers. The estimates (columns 7-9) indicate that BOSs have on average 0.35 fewer dollars in assets to cover each dollar in short-term liabilities (due within a year). Listed BOS partially offset the differentials compared to POEs, potentially linked to stronger market discipline and budget constraints (Wang & Colin, 2004). These findings could be explained by potential soft-budget constraints such that BOSs can receive implicit or explicit loan guarantees that allow them to borrow at favorable rates (Dewenter & Malatesta, 2001), receive fiscal means in the form of subsidies or reduction of tax obligations (Kornai, Maskin, & Roland, 2003).

Table 8. Results for current ratio

	Current ratio								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
BOS	-0.249***	-0.358***	-0.359***	-0.346***	-0.332***	-0.360***	-0.353***	-0.353***	-0.353***
	(0.019)	(0.020)	(0.020)	(0.020)	(0.020)	(0.021)	(0.021)	(0.038)	(0.058)
Size	-0.468***	-0.572***	-0.572***	-0.571***	-0.568***	-0.569***	-0.571***	-0.571***	-0.571***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.005)	(0.014)
Age		0.0575***	0.0575***	0.0579***	0.0575***	0.0549***	0.0550***	0.0550***	0.0550***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.002)
Listing status			0.116***	0.111**	0.107**	0.190***	0.189***	0.189*	0.189***
			(0.044)	(0.045)	(0.045)	(0.046)	(0.047)	(0.097)	(0.049)
Constant	5.176***	4.767***	4.769***	4.757***	4.754***	4.793***	4.797***	4.797***	4.797***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.018)	(0.048)
Observations	6,553,883	6,407,428	6,407,428	6,407,428	6,407,414	6,407,345	6,400,630	6,400,630	6,400,630
R-squared	0.047	0.051	0.051	0.051	0.053	0.063	0.067	0.067	0.067
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	No	No	No	No	No	Yes	Yes	Yes	Yes
Country-Sector-Year FE	No	No	No	No	No	No	Yes	Yes	Yes

| Clustered errors | No | No | No | No | No | No | No | Firm | Sector 2d |

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

Note: Current ratio is estimated as current assets over current liabilities (due within a year). The reference (excluded category) refers to Privately-owned Enterprises (POEs), so results should be interpreted as compared to private firms within the same sector, size, and age, and sector and controlling by the respective fixed effects. Firm's size is measured as the lagged values of log workers in year t-1, age refers to the lagged number of years in the market in t-1. Listed status is a dichotomous variable that takes value 1 if the company is listed in the stock market, 0 otherwise. Fixed effects are included to absorb for potential shocks such as temporary shocks (year-FE), sectoral shocks (sector-FE), time-varying sectoral shocks (sector-year FE), country specific shocks (country-FE), country time varying events (country-year FE), and country and sector specific and time varying shocks (country-sector-year, FE). Clustered standard errors are used to control for potential autocorrelation within firms (column 8 to capture potential serial correlation) and sectors (column 9).

Furthermore, we examine the ability of firms to cover their total financial obligations and the overall balance between debt and equity using the solvency ratio. The solvency ratio is provided by the ORBIS financial module and is computed as the ratio between shareholder's funds and the total assets. Results in Table 9 suggest BOSs have a higher solvency ratio compared to private counterparts. On average, BOS' solvency ratio is 5.4 percentage points higher than POEs. In other words, BOSs rely relatively more on debt than on shareholders' funds for their operation or are relatively more leveraged than private peers as evidenced before. Following Phi et al. (2019), this result could be interpreted as a potential signal of soft budget constraints in the sense that BOSs may be more dependent on debt to cover their financial needs and that it can result from indirect or direct state support, debt guarantees, or access to finance at a lower cost. Despite being exposed to higher levels of debt and lower profitability, soft budget constraints can make firms with state participation less likely to face bankruptcy (Megginson & Netter, 2001).[19]

Table 9. Solvency ratio

	Solvency ratio								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
BOS	7.045***	5.606***	5.542***	5.582***	5.624***	5.455***	5.481***	5.481***	5.481***
	(0.092)	(0.095)	(0.095)	(0.095)	(0.095)	(0.097)	(0.098)	(0.224)	(0.359)
Size	-0.602***	-2.004***	-2.030***	-2.059***	-2.027***	-1.926***	-1.922***	-1.922***	-1.922***
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.032)	(0.088)
Age		0.780***	0.779***	0.781***	0.778***	0.741***	0.741***	0.741***	0.741***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)	(0.009)
Listing status			5.675***	5.567***	5.501***	6.367***	6.295***	6.295***	6.295***
			(0.240)	(0.241)	(0.241)	(0.250)	(0.252)	(0.614)	(0.335)
Constant	42.67***	36.87***	36.95***	37.02***	36.95***	37.11***	37.09***	37.09***	37.09***
	(0.0514)	(0.0528)	(0.0529)	(0.0530)	(0.0530)	(0.0536)	(0.0538)	(0.108)	(0.295)
Observations	6,565,319	6,418,327	6,418,327	6,418,327	6,418,312	6,418,241	6,411,529	6,411,529	6,411,529
R-squared	0.07	0.106	0.106	0.107	0.109	0.132	0.137	0.137	0.137
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	No	No	No	No	No	Yes	Yes	Yes	Yes
Country-Sector-Year FE	No	No	No	No	No	No	Yes	Yes	Yes
Clustered errors	No	No	No	No	No	No	No	Firm	Sector 2d

Robust standard errors in parentheses

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

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[19] This can impact the firm dynamism, creation of jobs, entry and exit of firms, which are beyond the scope of this paper, but that can have important implications for private sector development.

Note: Solvency ratio is measured as the shareholders' funds over total assets. This variable is provided directly in the financial statements from ORBIS (BvD). The reference (excluded category) refers to Privately-owned Enterprises (POEs), so results should be interpreted as compared to private firms within the same sector, size, and age, and sector and controlling by the respective fixed effects. Firm size is measured as lagged values of the log of total workers (year t-1), age refers to the lagged number of years in the market in t-1. Listed status is a dichotomous variable that takes value 1 if the company is listed in the stock market, 0 otherwise. Fixed effects are included to absorb for potential shocks such as temporary shocks (year-FE), sectoral shocks (sector-FE), time-varying sectoral shocks (sector-year FE), country specific shocks (country-FE), country time varying events (country-year FE), and country and sector specific and time varying shocks (country-sector-year, FE). Clustered standard errors are used to control for potential autocorrelation within firms (column 9 to capture potential serial correlation) and sectors (column 10).

6.1.4   Return on investments: ROA and ROE

Finally, we assess the return on investments measured by the return on assets (ROA) and returns on equity (ROE). ROE provides an assessment of the firm capability to generate value for their investors for each dollar in equity, while the ROA offers a comparison between the firm profitability and its assets. Results in Table 10 and Table 11 are indicative of a negative relationship between state ownership and the returns of the firm. On average, for every dollar in assets in a BOS firm, the return is about 4.9 percentage points lower than the median private peer in the same industry. BOSs' returns on equity are approximately 15 percentage points lower compared to private peers. Results hold even after controlling by fixed effects and clustered-standard errors. These results showing a negative relationship between state participation and return on assets are consistent with former analysis by Phi et al., (2019) and Lin & Rowe (2006).

Table 10. Results for Return on Assets (ROA)

	Return on Assets								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
BOS	-4.992***	-4.939***	-4.905***	-4.901***	-4.882***	-5.001***	-4.986***	-4.986***	-4.986***
	(0.042)	(0.044)	(0.044)	(0.044)	(0.044)	(0.046)	(0.046)	(0.074)	(0.123)
Size	-0.651***	-0.546***	-0.532***	-0.556***	-0.540***	-0.505***	-0.499***	-0.499***	-0.499***
	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.012)	(0.032)
Age		-0.065***	-0.065***	-0.065***	-0.065***	-0.076***	-0.076***	-0.076***	-0.076***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.004)
Listing status			-3.034***	-2.950***	-2.979***	-2.447***	-2.413***	-2.413***	-2.413***
			(0.100)	(0.100)	(0.100)	(0.107)	(0.107)	(0.183)	(0.176)
Constant	8.576***	9.158***	9.113***	9.191***	9.139***	9.176***	9.151***	9.151***	9.151***
	(0.027)	(0.028)	(0.028)	(0.028)	(0.028)	(0.029)	(0.029)	(0.042)	(0.126)
Observations	6,576,325	6,428,898	6,428,898	6,428,898	6,428,883	6,428,815	6,422,117	6,422,117	6,422,117
R-squared	0.040	0.041	0.041	0.044	0.049	0.061	0.069	0.069	0.069
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	No	No	No	No	No	Yes	Yes	Yes	Yes
Country-Sector-Year FE	No	No	No	No	No	No	Yes	Yes	Yes
Clustered errors	No	No	No	No	No	No	No	Firm	Sector 2d

Robust standard errors in parentheses

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

Note: Return on Assets (ROA) is computed as the ratio between net income and total assets *100 (%). This variable is provided directly in the financial statements from ORBIS (BvD). The reference (excluded category) refers to Privately-owned Enterprises (POEs), so results should be interpreted as compared to private firms within the same sector, size, and age, and sector and controlling by the respective fixed effects. Size is measured as the log of total workers in year t-1, age refers to the lagged number of years in the market in t-1. Listed status is a dichotomous variable that takes value 1 if the company is listed in the stock market, 0 otherwise. Fixed effects are included to absorb for potential shocks such as temporary shocks (year-FE), sectoral shocks (sector-FE), time-varying sectoral shocks (sector-year FE), country specific shocks (country-FE),

country time varying events (country-year FE), and country, sector, and time varying shocks (country-sector-year, FE). Clustered standard errors are used to control for potential autocorrelation within firms (column 8 to capture potential serial correlation) and sectors (column 9).

Table 11. Results for Return on Equity

| | | | | | Return on Equity | | | | |
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
BOS	-16.17***	-15.34***	-15.24***	-15.29***	-15.27***	-15.48***	-15.45***	-15.45***	-15.45***
	(0.190)	(0.196)	(0.196)	(0.196)	(0.196)	(0.205)	(0.206)	(0.267)	(0.345)
Size	-2.251***	-1.242***	-1.201***	-1.264***	-1.252***	-1.127***	-1.116***	-1.116***	-1.116***
	(0.034)	(0.036)	(0.036)	(0.036)	(0.036)	(0.037)	(0.037)	(0.048)	(0.076)
Age		-0.577***	-0.576***	-0.575***	-0.574***	-0.599***	-0.597***	-0.597***	-0.597***
		(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.018)
Listing status			-8.680***	-8.409***	-8.439***	-7.690***	-7.535***	-7.535***	-7.535***
			(0.426)	(0.427)	(0.427)	(0.464)	(0.461)	(0.621)	(0.552)
Constant	26.97***	31.72***	31.59***	31.79***	31.72***	31.66***	31.60***	31.60***	31.60***
	(0.121)	(0.128)	(0.129)	(0.129)	(0.129)	(0.131)	(0.132)	(0.167)	(0.285)
Observations	6,035,007	5,896,478	5,896,478	5,896,478	5,896,459	5,896,382	5,889,443	5,889,443	5,889,443
R-squared	0.026	0.029	0.029	0.030	0.033	0.037	0.044	0.044	0.044
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	No	No	No	No	No	Yes	Yes	Yes	Yes
Country-Sector-Year FE	No	No	No	No	No	No	Yes	Yes	Yes
Clustered errors	No	No	No	No	No	No	No	Firm	Sector 2d

Robust standard errors in parentheses

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

Note: Return on Equity (ROE) is computed as the ratio between net income and shareholders' fund *100 (%). This variable is provided directly in the financial statements from ORBIS (BvD). The reference (excluded category) refers to Privately-owned Enterprises (POEs), so results should be interpreted as compared to private firms within the same sector, size, and age, and sector and controlling by the respective fixed effects. Size is measured as the log of total workers in year t-1, age refers to the lagged number of years in the market in t-1. Listed status is a dichotomous variable that takes value 1 if the company is listed in the stock market, 0 otherwise. Fixed effects are included to absorb for potential shocks such as temporary shocks (year-FE), sectoral shocks (sector-FE), time-varying sectoral shocks (sector-year FE), country specific shocks (country-FE), country time varying events (country-year FE), and country and sector specific and time varying shocks (country-sector-year, FE). Clustered standard errors are used to control for potential autocorrelation within firms (column 8 to capture potential serial correlation) and sectors (column 9).

6.2 Intensive margin: Does the level of state participation matter for operational and financial performance?

The state has multiple channels to participate in the corporate sector. It is not necessarily restricted to the majority or full shareholding. While BOSs are often majority or fully owned by the state, the state can also be a minority shareholder with mixed ownership with the private sector. In our sample, 58% of the BOSs are fully owned by the state (100%), and 16% are majority-owned (50%-99%). Additionally, 27% of the BOSs in our sample have minority shareholding (10%-49%).

This section explores to what extent the level of state participation as well as involvement of the private sector can influence firm performance. When there is private sector participation, we expect to observe potential gains in performance as private counterparts can contribute with financial, technical, and managerial resources as well as share risks and rewards with the government (UNDP, 2000).

For presentation purposes, the results are grouped in the Table 12 for the different outcomes of interest - labor productivity, profitability, liquidity, and return on investments.[20] These findings seem to confirm a gap between BOSs and POEs regardless the level of state shareholding. In other words, when the state holds 10% or more shareholding in the firm, the operational and financial results are subpar to those of private peers. Nonetheless, it also reveals private ownership can also play an important role in narrowing the gap between POEs and BOSs and improving performance. Results in Table 12 show performance differentials enlarge as state participation increases -particularly when the government holds majority or full control. On the contrary, BOS firms with mixed ownership jointly with the private sector and with minority state ownership seem to perform relatively better.

Table 12.Estimations by level of state participation

VARIABLES	(1) Labor productivity (log)	(2) Profit margin	(3) Current ratio	(4) Solvency ratio	(5) ROA	(6) ROE
BOS - 10-24.9%	**-0.187***	**-2.810***	**-0.203***	**1.460***	**-3.190***	**-10.66***
	(0.019)	(0.299)	(0.0552)	(0.356)	(0.157)	(0.677)
BOS -25-49.9%	**-0.229***	**-3.316***	**-0.170***	**1.773***	**-3.123***	**-10.25***
	(0.020)	(0.304)	(0.0530)	(0.392)	(0.163)	(0.610)
BOS -50%-99.9%	**-0.390***	**-4.068***	**0.0547**	**3.983***	**-4.194***	**-12.25***
	(0.015)	(0.233)	(0.0699)	(0.340)	(0.141)	(0.534)
BOS -100%	**-0.432***	**-8.578***	**-0.614***	**7.563***	**-6.101***	**-18.88***
	(0.025)	(0.436)	(0.0706)	(0.504)	(0.171)	(0.469)
Size	0.432***	-0.615***	-0.572***	-1.906***	-0.508***	-1.142***
	(0.009)	(0.0581)	(0.0135)	(0.0884)	(0.0317)	(0.0756)
Age	-0.0156***	0.0171***	0.0551***	0.740***	-0.0757***	-0.596***
	(0.001)	(0.00620)	(0.00193)	(0.00901)	(0.00380)	(0.0175)
Listing status	-0.643***	-0.440*	0.144***	6.675***	-2.610***	-8.133***
	(0.028)	(0.264)	(0.0490)	(0.333)	(0.168)	(0.535)
Constant	4.775***	7.554***	4.800***	37.04***	9.174***	31.67***
	(0.106)	(0.168)	(0.0482)	(0.295)	(0.125)	(0.284)
Observations	6,452,778	6,347,824	6,400,630	6,411,529	6,422,117	5,889,443
R-squared	0.718	0.105	0.067	0.137	0.069	0.044
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Clustered errors	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

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

Note: The reference (excluded category) refers to Privately-owned Enterprises (POEs), so results should be interpreted as compared to private firms within the same sector, size, and age, and controlling by the respective fixed effects. Labor productivity is measured as the total revenues per worker in logarithm. Profit margin is the ratio between profits before tax over total revenues*100 (%). Current ratio is estimated as current assets over current liabilities (due within a year). Solvency ratio is measured as the shareholders' funds over total assets. Return on Equity (ROE) is computed as the ratio between net income and shareholders' fund *100 (%). Return on Assets is computed as the ratio between net income and total assets

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[20] Results are robust and hold for the other specifications that include progressively the control variables and fixed effects as shown in the former section.

*100 (%). This variable is provided directly in the financial statements from ORBIS (BvD). Estimates include all sample. Size is measured as the log of total workers in year t-1 for the outcomes in columns (2-6), whereas size is measures as log of total assets when estimating labor productivity (Column 1) since the outcome is normalized by employment. Age is the lagged number of years in the market in t-1. Listed status is a dichotomous variable that takes value 1 if the company is listed in the stock market, 0 otherwise. Fixed effects are included to absorb for potential shocks such as temporary shocks (year-FE), sectoral shocks (sector-FE), time-varying sectoral shocks (sector-year FE), country specific shocks (country-FE), country time varying events (country-year FE), and country and sector specific and time varying shocks (country-sector-year, FE). Clustered standard errors are used to control for potential autocorrelation at the industry-level.

Compared to firms solely owned by the state, firms with private participation operate more closely to their private counterparts. As state participation decreases, the gap between BOS and POEs seems to shrink. Results in column 1 (Table 12) suggest fully owned BOSs are approximately 35% less productive than POEs, whereas the gap reduces up to 17% when the state is a minority shareholder (i.e., participation between 10%-24.9%).[21] Similar results are found in terms of profitability and return on investments. Profit margins (column 2) in fully-owned BOS are, on average, 8.5 percentage points lower than those reported by private counterparts within the same industry. As the state participation reduces to less than 25% (minority shareholding), the gap is only about 2.8 percentage points.

Returns on equity and assets show a similar pattern. Fully owned BOSs are more distant from POEs than firms with mixed ownership. When the state is a minority shareholder, the ROA for BOSs is about 3.1 percentage points lower than POEs, while for majority and fully owned BOS this difference increases up to 4.2 and 6.1 percentage points, respectively.

The lower the state participation, the smaller the performance gaps in terms of liquidity. For each dollar due within a year, fully owned BOSs have on average 0.6 dollars less to cover short-term obligations in current assets (column 3). On the contrary, the gap decreases to 0.2 when the state holds less than 25% participation. Overall, firms with 10% or more state participation have lower reserves on assets to fulfill financial commitments in the long term measured by the solvency ratio (column 4). Yet, when there is mixed ownership and the private sector is the main owner, the differential is about five times lower.

These results can obey to different risk-taking decisions when the state holds a dominant role as owner. As the state controls or owns more shareholding in a firm, it can outweigh other shareholders and leverage the connection to potential external resources. Hence, the level of state participation can influence risk-taking behavior and investment decisions, which may not necessarily be driven by profitability objectives (Uddin, 2016; Nguyen et al, 2020). Firms with higher state shareholding could be more exposed to the influence of the government, hindering effectiveness, and profitability by squeezing out commercial goals (Boko & Qin, 2011). Results highlight that the private sector can play an important role driving improved performance. As suggested by (Shang, Yuan, Li, & Fan, 2022), mixed ownership and non-state shareholders seem to reduce potential discretion of the state to influence management decisions of the firm and help mitigating principal-agency problems. Results seem indicative that private shareholding can help to balance the decision on whether to take a more prudent or market-oriented approach driven by considerations about performance, survival, and growth rather than social and political objectives (Nguyen et al, 2020).

6.3 Does the degree of separation from the state matter?

The state can act as a direct shareholder or operate at arm's length through other entities. By using the WB BOS database, we can explore whether there are potential differences when the state is the direct shareholder compared to cases in which it owns a BOS through other(s) firm(s) (i.e., indirect owner).

Former authors such as Okhmatovskiy (2010) and Liljeblom, Maury, & Hörhammer (2020) argue effects of state ownership on performance may be more evident among directly owned companies, while the effect

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[21] The interpretation of the coefficients requires the $Log - Lin$ transformation such that the average relationship is estimated as $(exp(\beta_1) - 1) * 100$.

of indirect ownership is more ambiguous.[22] We test this potential relationship to address this important empirical question.[23] We argue the government's ability to influence strategic and managerial decisions of BOSs is higher when it acts as a direct owner, whereas it may diminish as the state has participation through other entities or chain of entities. For instance, when acting as a direct shareholder, the government can have voting rights and exercise the decision powers of the board, which then can be reflected in different risk-taking decisions and financial outcomes of the firm.

Therefore, we explore how the degree of proximity to the public authority as a shareholder can explain differences in performance among BOSs. For this purpose, we create an indicator of the degree of proximity to the state based on the ownership structures provided by the WB BOS database. We differentiate between BOSs owned directly by the government (i.e., public authority) and those in which it holds participation through another firm or set of firms. For the latter, we identify how many firms -denoted as layers-participate in the ownership path and differentiate among BOSs with 2, 3, and 4+ layers of ownership (Table 13).[24]

Table 13. Degree of proximity to the state

Category	Definition
Direct ownership	Firms owned by a central or subnational public authority with 10% or more participation. For instance, Ministry of Finance owns 25% of firm A.
Indirect (2 layers)	The state is an indirect owner through another firm/entity. In this case, B is an indirectly owned BOS as the firm A (with 25% direct participation of the MoF) owns 10% or more of company B.
Indirect (3 layers)	The state is an indirect owner through ownership links that relate three firms. In this case, C is an indirectly owned BOS if the firm B owns 10% or more of company C, which is owned (by 10% or more) by company A, which is owned by the state. So, MoF owns A, which owns B, B owns C. Therefore, C owned by the government through at least 3 layers of ownership.
Indirect (4+ layers)	Firms indirectly owned by the state such that four or more firms are identified in the ownership path that connects the firm D with the Public Authority. For example, Public Authority owns A, which owns B, which owns C, and it owns D. D is indirectly owned by the government as it is connected to a Public Authority through a chain of four (or more) participated firms.

Source: Author's elaboration using World Bank's BOS database

Results in Table 14 are indicative of indirectly owned BOSs being associated with better performance results when compared to directly owned BOSs. As the distance from the public authority increases, BOSs appear to achieve better performance outcomes. Compared against directly owned BOSs (reference category), column (1) indicates that indirectly owned BOSs are 28% more productive.[25] When the degree of separation from the state increases, which we consider as a proxy of autonomy,[26] BOSs seem to perform relatively better achieving up to 62% more revenues per worker (labor productivity) when there are 4 or more layers between the BOS firm and the public authority who exercises the ownership rights. Similarly, the results suggest that further separation from the public authority is associated with better profitability up to 4.2 percentage points (column 2) higher and up to 9 percentage points higher returns of investments

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[22] (Okhmatovskiy, 2010) suggests that indirect state control may still give access to state resources but reduce the negative governance effects arising from direct shareholding.

[23] For this assessment, we restrict the analysis to compare among BOS as we do not have the ownership structure of private counterparts in the WB BOS database.

[24] To illustrate the difference, A is directly owned by the state if the direct shareholder corresponds to a Public Authority (denoted as such in ORBIS). On the contrary, B is indirectly owned, if it is participated by company A, which is owned by a Public Authority. The entity type is built from the ORBIS entity type vintage files.

[25] The interpretation of the coefficients requires the $Log - Lin$ transformation such that the average relationship is estimated as $(exp(\beta_1) - 1) * 100 = (exp(0.247)-1)*100 = 28.01\%$.

[26] It means more layers of ownership separate the entity from the public authority.

(columns 6) vis-à-vis directly owned BOSs. Interestingly in terms of liquidity, we find further separation from the state seems to reduce the financial leverage of BOSs and reduce the gap vis-à-vis POEs. This could be explained by the fact that as firms depart from the public authority, the probability of receiving direct government support could diminish, and therefore their decisions on financial leverage are more aligned with those of POEs. These findings could be indicative than higher separation or autonomy from the firm could serve to aligned better the incentives from the firm to achieve improved performance outcomes, which can curb political interference of the government in the day-to-day decisions of the firm and mitigate principal-agent issues.

Table 14. Estimations by degree of proximity of state participation

VARIABLES	(1) Labor productivity (log)	(2) Profit margin	(3) Current ratio	(4) Solvency ratio	(5) ROA	(6) ROE
Indirect - 2 layers	0.247***	1.501***	-0.300***	-6.793***	0.709***	4.934***
	(0.0117)	(0.189)	(0.0677)	(0.303)	(0.181)	(0.758)
Indirect - 3 layers	0.414***	2.270***	-0.928***	-8.877***	1.247***	7.376***
	(0.0211)	(0.330)	(0.107)	(0.451)	(0.228)	(0.868)
Indirect - 4+ layers	0.487***	4.211***	-0.683***	-10.70***	2.064***	9.513***
	(0.0241)	(0.297)	(0.135)	(0.527)	(0.236)	(1.040)
Size	0.342***	0.322***	-0.472***	-0.854***	0.125***	-0.419**
	(0.00568)	(0.101)	(0.0201)	(0.117)	(0.0472)	(0.168)
Age	-0.0101***	0.0894***	0.0101***	0.416***	0.0265***	-0.118***
	(0.000711)	(0.0117)	(0.00344)	(0.0171)	(0.00645)	(0.0244)
Listing status	-0.311***	1.849***	-0.111	1.670**	-0.184	0.135
	(0.0261)	(0.521)	(0.0932)	(0.693)	(0.253)	(1.380)
Constant	5.026***	-3.509***	5.066***	48.35***	-0.665***	3.789***
	(0.0818)	(0.538)	(0.112)	(0.508)	(0.250)	(0.811)
Observations	179,124	169,457	176,038	175,205	177,164	159,442
R-squared	0.700	0.230	0.133	0.195	0.106	0.086
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Clustered errors	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

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

Note: This regression is performed only among BOSs as we do not have the ownership structure of the POEs in the data. Thus, the reference (excluded category) refers to directly owned (BOSs), so results should be interpreted as compared to a firm directly owned by the state (10% or more) in the same sector, size, and age, and controlling by the respective fixed effects. Labor productivity is measured as the total revenues per worker in logarithm. Profit margin is the ratio between profits before tax over total revenues*100 (%). Current ratio is estimated as current assets over current liabilities (due within a year). Solvency ratio is measured as the shareholders' funds over total assets. Return on Equity (ROE) is computed as the ratio between net income and shareholders' fund *100 (%). Return on Assets is computed as the ratio between net income and total assets *100 (%). This variable is provided directly in the financial statements from ORBIS (BvD). Estimates include only firms with state participation -BOS only. Size is measured as the log of total workers in year t-1 for the outcomes in columns (2-6), whereas size is measures as log of total assets when estimating labor productivity (column 1) since the outcome is normalized by employment. Age is the lagged number of years in the market in t-1. Listed status is a dichotomous variable that takes value 1 if the company is listed in the stock market, 0 otherwise. Fixed effects are included to absorb for potential shocks such as temporary shocks (year-FE), sectoral shocks (sector-FE), time-varying sectoral shocks (sector-

year FE), country specific shocks (country-FE), country time varying events (country-year FE), and country and sector specific and time varying shocks (country-sector-year, FE). Clustered standard errors are used to control for potential autocorrelation at the industry-level.

6.4 Does the performance gaps vary across sectors?

It is commonly expected to observe performance differentials between POEs and BOSs as the latter are often coupled with a public mandate and pursue non-commercial functions that are not necessarily aligned with a profit maximization behavior (Pratuckchai & Patanapongse, 2012). Sometimes, these public service mandates are neither accounted for nor properly compensated and can impact firm performance. Although this might justify the deviation of the financial performance of BOSs vis-à-vis POEs, we explore whether this differs across the type of markets in which the state operates.

We argue that the likelihood of BOSs fulfilling a public mandate is lower in competitive sectors that can be viable for private investors such as the manufacturing of textiles, accommodation, or retail activities. Unless other market distortions unlevel the playing field, when operating in competitive sectors, BOSs should be expected to behave more closely to their private peers. In other words, signs of lower performance in competitive sectors can potentially have implications of misallocation of resources and opportunity costs of state ownership as those sectors could be more efficiently served by the private sector.

In competitive sectors, private entry is viable, technology is relatively homogeneous, and restrictions for operation are lower (Dall'Olio, et al., 2022b). On the contrary, as the degree of contestability of a sector decreases and market failures are more common such as externalities, public goods, or natural monopolies, then it is more likely that BOSs fulfill some public service obligations (e.g., postal services). In those cases, the underperformance of BOS could be expected by the potential of social mandates and the need to provide public services.

In this section, we assess to what extent performance differentials vary across sectors where BOSs operate by using the WB sector taxonomy (Dall'Olio, et al., 2022b) and explore the potential differences between competitive, partially contestable, and natural monopolies.[27] First, we compare between competitive and non-competitive sectors by combining the sectors denoted as natural monopolies and partially contestable in a single category. Next, we break down the analysis by exploring the differences across the three types of sectors -competitive, partially contestable, and natural monopolies.

Results in Table 15**Error! Reference source not found.** suggest a performance gap between BOSs and POEs across all types of sectors. Nonetheless, it also features some heterogeneity depending on the markets in which the state operates. BOSs in competitive sectors seem to achieve lower profit margins (column 5), lower return on assets and equity (columns 14 and 17), and be more financially able to cover short-term obligations (column 8) vis-à-vis non-competitive sectors. Results in Table 16 show these differences are statistically significant.

We delve deeper into these differences within non-competitive sectors for natural monopolies and partially contestable sectors in **Error! Reference source not found.**columns (3, 6, 9, 12, 15, 18). Findings confirm there is a differential across all sector types, but it seems larger in terms of profitability and returns on investments when BOSs operate in competitive sectors. Again, we confirm these differences are statistically significant (Table 16). These results are consistent with previous studies that find firms with state participation in competitive sectors tend to be less efficient and have lower profitability compared to private firms (Megginson, Nash, & Randenborgh, 1994), (Boardman & Vining, 1989), (Boardman & Vining, 1992), (Shirley & P., 2000). Findings also suggest that BOSs depart the most from POEs in terms of labor

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[27] Definitions are presented in Table 3. For more information on how the taxonomy was built and sector characteristics please refer to (Dall'Olio, et al., 2022b).

productivity and solvency when operating in natural monopoly sectors, which has been documented with POEs outperforming in sewage and garbage collection (Savas, 1977; Bennett & Johnson, 1979).**Error! Reference source not found.**

Table 15. Estimations of performance differentials between BOSs and POEs by sector-type

VARIABLES	(1) Labor productivity	(2) Labor productivity	(3) Labor productivity	(4) Profit margins	(5) Profit margins	(6) Profit margins	(7) Current ratio	(8) Current ratio	(9) Current ratio	(10) Solvency ratio	(11) Solvency ratio	(12) Solvency ratio
BOS	-0.448***			-6.297***			-0.436***			5.38***		
	(0.021)			(0.319)			(0.063)			(0.365)		
BOS*Competitive sectors		-0.405***			-6.953***			-0.471***			4.304***	
		(0.024)			(0.390)			(0.077)			(0.388)	
BOS*Non-Competitive s.		-0.569***			-4.454***			-0.340***			8.448***	
		(0.034)			(0.681)			(0.071)			(0.625)	
BOS*Competitive sector			-0.405***			-6.948***			-0.470***			4.318***
			(0.024)			(0.389)			(0.077)			(0.388)
BOS*Natural monopoly			-0.622***			-2.325***			-0.157***			14.68***
			(0.041)			(0.644)			(0.073)			(0.461)
BOS*P. Contestable sector			-0.534***			-5.981***			-0.467***			4.092***
			(0.0528)			(0.981)			(0.099)			(0.526)
Size	0.443***	0.444***	0.444***	-0.609***	-0.615***	-0.614***	-0.580***	-0.571***	-0.581***	-2.068***	-2.07***	-2.07***
	(0.008)	(0.008)	(0.008)	(0.053)	(0.054)	(0.054)	(0.013)	(0.013)	(0.013)	(0.085)	(0.085)	(0.085)
Age	-0.0154***	-0.0154***	-0.0154***	0.018***	0.018***	0.018***	0.057***	0.057***	0.057***	0.770***	0.771***	0.771***
	(0.0006)	(0.0006)	(0.0006)	(0.005)	(0.005)	(0.005)	(0.002)	(0.002)	(0.002)	(0.009)	(0.009)	(0.009)
Listing status	-0.688***	-0.686***	-0.685***	0.168	0.127	0.106	0.226***	0.224***	0.223***	6.43***	6.373***	6.315***
	(0.028)	(0.028)	(0.028)	(0.359)	(0.333)	(0.333)	(0.050)	(0.050)	(0.050)	(0.329)	(0.317)	(0.317)
Constant	4.622***	4.621***	4.621***	7.508***	7.524***	7.516***	4.804***	4.805***	4.805***	37.19***	37.22***	37.2***
	(0.109)	(0.109)	(0.109)	(0.159)	(0.160)	(0.160)	(0.048)	(0.045)	(0.045)	(0.279)	(0.279)	(0.279)
Observations	6,459,435	6,459,435	6,459,435	6,354,524	6,354,524	6,354,524	6,407,322	6,407,322	6,407,322	6,418,217	6,418,217	6,418,217
R-squared	0.701	0.701	0.701	0.081	0.082	0.082	0.056	0.056	0.067	0.137	0.117	0.118
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-Sector-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustered errors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

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

(Continued)

VARIABLES	(13) ROA	(14) ROA	(15) ROA	(16) ROE	(17) ROE	(18) ROE
BOS	**-5.04***			**-15.61***		
	(0.135)			(0.394)		
BOS*Competitive sectors		**-5.297***			**-16.32***	
		(0.157)			(0.500)	
BOS*Non-Competitive s.		**-4.328***			**-13.63***	
		(0.358)			(0.924)	
BOS*Competitive sector			**-5.295***			**-16.32***
			(0.156)			(0.499)
BOS*Natural monopoly			**-3.518***			**-12.98***
			(0.323)			(0.790)
BOS*P. Contestable sector			**-4.889***			**-14.09***
			(0.504)			(1.399)
Size	-0.526***	-0.529***	-0.529***	-1.120***	-1.128***	-1.127***
	(0.032)	(0.032)	(0.032)	(0.075)	(0.075)	(0.075)
Age	-0.073***	-0.073***	-0.073***	-0.602***	-0.602***	-0.602***
	(0.003)	(0.003)	(0.003)	(0.017)	(0.017)	(0.017)
Listing status	-2.413***	-2.511***	-2.518***	-7.43***	-7.470***	-7.476***
	(0.176)	(0.200)	(0.199)	(0.552)	(0.549)	(0.549)
Constant	9.20***	9.211***	9.208***	31.67***	31.70***	31.69***
	(0.125)	(0.125)	(0.125)	(0.284)	(0.284)	(0.284)
Observations	6,422,117	6,428,788	6,428,788	5,896,364	5,896,364	5,896,364
R-squared	0.055	0.056	0.056	0.034	0.035	0.035
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Clustered errors	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

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

Note: Labor productivity is measured as the total revenues per worker in logarithm. Profit margin is the ratio between profits before tax over total revenues*100 (%). Current ratio is estimated as current assets over current liabilities (due within a year). Solvency ratio is measured as the shareholders' funds over total assets. Return on Equity (ROE) is computed as the ratio between net income and shareholders' fund *100 (%). Return on Assets is computed as the ratio between net income and total assets *100 (%). The reference (excluded category) refers to Privately-owned Enterprises (POEs), so results should be interpreted as compared to private firms within the same sector, size, and age, and controlling by the respective fixed effects. Size is measured as the log of total assets when assessing the labor productivity as outcome, otherwise is measured by the log of total workers in year t-1. Age is the lagged number of years in the market in t-1. Listed status is a dichotomous variable that takes value 1 if the company is listed in the stock market, 0 otherwise. Fixed effects are included to absorb for potential shocks such as temporary shocks (year-FE), sectoral shocks (sector-FE at 2-digits), time-varying sectoral shocks (sector-year FE), country specific shocks (country-FE), country time varying events (country-year FE), and country and sector specific and time varying shocks (country-sector-year, FE). Clustered standard errors are used to control for potential autocorrelation at the industry-level. In this case, the sectoral fixed effects are considered at the 2-digits level to capture sectoral heterogeneities that are at a higher level than the sector taxonomy used at 4-digits level. For instance, this allows to capture differences within the electricity sector while acknowledging the different type of markets (e.g., production as competitive vs. transmission as natural monopoly

Indicator	Competitive vs. Non-competitive (F-value)	p-value	Competitive vs. partially contestable and natural monopoly sectors (F-value)	p-value
Labor productivity	15.99***	0.0010	12.34***	0.0000
Profit margin	8.82***	0.0031	15.87***	0.0000
Current ratio	1.77	0.1844	5.58***	0.0039
Solvency ratio	34.78***	0.0000	69.29***	0.0000
ROA	5.6**	0.0182	10.61***	0.0000
ROE	5.79**	0.0163	5.49***	0.0043

Note: These results test the null hypothesis of equality of the coefficients of BOS in competitive sectors vis-à-vis non-competitive sectors (column 2) and joint hypothesis of BOS in competitive sectors vs. partially contestable sectors, and natural monopolies.

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

Finally, we explore whether some differences in performance can vary simultaneously by the level of state participation and the type of market in which BOSs operate. We observe that when differentiating by competitive, natural monopoly, and partially contestable sectors, BOSs results are lower in terms of labor productivity at all levels of state participation. Yet, the largest differentials are evidenced in competitive and partially contestable sectors when BOSs are fully owned by the state.[28]

Regarding profit margins, the results in Table 17 indicate that BOSs in natural monopoly sectors and partially contestable sectors in which the state holds a minority (10-24.9%) do not differ statistically from the POEs. On the contrary, BOS profits in competitive sectors are lower than comparator peers at all levels of participation. For all sectors, the differential in profitability between BOSs and POEs is statistically significant and larger when the state is the full owner. The coefficients are statistically different and significant at 1%, 5% and 10% significance levels as shown in Annex 4.

In terms of liquidity in the short-term (current ratio), there are no significant differences between BOSs and POEs in natural monopoly sectors when there is minority state participation below 50% (Table 17, columns 9-11). For partially contestable sectors, this is also true when the state is a minority shareholder below 25%. When the BOSs are fully owned by the state, BOSs appear more financially leveraged across all types of sectors. Furthermore, when measuring long-term leverage using the solvency ratio, findings suggest BOSs are more dependent on external debt vis-à-vis POEs for covering long-term obligations across all type of sectors, but particularly when BOSs are fully owned (columns 10-12).

Finally, disparity between BOSs and POEs persist across all levels of state participation and sector-types for the indicators of return on investments -both ROA and ROE. As state participation increases within competitive, natural monopoly or partially contestable sectors, the differentials expand vis-à-vis POEs. The largest divergence between POEs and BOSs in terms of ROA and ROE is found for BOSs fully owned by the state across all 3 types of sectors (column 14-18).

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[28] For brevity, the test of the statistical differences among the levels of state participation is included in Annex 4. Nonetheless, the results and p-values show the coefficients for the level of state participation are statistically different and significant.

Table 17. Intensive margins and type of sectors where BOSs operate

VARIABLES	(1) Labor productivity Comp	(2) Labor productivity Nat. Mon.	(3) Labor productivity Part. Contestable.	(4) Profit margin Comp	(5) Profit margin Nat. Mon.	(6) Profit margin Part. Contestable.	(7) Current ratio Comp	(8) Current ratio Nat. Mon.	(9) Current ratio Part. Contestable.
BOS - 10-24.9%	-0.178***	-0.144***	-0.172***	-3.612***	0.120	-0.473	-0.273***	-0.00213	0.0597
	(0.0224)	(0.0314)	(0.0280)	(0.341)	(0.441)	(0.431)	(0.0656)	(0.107)	(0.113)
BOS -25-49.9%	-0.221***	-0.152***	-0.213***	-3.610***	-1.678***	-3.096***	-0.185***	0.0377	-0.190*
	(0.0236)	(0.0228)	(0.0289)	(0.375)	(0.378)	(0.546)	(0.0663)	(0.0976)	(0.113)
BOS -49.9%-99.9%	-0.346***	-0.378***	-0.467***	-4.450***	-2.843***	-3.281***	0.115	0.282**	-0.252**
	(0.0164)	(0.0247)	(0.0305)	(0.277)	(0.367)	(0.617)	(0.0897)	(0.120)	(0.0973)
BOS -100%	-0.415***	-0.332***	-0.537***	-8.869***	-6.756***	-8.619***	-0.637***	-0.485***	-0.534***
	(0.0326)	(0.0242)	(0.0235)	(0.541)	(0.428)	(1.066)	(0.0916)	(0.0812)	(0.121)
Size	0.435***	0.376***	0.400***	-0.628***	-0.195	-0.626***	-0.571***	-0.585***	-0.575***
	(0.00910)	(0.0111)	(0.0116)	(0.0626)	(0.169)	(0.0736)	(0.0143)	(0.0304)	(0.0302)
Age	-0.0157***	-0.0183***	-0.0122***	0.0190***	0.106***	-0.0722***	0.0559***	0.0457***	0.0361***
	(0.000780)	(0.00106)	(0.000746)	(0.00643)	(0.0133)	(0.0103)	(0.00202)	(0.00407)	(0.00316)
Listing status	-0.684***	-0.373***	-0.346***	-1.090***	1.409**	3.857***	0.153***	-0.00744	0.259**
	(0.0294)	(0.0347)	(0.0461)	(0.248)	(0.693)	(0.707)	(0.0533)	(0.147)	(0.126)
Constant	4.753***	5.036***	4.909***	7.519***	6.113***	9.511***	4.788***	4.781***	5.038***
	(0.111)	(0.140)	(0.155)	(0.179)	(0.680)	(0.343)	(0.0509)	(0.0887)	(0.0972)
Observations	6,110,399	107,406	234,973	6,014,287	105,235	228,302	6,062,067	106,629	231,934
R-squared	0.719	0.702	0.692	0.102	0.117	0.169	0.068	0.042	0.051
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustered errors	Sector 2d	Sector 2d	Sector 2d	Sector 2d	Sector 2d	Sector 2d	Sector 2d	Sector 2d	Sector 2d

Robust standard errors in parentheses

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

(Continued)

VARIABLES	(10) Solvency ratio Comp	(11) Solvency ratio Nat. Mon.	(12) Solvency ratio Part. Contestable.	(13) ROA Comp	(14) ROA Nat. Mon.	(15) ROA Part. Contestable.	(16) ROE Comp	(17) ROE Nat. Mon.	(18) ROE Part. Contestable.
BOS*[10-25%]	1.310***	2.524***	2.197***	-3.549***	-2.050***	-1.892***	-11.96***	-6.669***	-5.737***
	(0.416)	(0.541)	(0.765)	(0.179)	(0.373)	(0.377)	(0.795)	(1.843)	(1.506)
BOS* [25-50%]	1.097**	7.193***	1.391*	-3.411***	-1.854***	-2.573***	-11.46***	-4.540***	-8.021***
	(0.456)	(0.671)	(0.787)	(0.183)	(0.329)	(0.392)	(0.675)	(1.120)	(1.869)
BOS * [50%-99]	3.934***	6.230***	3.729***	-4.361***	-3.516***	-3.878***	-12.93***	-9.609***	-10.50***
	(0.409)	(0.698)	(0.691)	(0.175)	(0.306)	(0.354)	(0.668)	(1.078)	(1.388)
BOS*[100%]	6.778***	13.15***	6.592***	-6.136***	-5.320***	-6.406***	-19.37***	-15.55***	-18.81***
	(0.628)	(0.492)	(0.671)	(0.187)	(0.285)	(0.573)	(0.542)	(0.879)	(1.504)
Size	-1.928***	-1.219***	-1.790***	-0.506***	-0.523***	-0.548***	-1.128***	-1.563***	-1.269***
	(0.0944)	(0.239)	(0.181)	(0.0339)	(0.100)	(0.0592)	(0.0807)	(0.275)	(0.188)
Age	0.745***	0.684***	0.633***	-0.0752***	-0.0449***	-0.104***	-0.596***	-0.502***	-0.633***
	(0.00929)	(0.0299)	(0.0188)	(0.00394)	(0.0116)	(0.00883)	(0.0182)	(0.0472)	(0.0278)
Listing status	6.862***	3.491***	6.764***	-3.072***	0.0631	-0.168	-9.011***	-1.568	-4.150***
	(0.366)	(0.968)	(1.018)	(0.148)	(0.527)	(0.458)	(0.564)	(1.546)	(1.514)
Constant	36.91***	39.70***	39.49***	9.153***	8.871***	9.797***	31.59***	32.64***	32.76***
	(0.314)	(0.941)	(0.618)	(0.132)	(0.469)	(0.255)	(0.298)	(1.423)	(0.808)
Observations	6,073,902	106,297	231,330	6,083,695	106,331	232,091	5,583,006	95,858	210,579
R-squared	0.138	0.116	0.106	0.069	0.068	0.073	0.044	0.043	0.044
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustered errors	Sector 2d	Sector 2d	Sector 2d	Sector 2d	Sector 2d	Sector 2d	Sector 2d	Sector 2d	Sector 2d

Robust standard errors in parentheses

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

6.5 Robustness checks

We also test whether these findings are robust to the consideration of shorter periods to try to minimize the effect of omitted changes in ownership along the sample period. We also explore to what extent these results are robust when restricting the sample only to fully owned BOSs. For this purpose, we conduct two exercises. First, we estimate the model proposed in (1) for shorter time windows of 5-years and 3-years. The results of the first exercise are presented in the Annex for the different specifications, but for brevity are summarized in Table 18 for the 5-year period (2016-2020) and Table 19 (3-year period, 2018-2020).

Findings show the effects are robust when analyzing shorter timeframes of 5 and 3 years. The magnitude, direction, and statistical significance of the effects remain confirming a negative relationship between state ownership and labor productivity, profit margins, short-term liquidity, and returns of investments. When reducing the timeframe, the results still indicate that BOSs are on average 32-38% less productive, obtain between 6.3 and 7.8 percentage points lower profit margins, have 0.34-0.35 fewer dollars in assets to cover each dollar in short-term debts, and provide lower returns of the order of 4.9-5.6 dollars less for each dollar invested in assets. As before, BOSs also appear to rely more on external financing vis-à-vis equity for covering long-term debt.

Table 18. Robustness check considering 5-year period (2016-2020)

	(1) Labor productivity	(2) Profit margin	(3) Current ratio	(4) Solvency ratio	(5) ROA	(6) ROE
BOS	-0.476***	-7.486***	-0.347***	4.710***	-5.667***	-17.05***
	(0.034)	(0.517)	(0.109)	(0.468)	(0.147)	(0.52)
Labor	0.385***	-0.652***	-0.605***	-2.175***	-0.535***	-1.034***
	(0.012)	(0.078)	(0.022)	(0.112)	(0.0378)	(0.087)
Age	-0.0133***	0.0363***	0.0558***	0.731***	-0.0636***	-0.549***
	(0.001)	(0.010)	(0.003)	(0.011)	(0.0039)	(0.019)
Listing status	-0.552***	0.669	0.142	5.895***	-2.746***	-8.024***
	(0.041)	(0.427)	(0.096)	(0.516)	(0.293)	(0.888)
Constant	5.622***	7.652***	4.701***	37.76***	9.362***	31.07***
	(0.15)	(0.191)	(0.072)	(0.383)	(0.151)	(0.33)
Observations	2,892,917	2,848,595	1,475,667	2,865,387	2,870,563	2,649,938
R-squared	0.694	0.115	0.072	0.146	0.075	0.047
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Clustered errors	Sector 2d	Sector 2d	Sector 2d	Sector 2d	Sector 2d	Sector 2d

Robust standard errors in parentheses

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

	Labor productivity	Profit margin	Current ratio	Solvency ratio	ROA	ROE
BOS	-0.480***	-7.859***	-0.347***	4.333***	-5.898***	-17.47***
	(0.0517)	(0.768)	(0.109)	(0.648)	(0.211)	(0.782)
Labor	0.385***	-0.671***	-0.605***	-2.224***	-0.559***	-1.016***
	(0.0178)	(0.102)	(0.022)	(0.149)	(0.0479)	(0.125)
Age	-0.0131***	0.0379**	0.0558***	0.732***	-0.0562***	-0.513***
	(0.0016)	(0.0154)	(0.00330)	(0.0159)	(0.00524)	(0.0286)
Listing status	-0.545***	0.611	0.142	5.772***	-2.687***	-8.116***
	(0.0574)	(0.641)	(0.0963)	(0.745)	(0.379)	(1.183)
Constant	5.618***	7.441***	4.701***	37.96***	9.173***	29.72***
	(0.222)	(0.240)	(0.0725)	(0.501)	(0.194)	(0.486)
Observations	1,476,309	1,461,512	1,475,667	1,468,951	1,470,483	1,357,960
R-squared	0.687	0.126	0.072	0.146	0.085	0.052
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Clustered errors	Sector 2d	Sector 2d	Sector 2d	Sector 2d	Sector 2d	Sector 2d

Robust standard errors in parentheses

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

Note: The reference (excluded category) refers to Privately-owned Enterprises (POEs), so results should be interpreted as compared to private firms within the same sector-type, size, and age, and controlling by the respective fixed effects. Labor productivity is measured as the total revenues per worker in logarithm. Profit margin is the ratio between profits before tax over total revenues*100 (%). Current ratio is estimated as current assets over current liabilities (due within a year). Solvency ratio is measured as the shareholders' funds over total assets. Return on Equity (ROE) is computed as the ratio between net income and shareholders' fund *100 (%). Return on Assets is computed as the ratio between net income and total assets *100 (%). Size is measured as the log of total assets when assessing the labor productivity as outcome, otherwise is measured by the log of total workers in year t-1. Age is the lagged number of years in the market in t-1. Listed status is a dichotomous variable that takes value 1 if the company is listed in the stock market, 0 otherwise. Fixed effects are included to absorb for potential shocks such as temporary shocks (year-FE), sectoral shocks (sector-FE), time-varying sectoral shocks (sector-year FE), country specific shocks (country-FE), country time varying events (country-year FE), and country and sector specific and time varying shocks (country-sector-year, FE). Clustered standard errors are used to control for potential autocorrelation at the industry-level.

Second, we test whether the results hold when restricting the sample only to those firms fully owned by the state. Once more, robustness checks show that the results evidenced before are qualitatively unchanged in Table 20 restricting the sample to fully owned BOSs. As before, we find a negative and statistically significant correlation between state participation -defined here as firms with the state as the sole owner- and labor productivity, profit margins, current ratio, ROA, and ROE, whereas BOSs seem to be more leveraged than POEs.

Table 20. Robustness checks: estimates fully owned BOSs only

VARIABLES	(1) Log (labor productivity)	(2) Profit margin	(3) Current ratio	(4) Solvency ratio	(5) ROA	(6) ROE
BOS-fully owned (only)	-0.434***	-8.581***	-0.627***	7.600***	-6.082***	-18.81***
	(0.0257)	(0.442)	(0.0707)	(0.503)	(0.176)	(0.479)
Size	0.433***	-0.638***	-0.572***	-1.909***	-0.523***	-1.165***
	(0.00869)	(0.0589)	(0.0137)	(0.0896)	(0.0323)	(0.0769)
Age	-0.0156***	0.0168***	0.0557***	0.744***	-0.0767***	-0.601***
	(0.000748)	(0.00619)	(0.00193)	(0.00900)	(0.00383)	(0.0176)
Listing status	-0.639***	-1.006***	0.109**	6.842***	-3.242***	-9.967***
	(0.0316)	(0.252)	(0.0536)	(0.338)	(0.152)	(0.559)
Constant	4.759***	7.617***	4.793***	37.01***	9.242***	31.82***
	(0.106)	(0.169)	(0.0486)	(0.298)	(0.127)	(0.286)
Observations	6,376,996	6,275,906	6,325,638	6,336,963	6,346,550	5,821,167
R-squared	0.719	0.104	0.067	0.137	0.069	0.044
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Clustered errors	Sector 2d	Sector 2d	Sector 2d	Sector 2d	Sector 2d	Sector 2d

Robust standard errors in parentheses

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

Note: The reference (excluded category) refers to Privately-owned Enterprises (POEs), so results should be interpreted as compared to private firms within the same sector-type, size, and age, and controlling by the respective fixed effects. Labor productivity is measured as the total revenues per worker in logarithm. Profit margin is the ratio between profits before tax over total revenues*100 (%). Current ratio is estimated as current assets over current liabilities (due within a year). Solvency ratio is measured as the shareholders' funds over total assets. Return on Equity (ROE) is computed as the ratio between net income and shareholders' fund *100 (%). Return on Assets is computed as the ratio between net income and total assets *100 (%). Size is measured as the log of total assets when assessing the labor productivity as outcome, otherwise is measured by the log of total workers in year t-1. Age is the lagged number of years in the market in t-1. Listed status is a dichotomous variable that takes value 1 if the company is listed in the stock market, 0 otherwise. Fixed effects are included to absorb for potential shocks such as temporary shocks (year-FE), sectoral shocks (sector-FE), time-varying sectoral shocks (sector-year FE), country specific shocks (country-FE), country time varying events (country-year FE), and country and sector specific and time varying shocks (country-sector-year, FE). Clustered standard errors are used to control for potential autocorrelation at the industry-level.

6.6 Do BOSs react differently to POEs when facing economic shocks? An assessment of the early COVID-19 shock

Although there might exist differences in both operational and financial performance, BOSs can play roles in the economy by contributing to smooth economic shocks, providing counter-cyclical investment, and maintaining and protecting employment (Bai, Li, Tao, & Wang, 2000; Telegdy, 2016). The period of our panel allows us to explore whether this is the case in a short-term response to the COVID-19 shock for the year 2020. We analyze the response of POEs vis-à-vis BOSs for investment and employment to the COVID-19 shock, and whether there is some divergence in the adjustment paths to an unexpected shock. The specification of this estimation follows the model in (2) presented in section 5.

Overall, findings in Table 21 indicate that BOSs operate with a larger number of workers and grow at a higher pace compared to POEs (columns 2 and 8). During 2020, the interaction terms serve to explore whether the shock impacted differently BOSs and non-BOSs. The findings in column 3 show no statistical significance on the level of employment reported by BOS vis-à-vis private peers. Yet, results in column 6 reveal that firms with 25% up to 99% state participation grew faster in terms of labor force than private counterparts during the shock in 2020.

Regarding investment measured by fixed assets, the results suggest there was a relative contraction of the level of investment among fully owned BOS (column 9), and no significant change in the rate of investment among BOS at any level of state participation (column 12). In sum, in 2020, during the early COVID-19 pandemic, BOSs with state participation between 25% -99% experienced a higher growth rate in employment. These BOSs grew about 1.5 and 0.92 percentage points faster than private peers during 2020. On the contrary, there is no significant evidence suggesting BOSs played a counter-cyclical role in terms of investment growth during 2020.

It is important to note that these results capture only a short-term response and that a more comprehensive analysis will be needed to understand the inter-temporal impact and adjustments of BOSs in job creation and investment and potential effects on reallocation of jobs in the long-term, and potential impact on misallocation. For instance, evidence of former events of privatization shows that while the private sector can have a sharp job reduction phase, it could be temporary and promote efficiency gains that could be later translate into higher investment and eventually new jobs (Birdsall & Nellis, 2003).

Table 21. Estimations for employment and investment (levels and growth) during early COVID-19 shock.

VARIABLES	(1) Employment	(2)	(3)	(4) Employment growth	(5)	(6)	(7) Investment	(8)	(9)	(10) Investment growth	(11)	(12)
BOS	0.0453*** (0.004)	0.0448*** (0.005)		2.939*** (0.290)	2.865*** (0.322)		0.740*** (0.031)	0.765*** (0.032)		2.253*** (0.193)	2.329*** (0.198)	
BOS*2020		0.00353 (0.006)			0.620 (0.499)			-0.217** (0.097)			-0.636 (0.784)	
BOS 10-24.9%			0.0376*** (0.005)			0.998*** (0.184)			0.857*** (0.027)			0.974*** (0.326)
BOS 25-49.9%			0.0587*** (0.008)			1.811*** (0.335)			0.959*** (0.034)			2.806*** (0.338)
BOS 50%-99.9%			0.0538*** (0.006)			1.999*** (0.242)			1.017*** (0.043)			1.852*** (0.328)
BOS 100%			0.0411*** (0.005)			3.713*** (0.451)			0.671*** (0.044)			2.918*** (0.262)
BOS 10-24.9% *2020			0.00171 (0.011)			0.605 (0.556)			-0.055 (0.087)			-0.134 (0.960)
BOS 25-49.9%*2020			-0.00309 (0.011)			1.543** (0.673)			-0.0938 (0.107)			-1.799 (1.119)
BOS 50%-99.9%*2020			0.00484 (0.009)			0.928* (0.539)			-0.198 (0.131)			-0.646 (1.101)
BOS 100%*2020			0.00468 (0.007)			0.342 (0.681)			-0.282** (0.136)			-0.666 (0.941)
Size	0.936*** (0.003)	0.936*** (0.003)	0.936*** (0.003)	-3.456*** (0.143)	-3.456*** (0.143)	-3.449*** (0.143)	1.141*** (0.008)	1.141*** (0.008)	1.140*** (0.008)	2.401*** (0.066)	2.401*** (0.066)	2.403*** (0.066)
Age	-0.00208*** (0.000)	-0.00208*** (0.000)	-0.00208*** (0.000)	-0.110*** (0.006)	-0.110*** (0.006)	-0.111*** (0.006)	0.0251*** (0.001)	0.0251*** (0.001)	0.0252*** (0.001)	-0.203*** (0.006)	-0.203*** (0.006)	-0.203*** (0.006)
Listing status	0.0546*** (0.006)	0.0546*** (0.006)	0.0539*** (0.006)	2.168*** (0.307)	2.169*** (0.307)	2.322*** (0.314)	1.339*** (0.043)	1.339*** (0.043)	1.316*** (0.043)	-0.638** (0.308)	-0.639** (0.308)	-0.554* (0.307)
Constant	0.269*** (0.012)	0.269*** (0.012)	0.269*** (0.012)	14.57*** (0.468)	14.57*** (0.468)	14.55*** (0.469)	7.552*** (0.027)	7.552*** (0.027)	7.554*** (0.027)	-7.917*** (0.259)	-7.917*** (0.259)	-7.922*** (0.259)
Observations	6,503,554	6,503,554	6,503,554	6,159,926	6,159,926	6,159,926	5,638,506	5,638,506	5,638,506	5,324,141	5,324,141	5,324,141
R-squared	0.900	0.900	0.900	0.142	0.142	0.142	0.535	0.535	0.535	0.065	0.065	0.065

Robust standard errors in parentheses

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

Note: Employment is measured as the log of total workers, employment growth as the percentage annual change in labor force. Investment in levels is measured as the log of fixed assets, and investment growth as the annual (percentage) change of fixed assets. The estimations include country, sector, year fixed effects, as well as clustered standard errors to correct for potential autocorrelation within the industry. The reference (excluded) category refers to POEs, so the results should be interpreted as compared to the benchmark to private peers after controlling by size, sector, age, and other fixed effects.

7. CONCLUSIONS AND POLICY IMPLICATIONS

The role of the state in markets is still at play and it can have implications for firm performance. This paper analyzes the performance differentials in terms of operational efficiency measured by labor productivity and financial performance through profitability, liquidity (current ratio and solvency ratio), and return on investments (ROA and ROE) between privately owned enterprises (POEs) and Businesses of the State (BOSs). The latter are defined as firms with state direct and indirect state participation of at least 10% following Dall'Olio et al. (2022). This paper uses two main data sources: firm-level data from the ORBIS financial module and the World Bank's Businesses of the State (BOS) database.

This paper provides new evidence on the relationship between state ownership and firm performance studying 16 countries in the European and Central Asia region. Findings suggest important opportunity costs of state ownership as firms with state participation seem to achieve lower labor productivity outcomes and subpar financial performance in terms of profitability and return on investments. Yet, BOSs seem to be more financially leveraged and rely more on external debt compared to private peers suggesting potential soft budget constraints.

This paper suggests important trade-offs between state ownership and firm performance and highlights some policy implications that are relevant when designing and embarking on reforms.

First, the findings highlight that the private sector can play an important role in driving operational and financial performance. Firms with private shareholding seem to obtain better outcomes in terms of labor productivity as well as profit margins, and higher returns on assets and equity, and are less likely to support operations through external debt. Compared to firms in which the state is the sole owner, the results of this paper are indicative that private ownership can instill market-based incentives to improve performance.[29] It has important policy implications. Reforms can explore alternatives to crowd-in private participation beyond full divestiture or privatization through public-private partnerships or joint ventures (Alfalter & Sanchez-Navarro, 2023). The findings emphasize that private ownership can help mitigate principal-agent problems by strengthening supervisory power and weakening the government's control of day-to-day management.

Second, the paper finds evidence of the potential opportunity costs of state ownership that policy makers should consider when determining in which sectors to operate. While state ownership can address market failures and provide public services, it also seems to curb operational and financial performance for firms operating in competitive markets where the economic rationale for state ownership is less clear. Compared to POEs, BOSs obtain lower results in terms of labor productivity, profit margins, liquidity, and return on investments across all sector types but achieve lower profit margins and returns on investments when the state invests in competitive sectors. BOSs in natural monopolies such as electricity transmission and utilities tend to exhibit lower levels of labor productivity and higher levels of debt against their assets vis-à-vis POEs, which could be linked to potential public service obligations (PSOs). These findings highlight the importance of differentiating by markets in which BOSs operate and underscore the importance of understanding ex-ante what the economic rationale for state ownership and whether the benefits (e.g., provision of PSOs) offset the potential costs in terms of reduced profits and returns on

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[29] It can occur through the transference of skills, management, and 'know-how', which may translate into better financial outcomes.

investments in competitive sectors vis-à-vis others. Policy tools such as the principles of subsidiarity can serve for this purpose.[30]

Third, this study highlights that a higher degree of separation from the government can serve to mitigate principal-agent issues and improve operational and financial performance. Even though we do not measure corporate governance arrangements such as appointment of board members, independence, and other key aspects, our proxy of autonomy based on the distance from the government (i.e., layers of ownership) serves as an entry point and offers some indicative evidence. Compared to other BOSs, indirectly owned BOSs are more productive and profitable, and achieve better returns for each dollar invested in assets or equity. Moreover, as the distance from the public authority (i.e., layers of ownership) increases, BOSs seem to narrow the gap vis-à-vis private peers. This could be interpreted to mean that higher autonomy and separation of functions of the government from the day-to-day operations can lead to performance and operational gains. In that sense, policy measures that foster BOSs' autonomy and a higher degree of separation of the state as owner such as corporate governance and ownership reforms could potentially improve accountability and transparency and translate into significant performance gains.

Finally, we find that BOSs can play a counter-cyclical role in periods of crisis by protecting employment and job creation in the short term. However, we do not find significant evidence that BOSs maintain relatively higher levels of investment compared to private counterparts in response to economic shocks. Further analysis is required to explore the medium- and long-term adjustments and potential trade-offs in such counter-cyclical effects and long-term reallocation of resources and efficiency gains. Further studies are also needed to understand other policy implications of state ownership in terms of firm dynamism, misallocation, innovation, and productivity to understand the full extent of the implications of the role of the state in the economy.

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[30] Under the subsidiarity principle, the state has a subsidiarity duty to perform only in sectors that cannot be provided by the private sector. For more details on how to implement it, please refer to Alfalter & Sanchez-Navarro (2023) and the World Bank Markets and Competition policy Assessment Toolkit (World Bank Group, Forthcoming).

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Annex 1. Sample distribution BOS vis-a-vis POEs by country and year

Country/year	POEs	BOSs	Total firms	Share BOS in total firms
BA	66,474	2,707	69,181	3.9%
2011	5,753	263	6,016	4.4%
2012	6,160	268	6,428	4.2%
2013	5,920	271	6,191	4.4%
2014	5,888	270	6,158	4.4%
2015	6,958	270	7,228	3.7%
2016	7,058	271	7,329	3.7%
2017	6,619	264	6,883	3.8%
2018	7,288	278	7,566	3.7%
2019	7,359	279	7,638	3.7%
2020	7,471	273	7,744	3.5%
BG	633,625	3,435	637,060	0.5%
2011	58,607	336	58,943	0.6%
2012	48,895	331	49,226	0.7%
2013	60,190	345	60,535	0.6%
2014	46,666	323	46,989	0.7%
2015	70,470	347	70,817	0.5%
2016	76,482	368	76,850	0.5%
2017	70,884	353	71,237	0.5%
2018	71,053	347	71,400	0.5%
2019	69,440	343	69,783	0.5%
2020	60,938	342	61,280	0.6%
EE	633,425	1,242	634,667	0.2%
2011	36,100	120	36,220	0.3%
2012	41,135	120	41,255	0.3%
2013	46,574	113	46,687	0.2%
2014	53,290	117	53,407	0.2%
2015	60,300	121	60,421	0.2%
2016	69,016	126	69,142	0.2%
2017	76,756	129	76,885	0.2%
2018	83,339	137	83,476	0.2%
2019	89,552	138	89,690	0.2%
2020	77,363	121	77,484	0.2%
ES	2,887,762	13,239	2,901,001	0.5%
2011	229,148	1,236	230,384	0.5%
2012	243,484	1,260	244,744	0.5%
2013	261,307	1,305	262,612	0.5%
2014	274,198	1,362	275,560	0.5%
2015	292,731	1,377	294,108	0.5%

	2016	302,414	1,388	303,802	0.5%
	2017	318,349	1,434	319,783	0.4%
	2018	354,189	1,424	355,613	0.4%
	2019	354,233	1,365	355,598	0.4%
	2020	257,709	1,088	258,797	0.4%
HR		323,093	4,988	328,081	1.5%
	2011	20,124	389	20,513	1.9%
	2012	23,440	420	23,860	1.8%
	2013	25,284	439	25,723	1.7%
	2014	27,459	482	27,941	1.7%
	2015	30,568	509	31,077	1.6%
	2016	33,058	522	33,580	1.6%
	2017	36,551	529	37,080	1.4%
	2018	40,514	569	41,083	1.4%
	2019	43,339	563	43,902	1.3%
	2020	42,756	566	43,322	1.3%
IT		4,011,180	34,475	4,045,655	0.9%
	2011	334,203	3,033	337,236	0.9%
	2012	342,294	3,086	345,380	0.9%
	2013	352,885	3,260	356,145	0.9%
	2014	357,327	3,285	360,612	0.9%
	2015	374,763	3,376	378,139	0.9%
	2016	402,606	3,533	406,139	0.9%
	2017	434,584	3,668	438,252	0.8%
	2018	477,612	3,845	481,457	0.8%
	2019	502,279	3,885	506,164	0.8%
	2020	432,627	3,504	436,131	0.8%
LT		145,494	951	146,445	0.6%
	2011	10,406	87	10,493	0.8%
	2012	11,037	92	11,129	0.8%
	2013	11,902	90	11,992	0.8%
	2014	12,773	96	12,869	0.7%
	2015	13,227	96	13,323	0.7%
	2016	12,934	97	13,031	0.7%
	2017	14,572	97	14,669	0.7%
	2018	16,542	102	16,644	0.6%
	2019	21,542	100	21,642	0.5%
	2020	20,559	94	20,653	0.5%
LV		193,516	2,706	196,222	1.4%
	2011	12,148	258	12,406	2.1%
	2012	14,387	270	14,657	1.8%
	2013	15,111	268	15,379	1.7%
	2014	16,393	261	16,654	1.6%

	2015	17,831	269	18,100	1.5%
	2016	19,812	277	20,089	1.4%
	2017	22,630	275	22,905	1.2%
	2018	24,654	277	24,931	1.1%
	2019	25,257	276	25,533	1.1%
	2020	25,293	275	25,568	1.1%
MK		100,179	1,255	101,434	1.2%
	2011	4,199	104	4,303	2.4%
	2012	6,288	113	6,401	1.8%
	2013	6,790	121	6,911	1.8%
	2014	8,667	126	8,793	1.4%
	2015	9,337	131	9,468	1.4%
	2016	10,385	129	10,514	1.2%
	2017	11,605	132	11,737	1.1%
	2018	12,933	131	13,064	1.0%
	2019	14,269	133	14,402	0.9%
	2020	15,706	135	15,841	0.9%
PL		1,281,569	27,029	1,308,598	2.1%
	2011	71,857	2,366	74,223	3.2%
	2012	76,215	2,424	78,639	3.1%
	2013	82,781	2,482	85,263	2.9%
	2014	89,293	2,534	91,827	2.8%
	2015	96,612	2,608	99,220	2.6%
	2016	98,817	2,678	101,495	2.6%
	2017	170,900	2,916	173,816	1.7%
	2018	196,999	3,055	200,054	1.5%
	2019	210,179	3,063	213,242	1.4%
	2020	187,916	2,903	190,819	1.5%
PT		647,077	4,058	651,135	0.6%
	2011	46,436	366	46,802	0.8%
	2012	49,158	376	49,534	0.8%
	2013	52,428	389	52,817	0.7%
	2014	56,348	405	56,753	0.7%
	2015	60,836	412	61,248	0.7%
	2016	65,896	420	66,316	0.6%
	2017	71,424	427	71,851	0.6%
	2018	77,761	425	78,186	0.5%
	2019	82,355	440	82,795	0.5%
	2020	84,435	398	84,833	0.5%
RO		2,138,839	7,617	2,146,456	0.4%
	2011	131,179	640	131,819	0.5%
	2012	150,175	694	150,869	0.5%
	2013	168,376	720	169,096	0.4%

	2014	184,002	748	184,750	0.4%
	2015	191,534	765	192,299	0.4%
	2016	206,311	790	207,101	0.4%
	2017	238,208	810	239,018	0.3%
	2018	264,322	787	265,109	0.3%
	2019	287,607	830	288,437	0.3%
	2020	317,125	833	317,958	0.3%
RS		337,883	5,941	343,824	1.7%
	2011	8,751	515	9,266	5.6%
	2012	12,639	545	13,184	4.1%
	2013	23,341	568	23,909	2.4%
	2014	23,014	553	23,567	2.3%
	2015	20,392	459	20,851	2.2%
	2016	43,715	700	44,415	1.6%
	2017	34,305	655	34,960	1.9%
	2018	35,434	653	36,087	1.8%
	2019	66,996	649	67,645	1.0%
	2020	69,296	644	69,940	0.9%
RU		4,531,932	133,689	4,665,621	2.9%
	2011	204,886	9,616	214,502	4.5%
	2012	250,743	10,588	261,331	4.1%
	2013	302,107	11,144	313,251	3.6%
	2014	451,988	12,506	464,494	2.7%
	2015	634,318	14,170	648,488	2.2%
	2016	779,576	15,123	794,699	1.9%
	2017	404,852	14,723	419,575	3.5%
	2018	444,966	15,522	460,488	3.4%
	2019	457,351	14,890	472,241	3.2%
	2020	601,145	15,407	616,552	2.5%
SI		504,828	3,636	508,464	0.7%
	2011	37,951	331	38,282	0.9%
	2012	44,796	347	45,143	0.8%
	2013	45,892	352	46,244	0.8%
	2014	49,820	349	50,169	0.7%
	2015	50,535	354	50,889	0.7%
	2016	50,086	351	50,437	0.7%
	2017	52,756	362	53,118	0.7%
	2018	54,290	388	54,678	0.7%
	2019	57,405	405	57,810	0.7%
	2020	61,297	397	61,694	0.6%
UA		1,253,115	26,373	1,279,488	2.1%
	2011	113,335	2,874	116,209	2.5%
	2012	115,208	2,880	118,088	2.4%

2013	110,952	2,792	113,744	2.5%
2014	106,719	2,502	109,221	2.3%
2015	116,283	2,492	118,775	2.1%
2016	121,696	2,445	124,141	2.0%
2017	111,997	2,444	114,441	2.1%
2018	118,481	2,413	120,894	2.0%
2019	168,826	2,819	171,645	1.6%
2020	169,618	2,712	172,330	1.6%

Annex 2. Robustness checks: estimates for 5-year window (2016-2020)

A.2.1 Labor productivity

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(6)	(8)	(9)
BOS	-0.524***	-0.488***	-0.481***	-0.481***	-0.481***	-0.476***	-0.476***	-0.476***	-0.476***
	(0.00411)	(0.00420)	(0.00420)	(0.00420)	(0.00420)	(0.00432)	(0.00433)	(0.00766)	(0.0340)
Size	0.373***	0.392***	0.393***	0.393***	0.393***	0.385***	0.385***	0.385***	0.385***
	(0.000476)	(0.000497)	(0.000498)	(0.000499)	(0.000498)	(0.000504)	(0.000505)	(0.000786)	(0.0120)
Age		-0.0134***	-0.0133***	-0.0133***	-0.0133***	-0.0133***	-0.0133***	-0.0133***	-0.0133***
		(6.02e-05)	(6.01e-05)	(6.01e-05)	(6.00e-05)	(6.00e-05)	(6.02e-05)	(0.000101)	(0.00107)
Listed status			-0.569***	-0.568***	-0.568***	-0.551***	-0.552***	-0.552***	-0.552***
			(0.0128)	(0.0128)	(0.0128)	(0.0128)	(0.0129)	(0.0230)	(0.0411)
Constant	5.596***	5.537***	5.521***	5.523***	5.523***	5.624***	5.622***	5.622***	5.622***
	(0.00652)	(0.00660)	(0.00661)	(0.00661)	(0.00660)	(0.00668)	(0.00669)	(0.0103)	(0.150)
Observations	2,974,035	2,895,615	2,895,615	2,895,615	2,895,610	2,895,534	2,892,917	2,892,917	2,892,917
R-squared	0.667	0.671	0.671	0.671	0.673	0.693	0.694	0.694	0.694
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	No	No	No	No	No	Yes	Yes	Yes	Yes
Country-Sector-Year FE	No	No	No	No	No	No	Yes	Yes	Yes
Clustered errors	No	No	No	No	No	No	No	Firm	Sector 2d

Robust standard errors in parentheses

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

A.2.2 Profit margin

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
BOS	-6.969***	-7.275***	-7.276***	-7.265***	-7.252***	-7.479***	-7.486***	-7.486***	-7.486***
	(0.0814)	(0.0835)	(0.0835)	(0.0835)	(0.0834)	(0.0854)	(0.0857)	(0.133)	(0.517)
Size	-0.569***	-0.676***	-0.676***	-0.679***	-0.678***	-0.648***	-0.652***	-0.652***	-0.652***
	(0.0103)	(0.0107)	(0.0108)	(0.0108)	(0.0107)	(0.0109)	(0.0109)	(0.0155)	(0.0786)
Age		0.0476***	0.0476***	0.0478***	0.0477***	0.0363***	0.0363***	0.0363***	0.0363***
		(0.00109)	(0.00109)	(0.00109)	(0.00108)	(0.00110)	(0.00110)	(0.00162)	(0.0108)
Listed status			0.137	0.180	0.175	0.636**	0.669**	0.669	0.669
			(0.285)	(0.285)	(0.283)	(0.285)	(0.284)	(0.426)	(0.427)

Constant	7.906***	7.558***	7.560***	7.566***	7.564***	7.638***	7.652***	7.652***	7.652***
	(0.0371)	(0.0387)	(0.0388)	(0.0390)	(0.0388)	(0.0391)	(0.0391)	(0.0546)	(0.191)
Observations	2,925,822	2,851,305	2,851,305	2,851,305	2,851,299	2,851,235	2,848,595	2,848,595	2,848,595
R-squared	0.078	0.073	0.073	0.074	0.082	0.109	0.115	0.115	0.115
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	No	No	No	No	No	Yes	Yes	Yes	Yes
Country-Sector-Year FE	No	No	No	No	No	No	Yes	Yes	Yes
Clustered errors	No	No	No	No	No	No	No	Firm	Sector 2d

Robust standard errors in parentheses

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

A.2.3 Current ratio

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
BOS	-0.215***	-0.340***	-0.341***	-0.339***	-0.334***	-0.338***	-0.337***	-0.337***	-0.337***
	(0.0272)	(0.0282)	(0.0282)	(0.0282)	(0.0282)	(0.0296)	(0.0297)	(0.0451)	(0.0785)
Size	-0.478***	-0.580***	-0.580***	-0.585***	-0.588***	-0.588***	-0.591***	-0.591***	-0.591***
	(0.00386)	(0.00412)	(0.00413)	(0.00414)	(0.00414)	(0.00425)	(0.00427)	(0.00602)	(0.0163)
Age		0.0566***	0.0566***	0.0568***	0.0567***	0.0544***	0.0544***	0.0544***	0.0544***
		(0.000392)	(0.000392)	(0.000392)	(0.000392)	(0.000403)	(0.000404)	(0.000597)	(0.00232)
Listed status			0.0929	0.0990	0.104	0.222***	0.230***	0.230**	0.230***
			(0.0691)	(0.0691)	(0.0692)	(0.0718)	(0.0719)	(0.114)	(0.0742)
Constant	5.060***	4.582***	4.583***	4.597***	4.609***	4.644***	4.653***	4.653***	4.653***
	(0.0147)	(0.0149)	(0.0150)	(0.0150)	(0.0150)	(0.0153)	(0.0153)	(0.0214)	(0.0555)
Observations	2,950,077	2,875,396	2,875,396	2,875,396	2,875,392	2,875,326	2,872,670	2,872,670	2,872,670
R-squared	0.051	0.056	0.056	0.057	0.057	0.070	0.072	0.072	0.072
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	No	No	No	No	No	Yes	Yes	Yes	Yes
Country-Sector-Year FE	No	No	No	No	No	No	Yes	Yes	Yes
Clustered errors	No	No	No	No	No	No	No	Firm	Sector 2d

Robust standard errors in parentheses

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

A.2.4 Solvency ratio

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
BOS	6.627***	4.993***	4.946***	4.961***	4.974***	4.710***	4.710***	4.710***	4.710***
	(0.135)	(0.139)	(0.139)	(0.139)	(0.139)	(0.143)	(0.143)	(0.249)	(0.468)
Size	-0.848***	-2.219***	-2.239***	-2.271***	-2.278***	-2.164***	-2.175***	-2.175***	-2.175***
	(0.0207)	(0.0212)	(0.0213)	(0.0213)	(0.0213)	(0.0217)	(0.0218)	(0.0357)	(0.112)
Age		0.765***	0.764***	0.765***	0.765***	0.731***	0.731***	0.731***	0.731***
		(0.00197)	(0.00197)	(0.00197)	(0.00197)	(0.00201)	(0.00202)	(0.00337)	(0.0114)
Listed status			4.650***	4.687***	4.687***	5.913***	5.895***	5.895***	5.895***
			(0.368)	(0.368)	(0.368)	(0.378)	(0.379)	(0.678)	(0.516)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Constant	44.13***	37.42***	37.48***	37.58***	37.60***	37.72***	37.76***	37.76***	37.76***
	(0.0734)	(0.0756)	(0.0758)	(0.0759)	(0.0760)	(0.0769)	(0.0771)	(0.123)	(0.383)
Observations	2,943,260	2,868,110	2,868,110	2,868,110	2,868,105	2,868,038	2,865,387	2,865,387	2,865,387
R-squared	0.076	0.118	0.118	0.119	0.120	0.144	0.146	0.146	0.146
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	No	No	No	No	No	Yes	Yes	Yes	Yes
Country-Sector-Year FE	No	No	No	No	No	No	Yes	Yes	Yes
Clustered errors	No	No	No	No	No	No	No	Firm	Sector 2d

Robust standard errors in parentheses

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

A.2.5 Return on Assets

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
BOS	-5.623***	-5.599***	-5.565***	-5.561***	-5.557***	-5.663***	-5.667***	-5.667***	-5.667***
	(0.0629)	(0.0651)	(0.0652)	(0.0652)	(0.0651)	(0.0681)	(0.0684)	(0.0923)	(0.147)
Size	-0.704***	-0.627***	-0.613***	-0.609***	-0.600***	-0.537***	-0.535***	-0.535***	-0.535***
	(0.0104)	(0.0109)	(0.0110)	(0.0110)	(0.0110)	(0.0112)	(0.0113)	(0.0151)	(0.0378)
Age		-0.0530***	-0.0525***	-0.0527***	-0.0527***	-0.0636***	-0.0636***	-0.0636***	-0.0636***
		(0.00103)	(0.00103)	(0.00103)	(0.00103)	(0.00105)	(0.00105)	(0.00140)	(0.00398)
Listed status			-3.327***	-3.269***	-3.287***	-2.772***	-2.746***	-2.746***	-2.746***
			(0.163)	(0.163)	(0.163)	(0.172)	(0.172)	(0.246)	(0.293)
Constant	8.934***	9.502***	9.456***	9.447***	9.415***	9.365***	9.362***	9.362***	9.362***
	(0.0383)	(0.0408)	(0.0409)	(0.0410)	(0.0409)	(0.0416)	(0.0417)	(0.0544)	(0.151)
Observations	2,948,616	2,873,275	2,873,275	2,873,275	2,873,271	2,873,206	2,870,563	2,870,563	2,870,563
R-squared	0.045	0.045	0.046	0.047	0.052	0.069	0.075	0.075	0.075
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	No	No	No	No	No	Yes	Yes	Yes	Yes
Country-Sector-Year FE	No	No	No	No	No	No	Yes	Yes	Yes
Clustered errors	No	No	No	No	No	No	No	Firm	Sector 2d

Robust standard errors in parentheses

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

A.2.6 Return on Equity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
BOS	-17.73***	-16.95***	-16.86***	-16.86***	-16.83***	-17.04***	-17.05***	-17.05***	-17.05***
	(0.284)	(0.294)	(0.294)	(0.294)	(0.294)	(0.309)	(0.309)	(0.365)	(0.520)
Size	-2.234***	-1.344***	-1.306***	-1.265***	-1.242***	-1.040***	-1.034***	-1.034***	-1.034***
	(0.0483)	(0.0510)	(0.0512)	(0.0513)	(0.0512)	(0.0527)	(0.0528)	(0.0635)	(0.0872)
Age		-0.522***	-0.521***	-0.522***	-0.520***	-0.550***	-0.549***	-0.549***	-0.549***
		(0.00483)	(0.00483)	(0.00483)	(0.00482)	(0.00493)	(0.00493)	(0.00581)	(0.0199)
Listed status			-8.741***	-8.600***	-8.641***	-8.151***	-8.024***	-8.024***	-8.024***
			(0.654)	(0.653)	(0.653)	(0.707)	(0.703)	(0.851)	(0.888)
Constant	26.62***	31.67***	31.55***	31.43***	31.32***	31.09***	31.07***	31.07***	31.07***

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(0.172)	(0.185)	(0.185)	(0.186)	(0.185)	(0.189)	(0.189)	(0.223)	(0.330)
Observations	2,723,996	2,652,758	2,652,758	2,652,758	2,652,749	2,652,669	2,649,938	2,649,938	2,649,938
R-squared	0.026	0.030	0.030	0.030	0.034	0.041	0.047	0.047	0.047
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	No	No	No	No	No	Yes	Yes	Yes	Yes
Country-Sector-Year FE	No	No	No	No	No	No	Yes	Yes	Yes
Clustered errors	No	No	No	No	No	No	No	Firm	Sector 2d

Robust standard errors in parentheses

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

Annex 3. Robustness checks: estimates for 3-year window (2018-2020)

A.3.1 Labor productivity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
BOS	-0.523***	-0.487***	-0.481***	-0.481***	-0.481***	-0.480***	-0.480***	-0.480***	-0.480***
	(0.00595)	(0.00608)	(0.00608)	(0.00608)	(0.00608)	(0.00626)	(0.00627)	(0.00837)	(0.0517)
Size	0.373***	0.392***	0.393***	0.393***	0.393***	0.385***	0.385***	0.385***	0.385***
	(0.000680)	(0.000710)	(0.000711)	(0.000712)	(0.000711)	(0.000719)	(0.000720)	(0.000896)	(0.0178)
Age		-0.0133***	-0.0132***	-0.0132***	-0.0132***	-0.0131***	-0.0131***	-0.0131***	-0.0131***
		(8.39e-05)	(8.39e-05)	(8.39e-05)	(8.36e-05)	(8.37e-05)	(8.38e-05)	(0.000109)	(0.00160)
Listed status			-0.562***	-0.562***	-0.562***	-0.545***	-0.545***	-0.545***	-0.545***
			(0.0185)	(0.0185)	(0.0184)	(0.0186)	(0.0186)	(0.0249)	(0.0574)
Constant	5.578***	5.527***	5.512***	5.514***	5.511***	5.620***	5.618***	5.618***	5.618***
	(0.00933)	(0.00943)	(0.00945)	(0.00945)	(0.00944)	(0.00954)	(0.00955)	(0.0118)	(0.222)
Observations	1,518,928	1,477,624	1,477,624	1,477,624	1,477,621	1,477,518	1,476,309	1,476,309	1,476,309
R-squared	0.661	0.664	0.665	0.665	0.666	0.687	0.687	0.687	0.687
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	No	No	No	No	No	Yes	Yes	Yes	Yes
Country-Sector-Year FE	No	No	No	No	No	No	Yes	Yes	Yes
Clustered errors	No	No	No	No	No	No	No	Firm	Sector 2d

Robust standard errors in parentheses

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

A.3.2 Profit margin

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
BOS	-7.343***	-7.637***	-7.638***	-7.637***	-7.632***	-7.860***	-7.859***	-7.859***	-7.859***
	(0.119)	(0.121)	(0.121)	(0.121)	(0.121)	(0.124)	(0.124)	(0.154)	(0.768)
Size	-0.600***	-0.702***	-0.703***	-0.701***	-0.692***	-0.671***	-0.671***	-0.671***	-0.671***
	(0.0147)	(0.0153)	(0.0153)	(0.0153)	(0.0152)	(0.0153)	(0.0153)	(0.0183)	(0.102)
Age		0.0507***	0.0507***	0.0508***	0.0510***	0.0380***	0.0379***	0.0379***	0.0379**
		(0.00154)	(0.00154)	(0.00154)	(0.00153)	(0.00156)	(0.00156)	(0.00188)	(0.0154)
Listed status			0.0829	0.0847	0.0803	0.589	0.611	0.611	0.611

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
			(0.419)	(0.419)	(0.416)	(0.420)	(0.419)	(0.503)	(0.641)
Constant	7.767***	7.347***	7.348***	7.341***	7.309***	7.438***	7.441***	7.441***	7.441***
	(0.0526)	(0.0550)	(0.0551)	(0.0551)	(0.0548)	(0.0551)	(0.0550)	(0.0652)	(0.240)
Observations	1,502,347	1,462,794	1,462,794	1,462,794	1,462,792	1,462,688	1,461,512	1,461,512	1,461,512
R-squared	0.086	0.082	0.082	0.083	0.093	0.122	0.126	0.126	0.126
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	No	No	No	No	No	Yes	Yes	Yes	Yes
Country-Sector-Year FE	No	No	No	No	No	No	Yes	Yes	Yes
Clustered errors	No	No	No	No	No	No	No	Firm	Sector 2d

Robust standard errors in parentheses

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

A.3.3 Current ratio

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
BOS	-0.215***	-0.348***	-0.349***	-0.349***	-0.349***	-0.347***	-0.347***	-0.347***	-0.347***
	(0.0388)	(0.0401)	(0.0402)	(0.0402)	(0.0402)	(0.0423)	(0.0424)	(0.0519)	(0.109)
Size	-0.496***	-0.600***	-0.600***	-0.600***	-0.600***	-0.604***	-0.605***	-0.605***	-0.605***
	(0.00528)	(0.00562)	(0.00564)	(0.00564)	(0.00564)	(0.00579)	(0.00580)	(0.00699)	(0.0223)
Age		0.0583***	0.0583***	0.0582***	0.0582***	0.0558***	0.0558***	0.0558***	0.0558***
		(0.000548)	(0.000548)	(0.000548)	(0.000548)	(0.000564)	(0.000565)	(0.000685)	(0.00330)
Listed status			0.0206	0.0204	0.0211	0.135	0.142	0.142	0.142
			(0.0921)	(0.0921)	(0.0921)	(0.0941)	(0.0942)	(0.117)	(0.0963)
Constant	5.158***	4.646***	4.646***	4.648***	4.649***	4.698***	4.701***	4.701***	4.701***
	(0.0201)	(0.0204)	(0.0204)	(0.0204)	(0.0204)	(0.0208)	(0.0209)	(0.0249)	(0.0725)
Observations	1,516,720	1,476,958	1,476,958	1,476,958	1,476,956	1,476,866	1,475,667	1,475,667	1,475,667
R-squared	0.050	0.056	0.056	0.056	0.056	0.071	0.072	0.072	0.072
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	No	No	No	No	No	Yes	Yes	Yes	Yes
Country-Sector-Year FE	No	No	No	No	No	No	Yes	Yes	Yes
Clustered errors	No	No	No	No	No	No	No	Firm	Sector 2d

Robust standard errors in parentheses

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

A.3.4 Solvency ratio

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
BOS	6.275***	4.598***	4.552***	4.550***	4.554***	4.332***	4.333***	4.333***	4.333***
	(0.193)	(0.197)	(0.197)	(0.197)	(0.197)	(0.203)	(0.203)	(0.270)	(0.648)
Size	-0.954***	-2.309***	-2.328***	-2.329***	-2.324***	-2.221***	-2.224***	-2.224***	-2.224***
	(0.0287)	(0.0294)	(0.0294)	(0.0294)	(0.0294)	(0.0300)	(0.0300)	(0.0390)	(0.149)
Age		0.766***	0.765***	0.765***	0.765***	0.732***	0.732***	0.732***	0.732***
		(0.00273)	(0.00273)	(0.00272)	(0.00272)	(0.00278)	(0.00279)	(0.00362)	(0.0159)

					(4)	(5)	(6)	(7)	(8)	(9)
Listed status			4.611***	4.613***	4.601***	5.779***	5.772***	5.772***	5.772***
			(0.524)	(0.524)	(0.524)	(0.537)	(0.538)	(0.727)	(0.745)
Constant	44.77***	37.75***	37.80***	37.81***	37.79***	37.95***	37.96***	37.96***	37.96***
	(0.101)	(0.105)	(0.105)	(0.105)	(0.105)	(0.106)	(0.106)	(0.136)	(0.501)
Observations	1,510,209	1,470,243	1,470,243	1,470,243	1,470,240	1,470,144	1,468,951	1,468,951	1,468,951
R-squared	0.075	0.119	0.119	0.119	0.120	0.145	0.146	0.146	0.146
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	No	No	No	No	No	Yes	Yes	Yes	Yes
Country-Sector-Year FE	No	No	No	No	No	No	Yes	Yes	Yes
Clustered errors	No	No	No	No	No	No	No	Firm	Sector 2d

Robust standard errors in parentheses

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

A.3.5 Return on Assets

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
BOS	-5.867***	-5.847***	-5.815***	-5.816***	-5.812***	-5.893***	-5.898***	-5.898***	-5.898***
	(0.0901)	(0.0930)	(0.0931)	(0.0931)	(0.0929)	(0.0976)	(0.0978)	(0.112)	(0.211)
Size	-0.713***	-0.644***	-0.631***	-0.629***	-0.618***	-0.560***	-0.559***	-0.559***	-0.559***
	(0.0147)	(0.0154)	(0.0155)	(0.0155)	(0.0154)	(0.0158)	(0.0158)	(0.0183)	(0.0479)
Age		-0.046***	-0.046***	-0.046***	-0.045***	-0.056***	-0.056**	-0.056***	-0.056***
		(0.00146)	(0.00146)	(0.00146)	(0.00145)	(0.00148)	(0.00148)	(0.00169)	(0.00524)
Listed status			-3.265***	-3.262***	-3.278***	-2.692***	-2.687***	-2.687***	-2.687***
			(0.236)	(0.236)	(0.236)	(0.248)	(0.248)	(0.295)	(0.379)
Constant	8.777***	9.303***	9.261***	9.253***	9.210***	9.171***	9.173***	9.173***	9.173***
	(0.0536)	(0.0574)	(0.0575)	(0.0575)	(0.0573)	(0.0583)	(0.0583)	(0.0666)	(0.194)
Observations	1,511,792	1,471,766	1,471,766	1,471,766	1,471,764	1,471,670	1,470,483	1,470,483	1,470,483
R-squared	0.053	0.053	0.054	0.055	0.062	0.081	0.085	0.085	0.085
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	No	No	No	No	No	Yes	Yes	Yes	Yes
Country-Sector-Year FE	No	No	No	No	No	No	Yes	Yes	Yes
Clustered errors	No	No	No	No	No	No	No	Firm	Sector 2d

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

A.3.6 Return on Equity

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
BOS	-18.12***	-17.37***	-17.28***	-17.27***	-17.25***	-17.45***	-17.47***	-17.47***	-17.47***
	(0.413)	(0.426)	(0.427)	(0.427)	(0.426)	(0.448)	(0.448)	(0.482)	(0.782)
Size	-2.117***	-1.298***	-1.263***	-1.257***	-1.230***	-1.022***	-1.016***	-1.016***	-1.016***
	(0.0692)	(0.0733)	(0.0735)	(0.0735)	(0.0733)	(0.0753)	(0.0753)	(0.0823)	(0.125)
Age		-0.489***	-0.488***	-0.488***	-0.484***	-0.513***	-0.513***	-0.513***	-0.513***
		(0.00684)	(0.00684)	(0.00684)	(0.00683)	(0.00698)	(0.00698)	(0.00750)	(0.0286)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Listed status			-8.594***	-8.585***	-8.625***	-8.176***	-8.116***	-8.116***	-8.116***
			(0.955)	(0.954)	(0.955)	(1.028)	(1.025)	(1.124)	(1.183)
Constant	25.31***	30.27***	30.16***	30.12***	29.98***	29.74***	29.72***	29.72***	29.72***
	(0.245)	(0.263)	(0.264)	(0.264)	(0.264)	(0.269)	(0.269)	(0.291)	(0.486)
Observations	1,397,036	1,359,285	1,359,285	1,359,285	1,359,280	1,359,168	1,357,960	1,357,960	1,357,960
R-squared	0.031	0.034	0.034	0.034	0.038	0.048	0.052	0.052	0.052
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-year FE	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	No	No	No	No	No	Yes	Yes	Yes	Yes
Country-Sector-Year FE	No	No	No	No	No	No	Yes	Yes	Yes
Clustered errors	No	No	No	No	No	No	No	Firm	Sector 2d

Robust standard errors in parentheses

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

Annex 4. Test of statistical differences and significance of coefficients Table 17

Ho: β_iBOS at x% participation = β_jBOS at y% participation (Joint hypothesis F- test).

Indicator	Competitive F-value	p-value	Natural Monopoly F-value	p-value	Part. Contestable F-value	p-value
Labor productivity	70.07***	0.0000	40.17***	0.0000	38.24***	0.0000
Profit margin	70.27***	0.0000	138.56***	0.0000	23.86***	0.0000
Current ratio	18.74***	0.0000	20.89***	0.0000	4.13***	0.0071
Solvency ratio	45.78***	0.0000	147.54***	0.0000	12.80***	0.0000
ROA	50.85***	0.0000	40.30***	0.0000	45.83***	0.0000
ROE	45.83***	0.0000	43.20***	0.0000	14.33***	0.0000