State Ownership and Firm-level Performance[*]

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Abstract

State-owned enterprises (SOEs) remain widespread in various countries despite the theoretical prediction that they will be subject to an inherent "liability of stateness," that is, that they should underperform comparable private firms in terms of profitability and efficiency. Some argue that many SOEs that survived the privatization wave of the 1990s were reformed and that improved vehicles of minority state ownership have emerged. To examine the firm-level performance implications of this new trend, we built a novel dataset of large listed SOEs, both majority- and minority-owned, covering several industries and a host of developed and emerging countries between 1997 and 2012. We compare these SOEs to a sample of private firms using matching methods combined with differences-in-differences estimation to control for the endogenous choice of state ownership. We find that SOEs are not universally inferior to comparable private firms but typically exhibit important gaps when faced with negative environmental conditions that expose their constraints to optimize and adjust. Namely, the performance gaps between SOEs and private firms sharply increase when they are subject to external changes that require rapid adjustment and that increase the temptation of the government to intervene (in our case, events of economic downturn and election years). We also find that these negative effects are less frequent in the case of minority SOEs, which are relatively understudied compared to majority SOEs. Furthermore, adopting novel techniques to gauge heterogeneous treatment effects, we find that firms more likely selected as majority SOEs tend to have larger performance gaps especially after economic crises.

Key words

State ownership, performance, agency, state capitalism

INTRODUCTION

An impressive body of scholarly work has studied the liabilities of state ownership over the last few decades. The usual conclusion is that state-owned enterprises (SOEs) tend to be less efficient and profitable than privately-owned firms due to several factors. Based on agency logic, scholars have pointed out that managers of SOEs are poorly monitored and lack the high-powered incentives normally found in private firms (Boardman & Vining, 1989; Dharwadkar, George, & Brandes, 2000; La Porta & López-de-Silanes, 1999). SOEs also tend to pursue objectives other than efficiency and profitability (Bai & Xu, 2005; Shirley & Nellis, 1991). For instance, governments may require SOEs to keep prices low or avoid layoffs even in moments of economic downturn. In addition, many SOEs can be used as vehicles of patronage and corruption. For instance, politicians and their allies may be tempted to divert resources from SOEs to support their pet projects or directly benefit their constituencies (Boycko, Shleifer, & Vishny, 1996; Shleifer & Vishny, 1998; Vickers & Yarrow, 1988). Consistent with these predictions, empirical research examining firm-level effects of privatization reforms have, in general, detected performance improvements after the transition from state to private ownership (see for a review Chong & Lopez-de-Silanes, 2005; Megginson, 2005).

Given these potential liabilities of state ownership, it is surprising that in more recent years we still see a pervasive presence of SOEs throughout the world and in a broad range of industries (Wooldridge, 2012). In 2013, among the top-100 *Fortune 500* companies, 25 were state-owned multinational firms, directly owned by the state or indirectly through several state-related investment vehicles. Nine out of the 15 largest IPOs in the world between 2005 and 2012 involved SOEs selling minority positions to private investors (Musacchio & Lazzarini, 2014). And this phenomenon is not simply due to the rise of interventionist emerging economies such as

China or Russia; there is vast evidence that SOEs remain important even in developed countries. A recent survey of OECD countries, for instance, found that SOEs represented a total equity value of US$ 1.4 trillion in 2011, of which 61% involved firms with *minority* stakes—that is, firms with private management and partial state ownership (Christiansen, 2011). In this new scenario, there is also evidence that investors have not shied away from SOEs. A report by Morgan Stanley in May 2012 claimed that several SOEs have outperformed their industry peers in emerging markets, despite the fact that they may be "targeting development objectives rather than shareholder returns" (Morgan Stanley, 2012: 1). All in all, these facts raise an important question: given their flagrant resilience as top global corporations and potential investment targets, is it possible that SOEs' intrinsic sources of performance disadvantage have disappeared? Are these firms better managed and governed than the old SOEs of the past?

To shed light on these questions, in this paper we examine firm-level performance differences between SOEs and private firms based on a cross-industry, cross-country sample of 477 large listed SOEs observed between 1997 and 2012 in developed and emerging countries. Those are all publicly traded SOEs that are not only owned by governments but also by private investors and funds. Of those firms, 280 have minority state ownership—a form of governmental participation that has been relatively understudied. For instance, in our database we have large, global SOEs such as Norway's Telenor (majority), Russia's Rosneft (majority), France's Renault (minority) and Brazil's Vale (minority). These SOEs are compared to a group of 431 listed private firms with no state ownership. We adopt matching techniques (Abadie, Drukker, Herr, & Imbens, 2004; Abadie & Imbens, 2011) to guarantee comparability between the observed SOEs and private firms based on key observable traits such as firm-level "fundamentals" (such as size and capital intensity), industry-level characteristics, and country-

level conditions (chiefly, the extent of economic and institutional development). We focus on the effect of ownership (equity) and abstract from other potential conduits of governmental influence such as loans from state-owned banks (Lazzarini, Musacchio, Bandeira-de-Mello, & Marcon, 2015; Sapienza, 2004) or discretionary regulation (Lin & Milhaupt, 2013), which are more difficult to observe and quantify in large, cross-country databases like ours.

As it turns out, although the extant literature has emphasized that SOEs should exhibit important performance gaps, our data reveal that those gaps are not universally present. That is, at least for our sample of large SOEs, these firms do not appear to systematically underperform comparable private firms when we consider a broad range of performance indicators. Instead, we propose and find that significant performance gaps between SOEs and private firms emerge especially when the former are subject to *environmental* factors that expose their inherent constraints to adjust and optimize. We identify two major changes: macroeconomic crises and elections. For instance, while private firms can downsize and adjust when faced with strong economic downturn, governments may require SOEs to avoid layoffs and invest in unprofitable areas (Musacchio & Lazzarini, 2014; Shirley & Nellis, 1991). During elections, governments may also ask SOEs to avoid price increases and more generally benefit their political constituencies (Dinç, 2005; Moita & Paiva, 2013). Such exogenous events also allows us to better identify the effect of state ownership using differences-in-differences estimation to remove the effect of firm-level unobservables (Heckman, Ichimura, & Todd, 1997).

We also contribute with an assessment how the *selection* process of SOEs affects the differential performance between SOEs and private firms. Recall that our database involves SOEs that survived the privatization wave of the 1990s and privately controlled firms in which governments decided to keep minority stakes. Thus, selection in our context essentially means

"survival": the decision by governments to keep majority or minority stakes over time. Here we have two distinct views. A strand in the literature argues that, over time, SOEs were reformed with improved governance practices and checks-and-balances against governmental intervention (Gupta, 2005; Pargendler, 2012). In this case, we should see a process of *positive* selection: over time, firms with higher propensity to survive as SOEs will exhibit lower performance gaps when matched to comparable private firms. Yet, there is a second possibility: existing SOEs may have remained under state influence because governments are still tempted to use them as mechanisms to pursue political objectives (Bower, Leonard, & Paine, 2011; Bremmer, 2010). If this is the case, there will be *negative* selection: firms more likely to remain as SOEs will have higher performance gaps when compared to private firms with similar traits. These predictions are examined using novel techniques modeling *heterogeneous treatment effects* (Xie, Brand, & Jann, 2012): how performance differences between SOEs ("treated") and private firms ("non-treated") vary according to their propensity to be observed with majority or minority state ownership.

The remainder of the paper is organized as follows. In the next section, we present our theoretical framework and propose testable hypotheses. We then describe our data and methodology. Empirical discuss are discussed next, followed by a conclusion section with contributions and suggestions for future research.

STATE OWNERSHIP: BACKGROUND AND THEORY

The evolution of state ownership

Throughout the nineteenth and twentieth centuries, state ownership was adopted on a wide scale. The initial thrust for the expansion of state ownership followed the desire of governments to spur investment in public services such as mail, water, sewage, electricity, telephone, and railways (Millward, 2005; Toninelli, 2000). With the disruptions caused by the

Great Depression and the First World War, governments also ended up venturing into a variety new business industries beyond public services. In many cases, government ownership was accidental and temporary, as a way to bail out failing companies; in others, it was the result of an ideological shift towards increased state intervention, exacerbated by the rise of socialism in the Soviet Union, Eastern Europe, Asia, and parts of Latin America. State intervention and nonmarket coordination became widespread (Rajan & Zingales, 2004).

The expansion of state ownership, however, also came with substantial cost. Many SOEs were poorly managed and had to cope with a variety of social or political objectives, while trying to avoid losses or even generate profits (Shirley & Nellis, 1991). With subsequent global macroeconomic crises, notably the two oil shocks of the 1970s, the situation became unsustainable. Higher oil prices fueled inflation and led to a major credit rationing caused by escalating interest rates. Governments using SOEs to impose price controls or preserve employment rapidly eroded the profitability and solvency of the public sector. At the same time, the progressive collapse of command and mixed economies exposed the limits of running various industries with ubiquitous presence of state-controlled firms.

Facing increased debt and realizing the high opportunity cost of allocating state capital to unprofitable SOEs, many governments in the 1980s and 1990s eventually undertook large-scale privatization programs (Megginson, 2005) and experimented with varied reforms in the public sector (Gómez-Ibañez, 2007; Shirley, 1999). Yet, governments had political reasons to not fully privatize SOEs and keep some assets under their control. A number of studies showed that governments all around the world kept equity stakes in large SOEs, even after the privatization wave (Bortolotti & Faccio, 2009; Christiansen, 2011; OECD, 2005). Guillén (2005), for instance, describes how Spanish SOEs were consolidated before 1996 and initially only partly

privatized. In France, the government held a 18% stake in carmaker Renault and in 2014 acquired another stake in Peugeot, jointly with China's Dongfeng (also an SOE).

In reality, state ownership was not fully replaced by private capital but instead transformed in two important ways. SOEs with majority state control that survived the process of privatization remained relevant players in their sectors and in many cases were listed in stock exchanges, attracting private investors as minority shareholders (Gupta, 2005). In other cases, state ownership was morphed from majority to *minority*, though myriad investment vehicles such as state-owned holding companies, development banks, sovereign wealth funds, pension funds, life insurance companies and many others (Musacchio & Lazzarini, 2014). For instance, Temasek, Singapore's state-owned fund, invests 32% of its portfolio in companies such as Singapore Technologies Telemedia, Singapore Communications, Singapore Power, and Singapore Airlines (Goldstein & Pananond, 2008). Compared to majority SOEs, firms with minority state investment have been relatively understudied.

The firm-level performance implications of state ownership

Given these changes, which differences in performance can we expect between SOEs and private firms? We begin with baseline hypotheses based on most of the extant literature predicting an inherent "liability of stateness," that is, a *performance gap* between SOEs and private firms. All else constant, several features of SOEs will create intrinsic sources of disadvantage compared to private firms with similar traits.

Critical channels of performance disadvantage immediately follow from agency theory. Given that society essentially delegates the monitoring function to governmental representatives (Dixit, 2002), governments, as owners, tend to appoint politicians and political allies to run and influence SOEs. In China, for instance, SOE managers tend to be closely tied to the government and to the Communist Party (Li & Xia, 2007; Lin & Milhaupt, 2013). By controlling SOEs, governments can also misallocate resources to support projects that will yield political dividends, such as unprofitable investments in remote areas to benefit particular constituencies (Boycko *et al.*, 1996; Shleifer & Vishny, 1998; Vickers & Yarrow, 1988). Furthermore, managers of SOEs tend to have low-powered incentives—that is, salaries that are poorly responsive to performance (Boardman & Vining, 1989; Dharwadkar *et al.*, 2000; La Porta & López-de-Silanes, 1999). In reality, the pursuit of multiple objectives beyond profitability complicates the creation of efficient incentive contracts in SOEs (Bai & Xu, 2005; Firth, Fung, & Rui, 2006). SOE managers may not be fully incentivized to pursue profitability if they anticipate that governments will divert resources to support political objectives or veto certain actions that would otherwise cause political damage (e.g. layoffs after economic crises).

Despite these costs, some authors do recognize potential benefits emanating from state ownership. For instance, governments can provide firms with more "patient" capital (Beuselinck, Cao, Deloof, & Xia, 2013; Borisova, Brockman, Salas, & Zagorchev, 2012) and stimulate economy-wide new investment in areas where the private entrepreneurship is lacking (Gerschenkron, 1962; Rodrik, 2004). Yet, at the firm level, these benefits may not outweigh the costs of state ownership especially in the case of firms where governments have direct control rights. Under majority state ownership, agency problems associated with diffuse monitoring, low-powered incentives and political meddling should escalate. Even if majority SOEs yield

positive spillovers to the economy as a whole, these social benefits may come at the cost of reduced firm-level profitability and efficiency.

In firms with minority state ownership, in contrast, management will be in the control of private shareholders who will more likely follow profit-maximization goals. This feature will not only facilitate the creation of managerial incentive contracts, but also enhance the monitoring pressure on SOE managers. At the same time, partial state equity can help minority SOEs pursue profitable projects especially when faced with scarce availability of capital and other institutional constraints (Inoue, Lazzarini, & Musacchio, 2013; Vaaler & Schrage, 2009). Thus, minority SOEs should have lower costs of state ownership and, at the same time, benefit from their superior access to governmental resources. We, however, cannot predict that minority SOEs will generally have superior performance when compared to private firms. SOEs may not be completely insulated from governmental interference: governments may collude with other shareholders and even use their distinct regulatory power to influence particular choices (Musacchio & Lazzarini, 2014). For instance, Renault, minority-owned by the French government, decided to back off on its intentions to shift production overseas in 2010 after President Nicolas Sarkozy publicly objected to this decision. Therefore, we expect that majority SOEs will underperform minority SOEs, although the latter will not necessarily fare better than private firms (Boardman & Vining, 1989; Majumdar, 1998; Wu, 2011). This discussion leads to our first (baseline) set of hypotheses:

> *Hypothesis 1. There will be significant performance gaps between SOEs with majority state ownership and comparable private firms (that is, majority SOEs will underperform private firms with similar traits).*

Hypothesis 2. There will be no systematic, significant performance gaps between SOEs with minority state ownership and comparable private firms.

Environmental changes and the performance of SOEs

We advance the existing literature by proposing that SOEs' intrinsic sources of disadvantage will be especially relevant when they need to respond to negative pressure from their external environment. We examine two types of exogenous variation at the country-level: events of economic downturn and cyclical changes in the political market, driven by elections in democratic countries.

Economic crises tend to sharply decrease environmental munificence (Wan & Yiu, 2009) and require organizational response in the form of capacity readjustment, downsizing and resource reallocation more generally (Garcia-Sanchez, Mesquita, & Vassolo, 2014). In this environment, the liabilities of stateness, discussed before, create formidable challenges for the organizational adjustment of SOEs in periods of economic downturn. Although in conditions of extreme distress governments may be required to bail out SOE, in most cases the pressure will occur the other way around: SOEs will be seen as tools to help governments. For instance, regulatory impediments may constrain SOEs to fire unproductive workers and sell assets to restore profitability and efficiency (Gallagher, 2004). The low-powered incentives of SOE managers may further reduce their effort to adjust (Kato & Long, 2006), even when they are not formally constrained. Complicating matters, governments may directly request SOEs to preserve employment and even pursue unprofitable investment projects (Musacchio & Lazzarini, 2014; Shirley & Nellis, 1991). Given their restricted ability to adjust and the expected escalation in governmental intervention during economic crises, we expect that such events will increase the performance gap of SOEs.

Elections, in turn, will also create extra incentives for governments to intervene. SOEs, in particular, can be used as mechanisms to support governmental pet projects and distort local markets as a way to benefit incumbent politicians (Shleifer & Vishny, 1994). For instance, Dinç (2005) finds that, during election years, state-owned banks generally lend more than private banks in emerging markets. In same vein, Carvalho (2014) finds that governments try to expand employment during elections and use state-owned banks to provide firms with favorable lending conditions. Moita and Paiva (2013) show that prices in regulated industries tend to follow the political cycle: governments typically force SOEs in those industries to keep prices low during elections, as a way to increase the likelihood that the incumbent party will win. All these actions should have negative effects on firm-level profitability and efficiency.

As before, we also expect that such gaps will be lower in the case of SOEs with minority state equity. Although residual interference is still a possibility in those firms, minority SOEs are controlled by private owners who not only have high incentives to adjust but are also less directly influenced by governments. Because they are not fully controlled by the state, minority SOEs should also be less constrained in their ability to downsize and rearrange their investments. In other words, we hypothesize that the performance gap of minority SOEs will be lower than the gap of majority SOEs as a function of environmental changes that require adjustment or increase the likelihood of governmental intervention. Thus:

> *Hypothesis 3. The performance gap between SOEs with majority state ownership and comparable private firms will increase after negative environmental changes (i.e. changes that require organizational adjustment and that increase the temptation of governments to intervene).*

Hypothesis 4. The effect predicted by Hypothesis 3 will be reduced in the case of SOEs with minority state ownership.

Selection and performance

The performance gap of SOEs and private firms may also depend on selection processes affecting the resilience of state ownership in various industries and countries. As noted before, our observed SOEs represent instances where state ownership survived over time. Throughout the last decades, various governments reduced the public burden of inefficient SOEs, privatized state-controlled assets and sought to increase the performance of the remaining firms under their direct influence (Aivazian, Ge, & Qiu, 2005; Lin, Cai, & Li, 1998). For instance, governments listed large SOEs on stock exchanges, professionalized management, created independent boards of directors (often with external members), and gave many of these large SOEs substantial budgetary autonomy in tandem with mechanisms to improve financial transparency (Gupta, 2005; Pargendler, 2012). With those changes, governments managed to attract private investors acting as minority investors, despite the presence of the state as controlling shareholder. For instance, in Statoil, Norway's national oil company, CEOs receive stock options, are appointed and monitored by boards with a large number of external members, and are subject to an independent regulatory agency that help constrain the ability of governments to directly intervene in the company (Pargendler, Musacchio, & Lazzarini, 2013; Thurber & Istad, 2010). In this scenario, we should expect a process of *positive* selection: over time, firms with higher propensity to survive as SOEs should exhibit lower performance gaps.

An alternative prediction is that governments selectively kept SOEs to support political allies or intervene in markets to reap electoral dividends. Thus, observing the resilience of SOEs in many countries, Bremmer (2010: 5) defines state capitalism as "a system in which the state

functions as the leading economic actor and uses markets primarily for political gain." Absent broader institutional reforms to tie the hands of politicians —such as strong anti-corruption laws and independent regulatory agencies (Bortolotti, Cambini, & Rondi, Forthcoming)—the temptation of governments to intervene may be too high. For instance, after the end of the Brazilian privatization program in the 1990s, Petrobras, a remaining majority SOE in the oil sector, was required to list its shares in the New York Stock exchange and many governance reforms were implemented. Yet, after this period, the firm was progressively used to support politically-motivated investments, accommodate political allies in its managerial ranks, and directly control market prices (such as the price of gasoline), with negative implications for firm-level profitability. In this case, we should expect a process of *negative* selection: firms more likely to survive as SOEs will exhibit larger performance gaps.

Although we concur that in many cases reforms in the public sector improved management practices and transparency, SOEs are ultimately influenced by governments that will cyclically change and differ in their inclination to intervene. This effect should be particularly critical in the case of SOEs with majority ownership, where governments have direct control rights and, absent institutional checks-and-balances, have a voice in the appointment of managers and firm-level strategies. Thus, we expect that in majority SOEs negative selection will prevail. In contrast, because state capital is under private control in minority SOEs, these firms should be less affected by direct governmental intervention and with an improved capacity to adjust. New vehicles of minority state ownership have also emerged over the years with an independent management and objectives more or less insulated from political influence (Giannetti & Laeven, 2009). For instance, many sovereign funds have tried to efficiently diversify national savings over a broad range of investment targets (Dewenter, Han, & Malatesta,

2010). In other words, even if intervention in minority SOEs is still a possibility, we expect that these firms will be relatively less affected by the process of negative selection. This logic therefore leads to our final set of hypotheses:

Hypothesis 5. Firms with higher propensity to survive with majority state ownership should generally exhibit larger performance gaps when compared to private firms with similar traits.

Hypothesis 6. Firms with minority state ownership will be less subject to the negative selection effect predicted by Hypothesis 4.

DATA AND METHODS

Data

We built a unique database of listed SOEs and private firms observed between 1997 and 2012. Our sample is comprised of 477 SOEs, of which 197 are majority- and 280 are minority-owned. For the sake of comparison, we also collected data on 431 private firms. Our procedure to select our firms was as follows. We started with a set of large publicly listed SOEs described in a recent survey on state ownership in OECD countries (Christiansen, 2011). We then searched in the *Fortune 500* list to find a group of large SOEs in emerging markets. Departing from this preliminary list, we then collected data on the top-ten listed firms, by revenues, in each sector a certain SOE appeared. Whenever available, we also collected data of additional firms in the same sector *and* country of each of the SOEs that we selected. We next looked for detailed ownership data to reclassify these newly added firms as SOEs or private firms.

Ideally, we would like to perform comparisons between SOEs and private firms in the same country and sector. Unfortunately, however, various SOEs do not have comparable listed private firms in the same country. Some SOEs represent monopolies or quasi-monopolies in

their own sectors; and, in some countries, the widespread presence of minority state equity makes it more difficult to find firms that are completely private-owned. Thus, in our database only 15.6% of majority SOEs have private firms in the same country and sector. For this reason, as we explain below, we compare SOEs to private firms in the same sector and then used country-level traits to find private firms under similar conditions.

Dependent variables (firm-level performance)

We adopt a host of measures capturing distinct elements of firm-level performance. We use two accounting-based measures, *ROA* and *EBITDA/Assets*, to measure short-term performance; the later, in particular, is used to assess the comparative operational performance of firms removing the effects of differential taxes or subsidized interest rates. We also adopt a market-based measure, *Tobin's q* (operationalized as the stock market value of the firm plus debt divided by total assets), to examine the effect of ownership on the long-term valuation of firms. Finally, we use two measures of firm-level productivity. *TFP* (total factor productivity) gauges how firm-level output (revenues) varies beyond the existing stock of capital and labor (Syverson, 2011), measured as total fixed assets and number of employees respectively. To avoid endogeneity bias due to firms' simultaneous choice of inputs and outputs, we computed TFP using first-differences, thus removing the effect of firm-level unobserved heterogeneity (Van Beveren, 2012). Namely, we used the following specification:

$$\Delta Ln(Revenues) = \beta_1 \Delta Ln(Fixed\ assets) + \beta_2 \Delta Ln(Employees) + \text{year dummies} + \text{error},$$

where Δ denotes first-differences. TFP is then computed as the residual of this equation; in this sense, our measure can be interpreted as *TFP growth*. Additionally, we also more directly computed *Labor productivity* as the ratio of total revenues to the total number of employees. This measure allows us to specifically examine how SOEs and private firms differ in their use

and allocation of labor. Given their wide variation and likely presence of outliers, we winsorized all performance variables at the 1% and 99% percentiles.

Independent (ownership) variables

For each firm and year, we collected data on the extent of total state ownership and the nature of ownership, that is, whether states directly own firms or instead use indirect channels of ownership or "pyramids" (e.g. Inoue *et al.*, 2013). For instance, it is very common for states to hold ownership stakes in certain firms that in turn have stakes in other firms, and so on. Whenever available, we tried to unveil those pyramids and identify state-related owners including the federal government, state-level governments, sovereign wealth funds, development banks, and all sorts of state-related investment vehicles (such as pension and insurance funds). Our primary data sources were the databases *Orbis* and *Capital IQ*, besides Christiansen's (2011) survey in the case of OECD countries. Yet, in various cases we had to search for additional information on multiple sources such as *Nexis-Lexis,* company websites and the shareholder lists available in some of their annual reports.

We then created two dummy variables coding the type of state ownership. We classified firms as *Majority SOEs* when a state-related entity held more than 50% of the controlling shares throughout the whole pyramid. This can occur, for instance, when a state-related owner holds more than 50% of the shares of a given firm, which then holds more than 50% of the shares of another firm, and so successively until the ultimate owner of the firm in the database is found. *Minority SOEs* are then coded as such when there is relevant state ownership (more than 1%) but less than the amount necessary to grant clear control rights. In our database, the median levels of state ownership are 71.2% and 18.1% in majority and minority SOEs respectively.

Control (matching) variables

We use three sets of control variables to more effectively compare SOEs and private firms. The first set involves firm-level traits. *Ln(Assets)* is the logarithm value of total assets and allows us to compare firms with similar size. *Fixed capital* is the ratio of fixed assets to total assets and is used to control for capital intensity. *Leverage*, a measure of total debt to total assets, is in turn adopted to account for differences in the use of debt across firms. The second set includes fixed industry- and year-specific factors, operationalized as industry and year dummy variables. The third set of variables, in turn, is comprised of country-level indicators of economic and institutional development

We adopted the following country-level indicators. *GDP per capita* is used as a measure of economic development. Drawing from the *Polity IV* database (Marshall, Jaggers, & Gurr, 2002), we also coded the nature of the country's political regime, ranging from -10 (autocracy) to 10 (full democracy). In addition, following previous research (e.g. Chacar, Newburry, & Vissa, 2010; Chan, Isobe, & Makino, 2008; Hermelo & Vassolo, 2010) we employed a host of variables measuring the extent of institutional development based on capital, product, and labor markets. *Market capitalization* represents the total stock market value of companies in each country divided by the country's GDP. We also add a group of measures coming from the *World Competitiveness Yearbook*, a survey published by IMD. *Ease of credit*, *Competition Legislation* and *Skilled labor* measure executive perceptions on the availability of credit, the extent of regulation avoiding unfair competition, and the supply of high-quality workers respectively. Finally, we created a composite measure with three indicators of the *Yearbook* found to be highly correlated: perceptions of protection of property rights, justice and absence of corruption. The final measure, referred to as *Rule of law*, has a high reliability score (Cronbach Alpha = 0.913).

Tables 1 and 2 present summary statistics and correlations of our variables.

<Tables 1 and 2 around here>

Methods

Simple comparisons between SOEs and private firms are plagued with critical endogeneity concerns: that is, governments do not choose their ownership stakes at random. For instance, governments may decide to privatize high-performance firms or keep under their control certain firms controlling "strategic assets" such as mines and public utilities. To circumvent this problem and guarantee a more effective comparison between SOEs and private firms, we primarily rely on a host of matching methods (see e.g. Imbens, 2004). For each individual firm *i*, let π_i^S denote its performance under state ownership (majority or minority) and π_i^P its performance under private ownership. S_i is a dummy variable indicating whether firm *i* is actually observed with state equity or not. State ownership, in this case, is a "treatment." Our measure of interest is the so-called *average treatment effect of the treated* (ATT), which is the difference in the expected performance of an SOE compared to the counterfactual outcome if the *same* firm were private:

$$\text{ATT} = E[\pi_i^S - \pi_i^P | S_i = 1] = E[\pi_i^S | S_i = 1] - E[\pi_i^P | S_i = 1]. \quad (1)$$

In our theoretical discussion, a *performance gap* between SOE and private firms would be observed if ATT < 0. In practice, however, we only observe whether, in a given moment, a certain firm is an SOE or private firm. That is, instead of $[\pi_i^P | S_i = 1]$, we only observe $[\pi_i^P | S_i = 0]$. Thus, we need to carefully build a "control" group of private firms that more likely resemble our "treated" cases (SOEs). Matching analysis essentially builds on two core assumptions (Rosenbaum & Rubin, 1983). The first assumption is called "selection on observables": conditional on a set of observable traits, being an SOE or private firm (i.e. S_i) is independent of the final outcome (firm-level performance). Let X_i represent a set of observable covariates—in

our case, represented by our previously discussed control variables. The assumption of selection on observables guarantees that $E[\pi_i^P|X_i, S_i = 1] = E[\pi_i^P|X_i, S_i = 0]$, i.e., we can take the performance of comparable private firms as an approximation of what would be the performance of a similar SOE under private ownership. The second assumption is that there is a group of comparable control (private) firms, similar to the set of treated (state-owned) firms that can be used for matching purposes. Under these assumptions, ATT can now be estimated as:

$$\text{ATT} = E[\pi_i^S - \pi_i^P| X_i, S_i = 1] = E[\pi_i^S| X_i, S_i = 1] - E[\pi_i^P| X_i, S_i = 0]. \quad (2)$$

In most of our analyses we adopt the nearest-neighbor matching estimator proposed by Abadie and Imbens (2011) and implemented by Abadie, Drukker, Herr and Imbens (2004). For each SOE, majority or minority, we try to find the closest private firm based on our set of observables. We adopt one match per treated firm, and implement, whenever possible, exact matching by sector and year (with replacement). In addition, we compute robust standard errors controlling for heteroscedasticity and employ a bias adjustment given that the continuous nature of certain observables does not allow for exact matching. To reduce the effect of a contemporaneous association between our performance indicators and matching variables, all our control covariates are lagged (average of the two previous years).

A clear problem with matching techniques, however, is that they do not remove bias due unobservable factors that are captured by our controls. Fortunately, our strategy of examining how SOEs and private firms respond to exogenous changes allows us to remove the effect of fixed firm-level observables by combining matching analysis with differences-in-differences estimation (Heckman *et al.*, 1997). Following our theoretical discussion, we focus on two distinct changes: macroeconomic crises and elections. We assume that an event of economic downturn at year *t* occurs when a given country exhibits two years of positive GDP growth (at *t*-

1 and *t*-2) followed by two years of negative growth (at *t* and *t*+1). For the subsample of countries with democracies, we also observe whether presidential or parliamentary elections occurred at year *t*. Therefore, for a given exogenous event, we consider *changes* in firm-level performance after and before the event, thus removing the effect of fixed unobservable factors. We compute post-event performance as the average between years *t* and *t*+1 and pre-event performance as the average between years *t*-1 and *t*-2; and then take the difference between the two measures as our final measure of performance change. As matching covariates, we use all our previously discussed controls and, following the suggestion by Cook, Shadish and Wong (2008), also add pre-event performance as an additional covariate. For instance, when computing ATTs for *ROA*, we also include as a matching variable the pre-event level of *ROA*. In total, we have 48 events (country-year pairs) of economic downturn and 137 events of elections, multiplied by the number of SOEs and private firms subject to these shocks.

Conditional on this fixed set of pre-event observables and only considering firms subject to the same exogenous change, we can then compute the ATTs as the difference between treated (state-owned) and private (control) firms, this time considering observed variations in their performance after the event at *t*, whose occurrence is indicated by the dummy variable D_{it}:

$$\text{ATT} = E[\Delta\pi_{it}^{S} | X_{it}, S_{it} = 1, D_{it} = 1] - E[\Delta\pi_{it}^{P} | X_{it}, S_{it} = 0, D_{it} = 1]. \quad (3)$$

Finally, also following our previous theoretical discussion, we would like to examine heterogeneous treatment effects: how ATTs vary according to particular characteristics of each firm and their environment. We benefit from the techniques described in Xie, Brand and Jann (2012) and implemented by Jann, Brand and Xie (2010). The idea is to model treatment effects as a function of the *propensity score* of a given firm (Rosenbaum & Rubin, 1983), that is, the predicted probability that the firm will be observed as an SOE (i.e. it will be "treated") for a

given set of covariates (our control variables). We adopt the *matching-smoothing* procedure, which essentially ploys ATTs against the measure propensity score of each firm and then uses a nonparametric method (polynomial regression) to visually see how ATTs vary according to the propensity scores. Negative selection, for instance, occurs when observe a significant downward-sloping trend: firms more likely to be treated (i.e. with a high propensity score) are more likely to underperform firms in the control group. We use logit regression to estimate propensity scores and restrict our analysis to regions of "common support," that is, cases when treated and control firms have similar propensity scores..

In the Appendix we describe our data and sample in more detail, including balancing tests to assess if SOEs and private firms are more or less comparable in terms of their observable traits as well as selection regressions showing how these traits influence the likelihood that a given firm will be observed with minority or majority ownership.

RESULTS

Comparative performance of SOEs versus private firms

Table 3 presents matching (ATT) estimates corresponding to the difference in performance between SOEs and matched private firms with similar traits (equation 2). We see that majority SOEs significantly underperform private firms only in terms of *Labor productivity*. Revenue per worker in majority SOEs is -0.075 lower than in comparable private firms, a difference of around 19.3% in magnitude considering the average labor productivity in the whole sample, 0.389 (see Table 1). Yet we fail to uncover any significant difference with respect to the accounting variables and even find that majority SOEs have *superior* Tobin's q. Estimates indicate that the Tobin's q of majority SOEs is 0.121 superior to private firms, or around 8.2% considering the average value of *Tobin's q* in the whole sample, 1.462. As for minority SOEs,

we observe that they also underperform private firms in terms of *Labor productivity* and also in terms of *EBITDA/Assets*. Even if it has a larger magnitude, the labor productivity gap in minority SOEs is not significantly different from the performance gap of majority SOEs according to Chi-square test of coefficient comparison.

<Figure 1 and Table 3 around here>

However, given that our database has a panel structure, the above analysis ignores within-firm correlation patterns across various years as well as temporal changes in the performance gap between SOEs and private firms. We thus compute ATTs separately for each year. Because a larger incidence of missing observations in the early years of our database makes it more difficult to compute yearly estimates for most firms, we focus our analysis in the period after 2000. Figure 3 shows our yearly estimates with 95% confidence intervals. In general, we do not see consistent, systematic performance gaps (that is, ATT significantly below zero) for all performance variables except for *Labor productivity* especially in more recent years.

<Figure 3 around here>

Therefore, these results do not provide consistent support for Hypothesis 1. Majority SOEs do not unambiguously underperform comparable private firms except when labor productivity is used as a performance variable. A possible explanation is that governments may keep equity stakes in firms with low labor productivity to support labor unions and other pressure groups; yet, in our selection regressions presented in the Appendix, we show that this does not appear to be the case. Another explanation is that potential liabilities of stateness (such as agency problems) may negatively affect labor efficiency but may be partially compensated by certain sources of idiosyncratic rents available to SOEs (such as distinct access to public resources). In contrast, we have partial support for Hypothesis 2: minority SOEs do not exhibit

clear performance gaps except with respect to labor productivity. As mentioned before, however, this comparison does take into account changes in the environment that might differentially affect SOEs and private firms. Also, from an empirical identification standpoint, matching on observable variables does not control for firm-level unobservable factors that might bias the computation of treatment effects. In the next section we rely on differences-in-differences estimation to more directly examine the impact of negative environmental changes.

The effect of exogenous changes: differences-in-differences estimation

Tables 4 and 5 show how the performance of SOEs and private firms change before and after exogenous changes involving economic crises and elections (see equation 3). To avoid spurious inference, we restrict our analysis to firms that have not changed their ownership type before and after each event. In addition, we impose that each control (private) firm should also be subject to a similar shock. As a robustness check, we also include "placebo" estimates by computing variations exactly two years before each economic crisis or election. By construction, the placebo for economic crisis event will be an observation with two years of subsequent positive growth. In the case of elections, we considered variations occurring two years before elections, provided there is also no election the year before or after each year used as a placebo. As per our hypotheses, we do not expect to find negative ATTs in these alternative observation years.

We find that moments of economic downturn are usually associated with negative ATTs for the majority SOEs (Table 4): after an economic crisis, the performance of those SOEs falls more than that of private firms for all performance indicators. The placebo cases, in contrast, exhibit null and even *positive* ATTs: in moments of positive growth, majority SOEs in some cases appear to *increase* their performance relative to comparable private firms. This result

potentially explains why we fail to find consistent results when we simply compare SOEs and private firms without taking into account changes in the environment. We also find negative ATTs after elections for all indicators except *ROA* and *TFP,* while in the placebo cases the difference is generally statistically insignificant or positive in the case of *ROA.* These estimated performance gaps are also economically relevant. For instance, after an event of economic downturn, the estimated change in *ROA* for the majority SOEs is 3.1 percentage points inferior to the observed change in comparable private firms—a difference in magnitude of 75.6% considering the average *ROA* in the sample (4.1%). Results therefore lend strong support for Hypothesis 3.

For minority SOEs, in contrast, the only detected effects are on *Labor productivity* for both economic crises and elections and *ROA* for events of economic downturn (Table 5). For all other indicators, there is no significant performance gap. In the case of *ROA*, we also find a similar negative effect in the placebo cases occurring two years before crises; thus, the result does not appear to occur specifically during crises. Thus, except for labor productivity, minority SOEs appear to be less affected by exogenous changes that tend to increase the temptation of governments to intervene. A possible explanation is that keeping employment high is generally a relevant political objective for governments and therefore they may try to influence minority SOEs specifically for that purpose (e.g. recall the Renault example discussed earlier). To further explore this finding, we computed changes in the logarithm of the number of employees of minority SOEs versus matched private firms. In events of economic downturn, minority SOEs significantly change employment by 7.9 percentage points *above* private firms, versus -3.8 percentage point in the placebo years, although the latter is not significant. These results therefore provide partial support for Hypothesis 4: relative to private firms, minority SOEs are

generally less affected by environmental shocks except when labor productivity is the relevant performance measure.

<Tables 4 and 5 around here>

Heterogeneous treatment effects

We can now turn to the analysis of heterogeneous treatment effects. Our goal is to assess how performance gaps (expressed as negative ATTs) may change depending on the propensity that a given firm will survive as an SOE. Figure 2 then shows how ATTs vary according to the propensity score of the firm. From the discussion in the Appendix, we know that a "typical" majority SOE is large, capital-intensive, less leveraged, and owned by governments in less developed countries. Figure 2 shows heterogeneous treatment effects considering differences-in-differences estimates after economic crises. We see that those typical majority SOEs, with high propensity scores, tend to have negative ATTs for *ROA, EBITDA/Assets* and *TFP*. This result indicates a process of *negative* selection: firms with higher propensity to have majority state control will also be more susceptible to negative interference. As for minority SOEs, although we find a similar negative selection effects for *TFP* and pervasive negative ATTs for *Labor productivity*, we also detect selection effects in the other direction: the *least* likely minority SOEs are the ones most affected by crises when the relevant variables are *ROA* and *Tobin's q*. Thus, results for minority SOEs are again mixed: firms more likely observed as minority SOEs tend to have lower ATTs except for efficiency-based measures of performance.

Figure 3 shows heterogeneous treatment effects after elections. For majority and minority SOEs, we again detect negative selection effects for *Labor productivity*. However, for minority SOEs we find a new pattern of *positive* selection: ATTs are significantly positive for the typical minority SOEs when *ROA* and *EBITDA/Assets* are used as performance indicators. In

other words, the typical minority SOEs tend to benefit more than private firms from election events. A possible explanation is that private capitalists with minority state capital are better connected with local governments and can therefore benefit from transfers, preferential access to credit, or other nonmarket rents that increase during elections (Carvalho, 2014; Sapienza, 2004).

Thus, these results provide support for Hypothesis 5: negative ATTs are mostly found in the typical majority SOEs, that is, firms that are more likely to be selected as majority SOEs given their observable traits. These negative selection effects tend to occur especially during economic crises. Support for Hypothesis 6 is, however, mixed: although negative ATTs are relatively less frequent for the typical minority SOEs, we still observe a pattern of negative selection when *Labor productivity* is used as a relevant performance measure. This result reinforces the importance of considering efficiency-based measures besides the usual profitability indicators used to compare firms. Although minority SOEs may be constrained in their ability to optimize, they also appear to benefit from political rents.

<Figures 2 and 3 around here>

CONCLUDING REMARKS

In this paper we analyze a large dataset of listed SOEs and private firms covering several countries and industries. We not only examine SOEs with majority state control and private minority owners but also SOEs controlled by private owners with minority state capital. In a nutshell, we fail to show that SOEs exhibit systematic performance gaps but we do find that these gaps will significantly emerge when SOEs are subject to external changes that require rapid adjustment and that increase the temptation for governments to intervene (namely, economic crises and election years). We also find that these negative effects are especially large for SOEs with majority state ownership. Furthermore, we find some evidence of negative selection in the

choice of state ownership: firms more likely to survive as majority SOEs, given their observable characteristics, tend to have a larger performance gap especially after economic crises. These results suggest that SOEs are not universally inferior to comparable private firms but typically exhibit important performance gaps when faced with negative environmental changes that expose their inherent constraints to optimize and adjust.

In light of these results, below we discuss the contributions and implications of our research, followed by suggestions for future research.

Contributions

At a more fundamental level, our paper contributes to the literature on the determinants of heterogeneous firm-level performance by examining the impact of state ownership in its various forms. We examine not only firms with majority state control, but also the effect of minority state equity, which has been relatively understudied despite their prevalence in many countries. In addition, our theorizing explicitly includes the role of environmental changes as factors that will shift the relative performance of SOEs versus private firms. That is, we study in which conditions performance gaps might become relatively more acute after exogenous changes that magnify the liabilities of state ownership. We show that changes in environmental conditions are crucial to explain performance gaps, thus suggesting that sources of performance heterogeneity between SOEs and private firms are not universal but contingent on external factors that make the liabilities of stateness more salient. Not less important, we explicitly incorporate in our theorizing and empirical analysis the role of selection: how the processes that make a certain firms more likely to be observed as an SOE might also change their performance gap when compared to similar private firms.

Our empirical analysis also presents some important novel features. Instead of focusing on a single country and industry, our database covers many countries and sectors, which increases the generalizability of our findings and allows us to unveil a host of heterogeneous factors affecting performance and selection. Our matching methods also allow for a more direct comparison between SOEs and private firms, thus helping mitigate biases in the assessment of performance heterogeneity. Moreover, our use of new methods to measure heterogeneous treatments effects helps us identify factors the influence the selection of state ownership and how selection affects performance gaps. These methods can also be more widely adopted in strategy research as a way to control for endogeneity in a broad range of strategic choices.

Implications for practice and policy

Our sample includes large, listed SOEs that not only compete with private firms—in some cases, even on a global scale—but also attract private owners as relevant investors. From the point of view of managers of SOEs, our study shows that these firms still exhibit important liabilities that potentially create competitive disadvantage after external negative shocks. Thus, our results suggest that sources of disadvantage can be greatly curtailed if managers pursue initiatives to either curb direct interference or reduce their constraints to adapt. Although these liabilities appear to be weakened when the state participates as a minority owner—a model of state capitalism that is becoming increasingly widespread—we still find that minority SOEs have important efficiency-based liabilities related to labor markets. Thus, a movement from majority to minority state ownership can potentially reduce performance gaps but not necessarily so if managers are constrained in their ability to optimize labor productivity.

From the point of view of investors, our study does not imply that SOEs should be generally avoided (for instance, many SOEs control unique resources that can yield positive

rents) but instead that particular caution is needed when exogenous changes increase the temptation of governments to intervene. Monitoring and responding to these events seems to be critical. Our study suggests two major dynamics that should be closely monitored: fluctuations in country-level economic activity and political cycles in democracies. Ideally, if investors can incorporate these events in their pricing strategies, then SOEs should become relatively more attractive in moments of positive economic growth and without forthcoming elections.

Our study also suggests important policy implications. Over the years, many governments have privatized failing SOEs and reformed the corporate governance of the remaining firms with state capital. Yet our results show that these reforms were only partial. SOEs still appear to be less responsive than private firms to negative shocks, such as economic crises, that require rapid adjustment. They also appear to be influenced by the political cycle, as indicated by the negative effect of elections. Thus, our results suggest the need of new reforms that improve the ability of SOEs to adjust and repel discretionary intervention. Also, given that gaps appear to be lower in firms with minority state capital, a possibility is to reduce the extent of state ownership as a way to more effectively infuse performance-enhancing private practices even if the state remains a relevant (minority) investor.

Limitations and suggestions for future research

Although we tried to include several covariates that can affect firm-level performance and the process of selection, there is still room to assess sources of unexplained heterogeneity. For instance, there are reasons to believe that particular governance features will help reduce performance gaps. As noted before, heterogeneous governance practices across SOEs may critically influence the ability of governments to intervene. For instance, some SOEs have boards with independent directors. State ownership may also change the way managers are allowed to

exert managerial discretion and promote performance-enhancing adjustments (e.g. Li & Tang, 2010). The analysis of heterogeneous managerial and governance features of SOEs, compared to private firms, can be particularly rewarding.

Furthermore, we restricted our empirical analysis to performance indicators related to profitability and efficiency. Yet SOEs may yield positive externalities not necessarily captured by these indicators. For instance, some argue that state intervention is sometimes necessary to invest in areas with scant private interest or when private investment is inherently risky (Murphy, Shleifer, & Vishny, 1989; Rodrik, 2004). More recently, authors such as Mazzucato (2011) have forcefully argued that states have been instrumental in the development of novel technologies with positive spillovers to the private investment and innovation (such as early computing know-how and green technologies). Following this idea, one could argue that state ownership will reduce its performance gap and even become a source of advantage for performance indicators that are not naturally pursued by the private sector but that have relevant implications for the economy and society. Examining these other performance indicators in comparative perspective will be an important step to improve our understanding of the pros and cons of state ownership.

APPENDIX

More details on the data

Figure A1 shows our sample of SOEs, separated by country and country, Figure A2, in turn, depicts a visual, cross-sectional comparison of SOEs and private firms without matching. In general, we see substantial performance heterogeneity, and private firms are not apparently clearly superior to SOEs. Of course, this comparison fails to consider that SOEs may differ from private firms based on important traits that can crucially influence the selection of state or private ownership, a problem that we try to remedy with our matching methods.

<Figures A1 and A2 around here>

When comparing distinct groups of firms, it is also important to assess if the groups are "balanced," that is, if the matching procedure guarantees that groups do not significantly differ in terms of observable traits. Using propensity score (kernel) matching to balance the sample, keeping only firms in the common support and using firm-level averages, we then evaluate how majority and minority SOEs differ from private firms. Although most of our analysis use matching based on covariates (following Abadie and Imbens, 2011), propensity scores are also used in our assessment of heterogeneous treatment effects. Preliminary analyses indicated that the inclusion of the squared term of *Leverage* helped balance the groups; we thus also include this squared term in our propensity score estimations. Results are presented in Table A1. The matching procedure substantially reduces "bias," that is, the difference in averages between SOEs and private firms for each observable trait. After matching, the differences in those traits across SOEs and private firms become insignificant.

<Table A1 around here>

Finally, given our interest in examining heterogeneous treatment effects, it is crucial to model the process of selection, that is, which firm-, industry-, and country-level traits will increase the likelihood that the firm will be observed as a majority or minority SOE. Although we do not offer specific hypotheses on how selection will occur, it is informative to briefly describe which covariates are more important and in which direction. Our objective is not to claim causality but rather to examine which factors are mostly correlated with state ownership.

Table A2 presents the results of logit regressions with all our matching covariates plus an additional trend (year count) term. We examine, for instance, the likelihood that a given firm will be observed with majority state versus private ownership. We also add lagged values of

each performance variable as regressors as a way to check if past performance affects selection. We see that, compared to private firms, majority SOEs tend to be larger (in terms of total assets), more capital intensive (in terms of fixed assets) and less leveraged. We also observe a higher incidence of majority SOEs in countries that do not have consolidated democracies (as seen by the negative coefficient of *Polity*) and with limited economic progress in terms of *GDP per capita* and capital market development (*Market capitalization*). This finding is consistent with theoretical discussions that state ownership might help solve myriad institutional voids in developing countries, such as capital scarcity to fund new industries (e.g. Gerschenkron, 1962; Yeyati, Micco, & Panizza, 2004). Yet we find that, conditional on these other development indicators, *Rule of law* has a *positive* effect on the likelihood of majority state ownership. Although somewhat counterintuitive, this finding is also consistent with more recent discussions arguing that the existence of large, listed SOEs mandates minimal institutional conditions curbing the risk of expropriation of minority private shareholders (Bortolotti *et al.*, Forthcoming; Pargendler *et al.*, 2013).

As for minority SOEs, we also see that their incidence is affected by similar factors except for *Leverage*, which appears to mostly influence majority SOEs, and *Skilled labor*, which negatively affects the likelihood of observing minority state ownership. Although the effect of capital intensity also appears to become weaker in magnitude when we compare the coefficients of *Fixed assets* across the regressions for the two types of SOEs, the difference is not significant according to a Chi-square test of coefficient comparison. It is also interesting to note that the trend term is highly significant for minority SOEs: over the years, the incidence of minority state equity has generally increased in various industries and countries.

Finally, and fortunately, we do not detect significant effects of the lagged performance variables, which indicates that, conditional on our matching covariates, selection does not appear to be generally influenced by past firm-level performance.

<Table A2 around here>

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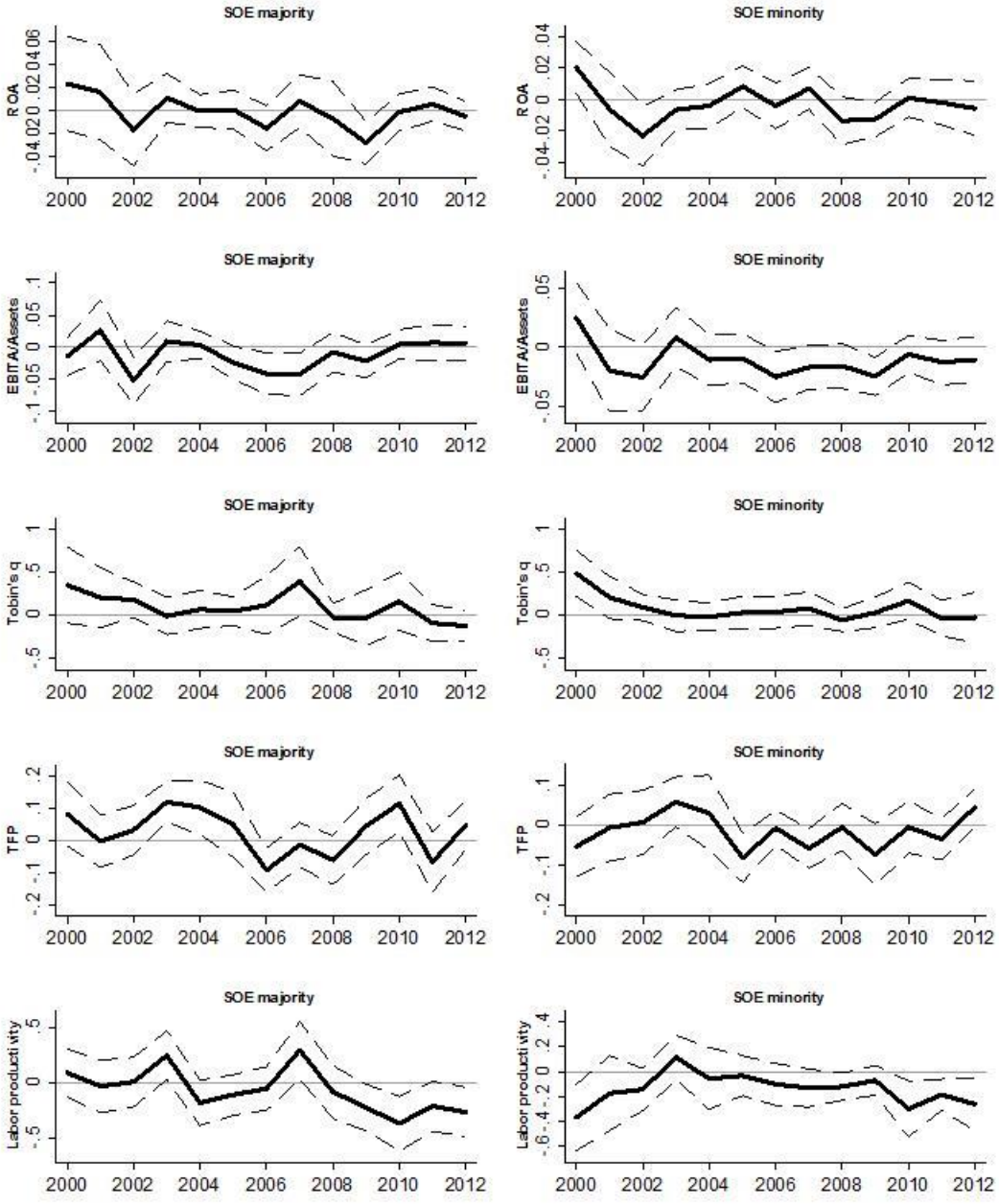

Figure 1. Performance differences between SOEs and matched private firms, by year (ATT matching estimates; dashed lines represent 95% confidence intervals)

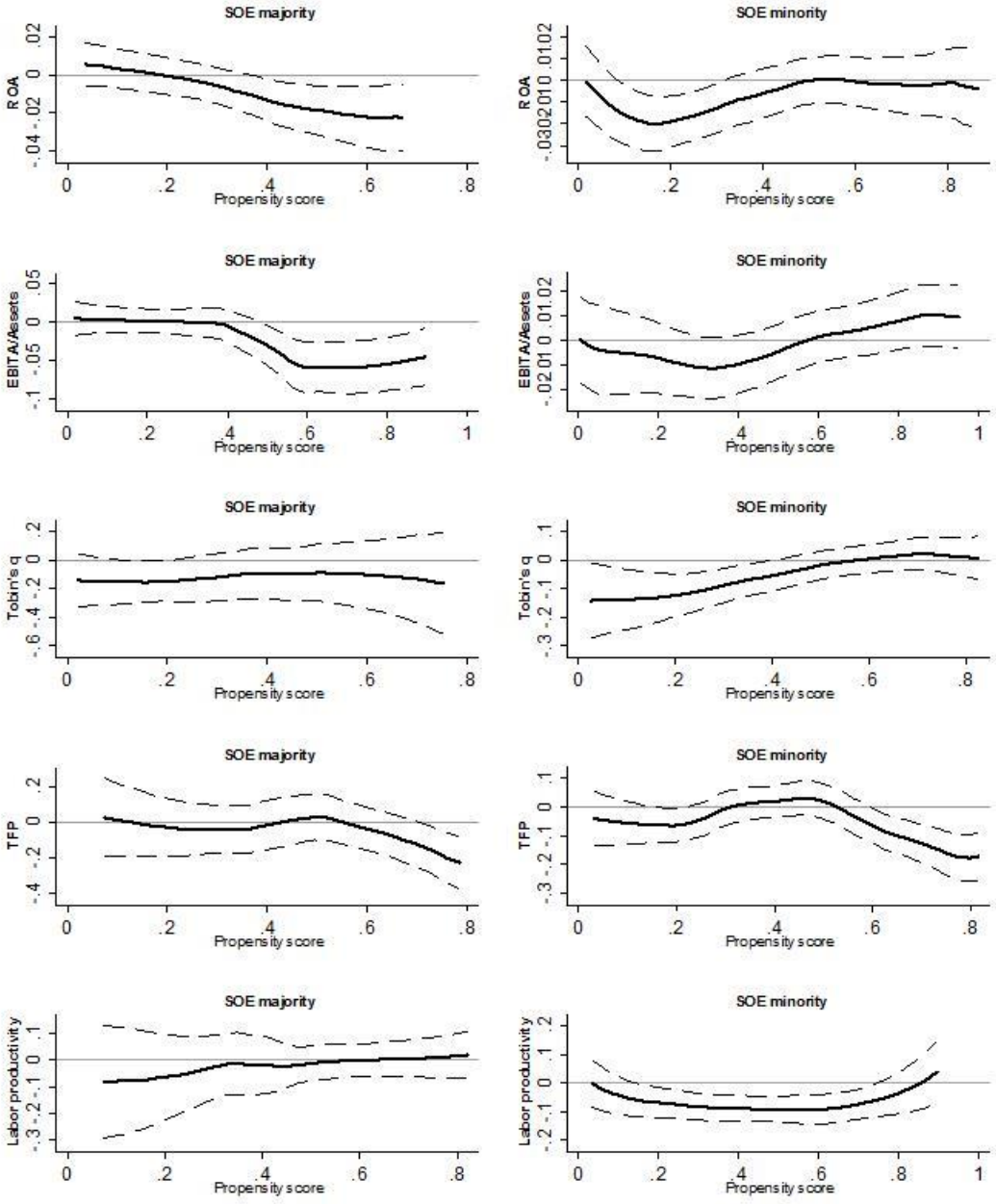

Figure 2. Heterogeneous treatment effects using economic crises as an exogenous source of variation (dashed lines represent 95% confidence intervals)

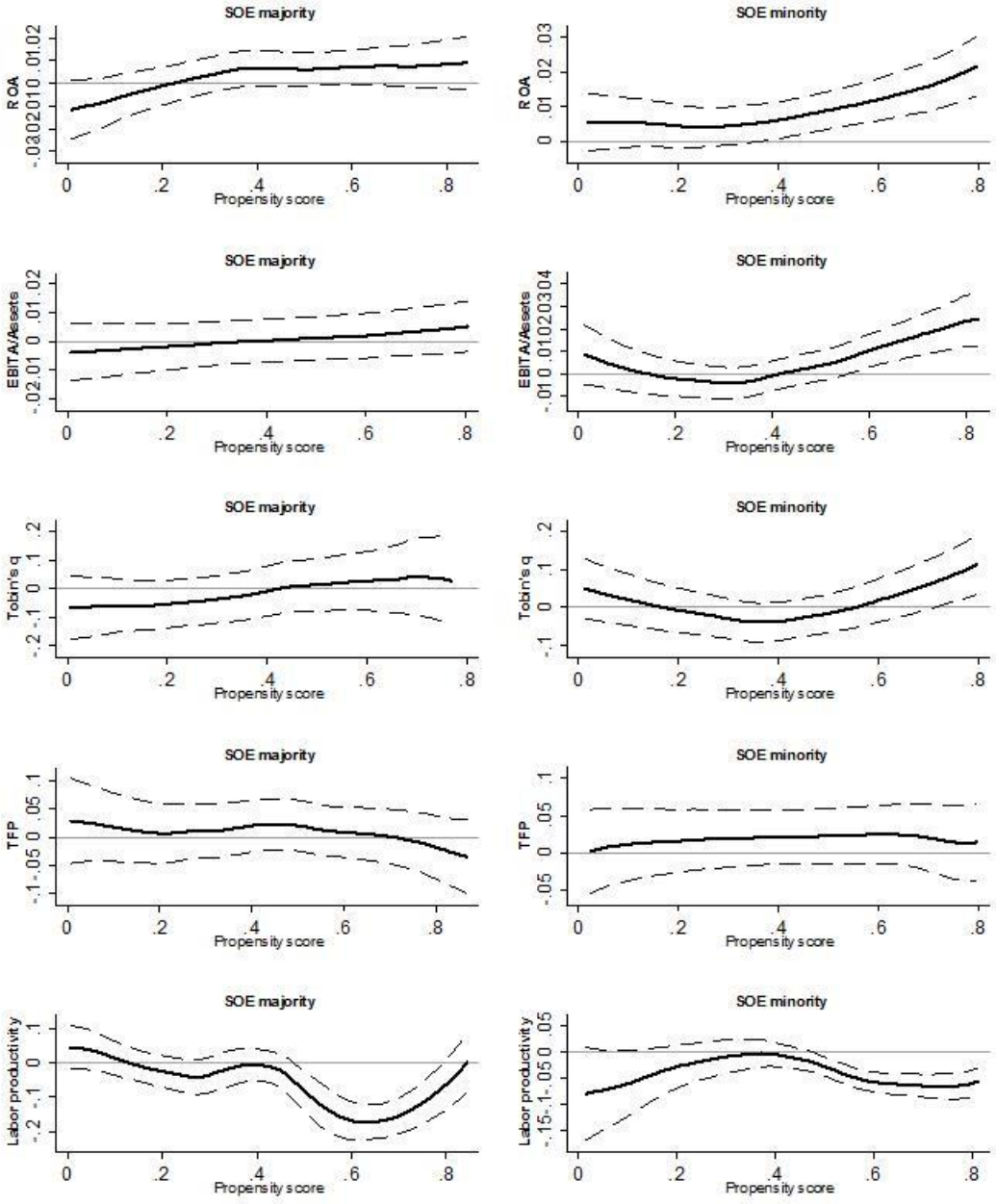

Figure 3. Heterogeneous treatment effects using elections as an exogenous source of variation

(dashed lines represent 95% confidence intervals)

Table 1. Summary statistics and description of variables

Variable	*N*	Mean	Std. dev.	Description	Source of data
ROA	9,462	0.041	0.063	Net profit divided by total assets	Capital IQ
EBITDA/Assets	7,446	0.126	0.082	EBITDA divided by total assets	Capital IQ
Tobin's q	7,947	1.462	0.863	Market value of stock plus debt divided by total assets	Capital IQ
TFP	6,299	-0.003	0.200	Estimate of total factor productivity growth as the residual of the regression: ΔLn(Revenues) = $\beta_1\Delta$Ln(Fixed assets) + $\beta_2\Delta$Ln(Employees) + year dummies + error, where Δ denotes first-differences.	Capital IQ/Bloomberg (employees)
Labor productivity	7,224	0.389	0.614	Revenues divided by number of employees	Capital IQ/Bloomberg
Majority SOE	9,464	0.194	0.396	Dummy variable equal to 1 if the firm is an SOE with majority state ownership	Capital IQ, Orbis and own research
Minority SOE	9,464	0.209	0.407	Dummy variable equal to 1 if the firm is an SOE with minority state ownership	Capital IQ, Orbis and own research
Ln(Assets)	9,464	8.250	2.415	Logarithmic value of total assets (deflated 1,000 dollars)	Capital IQ
Fixed capital	9,464	0.361	0.278	Fixed assets divided by total assets	Capital IQ
Leverage	9,464	0.652	0.223	Total debt divided by total assets	Capital IQ
GDP per capita	9,464	19.000	11.830	GDP per capita (deflated 1,000 dollars)	World Bank
Polity	9,440	7.443	5.405	Nature of the political system, from -10 (autocracy) to 10 (full democracy)	Polity IV database
Rule of law	8,625	6.105	1.866	Composite index involving perceptions of protection of intellectual rights, justice and absence of corruption	World Competitiveness Yearbook (WCY)
Ease of credit	8,627	6.113	1.698	Perceptions of availability of credit	WCY
Market capitalization	8,566	92.380	67.410	Country-level stock market capitalization to GDP	World Bank
Competition legislation	8,551	5.890	1.108	Perceptions of regulation avoiding unfair competition	WCY
Skilled labor	8,552	6.209	1.030	Perceptions of availability of skilled labor	WCY

Table 2. Correlation matrix

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1.ROA	1.00																
2.EBITDA/Assets	0.71	1.00															
3.Tobin's q	0.40	0.37	1.00														
4.TFP	0.08	0.10	0.08	1.00													
5.Labor productivity	0.05	-0.01	-0.07	0.06	1.00												
6.Majority SOE	0.07	0.03	0.01	0.03	-0.04	1.00											
7.Minority SOE	0.02	-0.01	-0.02	0.01	-0.05	-0.25	1.00										
8.Ln(Assets)	-0.19	-0.10	-0.34	-0.04	0.11	-0.04	0.05	1.00									
9.Fixed capital	0.11	0.13	0.00	-0.03	0.12	0.18	-0.02	-0.26	1.00								
10.Leverage	-0.46	-0.28	-0.30	-0.02	-0.01	-0.15	-0.03	0.51	-0.39	1.00							
11.GDP per capita	-0.13	-0.13	-0.08	-0.10	0.16	-0.28	-0.06	0.16	-0.05	0.15	1.00						
12.Polity	-0.09	0.02	-0.14	-0.12	0.13	-0.26	-0.07	0.14	0.01	0.14	0.44	1.00					
13.Rule of law	-0.12	-0.12	-0.05	-0.08	0.09	-0.25	-0.04	0.11	-0.03	0.18	0.78	0.35	1.00				
14.Ease of credit	-0.04	-0.04	-0.01	-0.04	0.04	-0.22	-0.08	-0.02	0.03	0.09	0.54	0.30	0.69	1.00			
15.Market cap.	0.01	-0.05	0.08	0.00	-0.01	-0.14	-0.07	0.01	0.02	0.01	0.27	-0.17	0.39	0.45	1.00		
16.Comp.legislation	-0.10	-0.10	-0.05	-0.05	0.07	-0.23	0.00	0.10	-0.02	0.15	0.63	0.38	0.88	0.68	0.25	1.00	
17.Skilled labor	-0.11	-0.10	-0.07	-0.07	0.09	-0.16	-0.09	0.04	0.01	0.12	0.41	0.36	0.54	0.41	0.16	0.46	1.00

Table 3. Performance differences between SOEs and matched private firms (full sample)

	Performance variable				
	ROA	EBITDA/Assets	Tobin's q	TFP	Labor productivity
Majority SOEs					
Matching estimate (ATT)	-0.001	-0.004	0.121**	-0.002	-0.075**
	(0.003)	(0.004)	(0.037)	(0.012)	(0.026)
N	5,452	4,429	4,935	4,128	4,408
Minority SOEs					
Matching estimate (ATT)	-0.003	-0.012**	0.042	0.002	-0.127**
	(0.002)	(0.003)	(0.032)	(0.009)	(0.025)
N	5,878	4,717	5,465	4,453	4,741

* $p < 0.05$, ** $p < 0.01$. Robust standard errors are in parenthesis. ATT is computed using the bias-corrected nearest-neighbor matching estimator proposed by Abadie and colleagues (2004, 2011). We allow one matching observation per SOE, imposing exact matching by year and industry. Besides industry and year, other observable matching variables include Ln(Assets), Fixed capital, Leverage, GDP per capita, Polity, Rule of law, Ease of credit, Market capitalization, Competition legislation and Skilled labor (see Table 1). All these matching variables are lagged (average, two previous years).

Table 4. Differences-in-differences estimation of the effect of exogenous changes on the performance differences between *majority* SOEs and matched private firms

	Performance variable				
	ΔROA	ΔEBITDA/ Assets	ΔTobin's q	ΔTFP	ΔLabor productivity
Economic crises					
Matching estimate (ATT)	-0.031**	-0.024**	-0.261**	-0.105**	-0.151**
	(0.008)	(0.008)	(0.079)	(0.040)	(0.043)
N	418	354	388	328	348
Placebo	0.002	0.011	0.314**	0.612**	0.220**
	(0.006)	(0.006)	(0.100)	(0.050)	(0.027)
N	375	324	334	301	324
Elections					
Matching estimate (ATT)	0.000	-0.014*	-0.119*	0.024	-0.172**
	(0.004)	(0.005)	(0.050)	(0.029)	(0.052)
N	848	675	679	530	593
Placebo	0.012*	0.003	0.092	0.001	-0.018
	(0.005)	(0.006)	(0.067)	(0.029)	(0.030)
N	769	634	657	523	572

* $p < 0.05$, ** $p < 0.01$. Robust standard errors are in parenthesis. ATT is computed using the bias-corrected estimator proposed by Abadie and colleagues (2004, 2011); see the note on Table 3. For a given change event at year *t*, we compute differences between post- (average between *t* and *t*+1) and pre-event observed performance (average between *t*-1 and *t*-2). The placebo tests involve changes evaluated two years before each event.

Table 5. Differences-in-differences estimation of the effect of exogenous changes on the performance differences between *minority* SOEs and matched private firms

	Performance variable				
	ΔROA	ΔEBITDA/ Assets	ΔTobin's q	ΔTFP	ΔLabor productivity
Economic crises					
Matching estimate (ATT)	-0.010*	0.003	-0.001	-0.031	-0.087**
	(0.005)	(0.005)	(0.033)	(0.022)	(0.027)
N	489	409	456	376	405
Placebo	-0.012*	0.007	-0.010	-0.033	0.013
	(0.005)	(0.006)	(0.048)	(0.022)	(0.018)
N	431	368	396	341	365
Elections					
Matching estimate (ATT)	0.006	0.001	-0.021	0.030	-0.146**
	(0.004)	(0.005)	(0.065)	(0.021)	(0.049)
N	920	729	773	591	653
Placebo	-0.011	-0.015*	-0.042	-0.017	-0.041
	(0.006)	(0.006)	(0.053)	(0.019)	(0.023)
N	836	683	739	570	623

* $p < 0.05$, ** $p < 0.01$. Robust standard errors are in parenthesis. ATT is computed using the bias-corrected estimator proposed by Abadie and colleagues (2004, 2011); see the notes on Table 3 and 4.

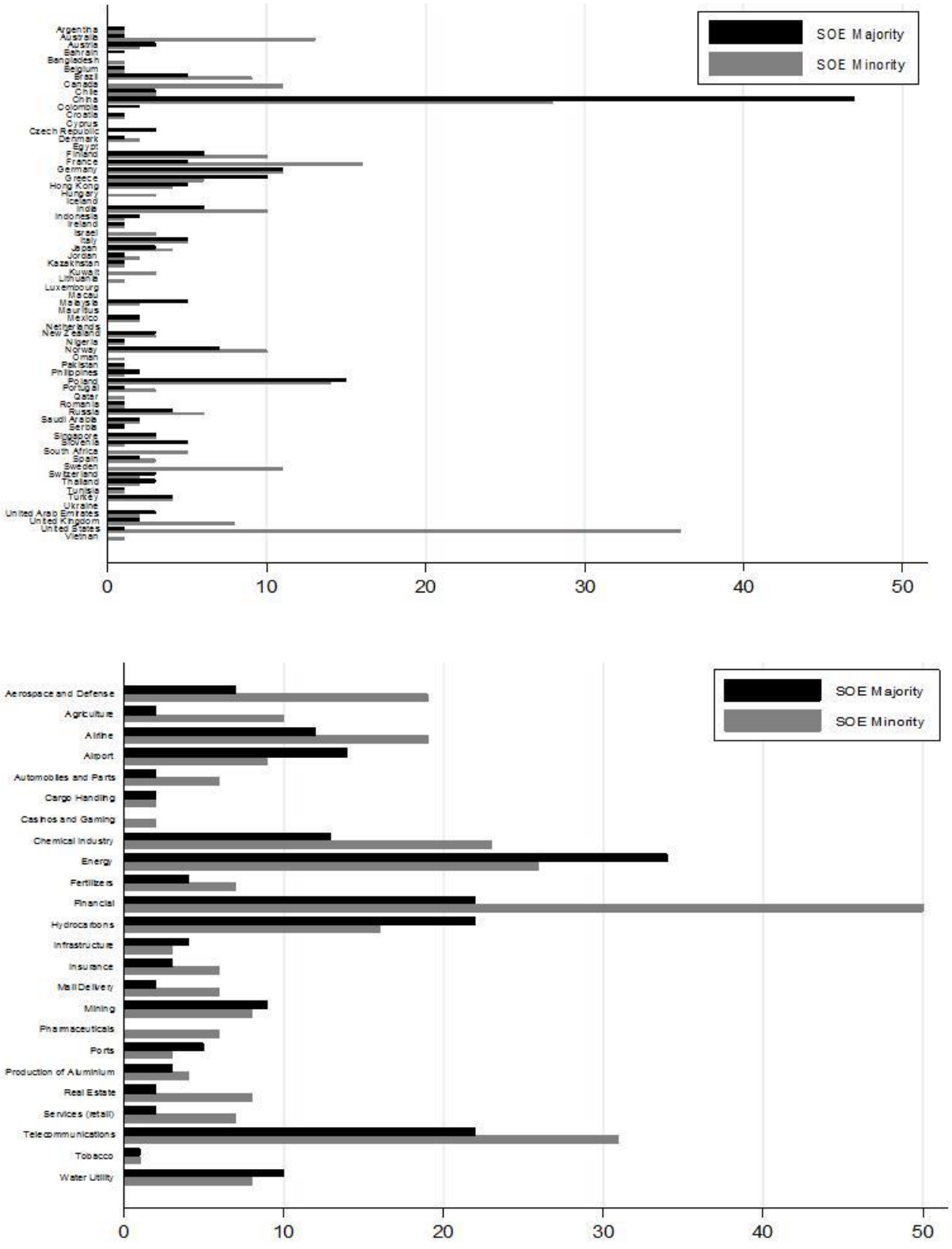

Figure A1. Number of SOEs by country and sector

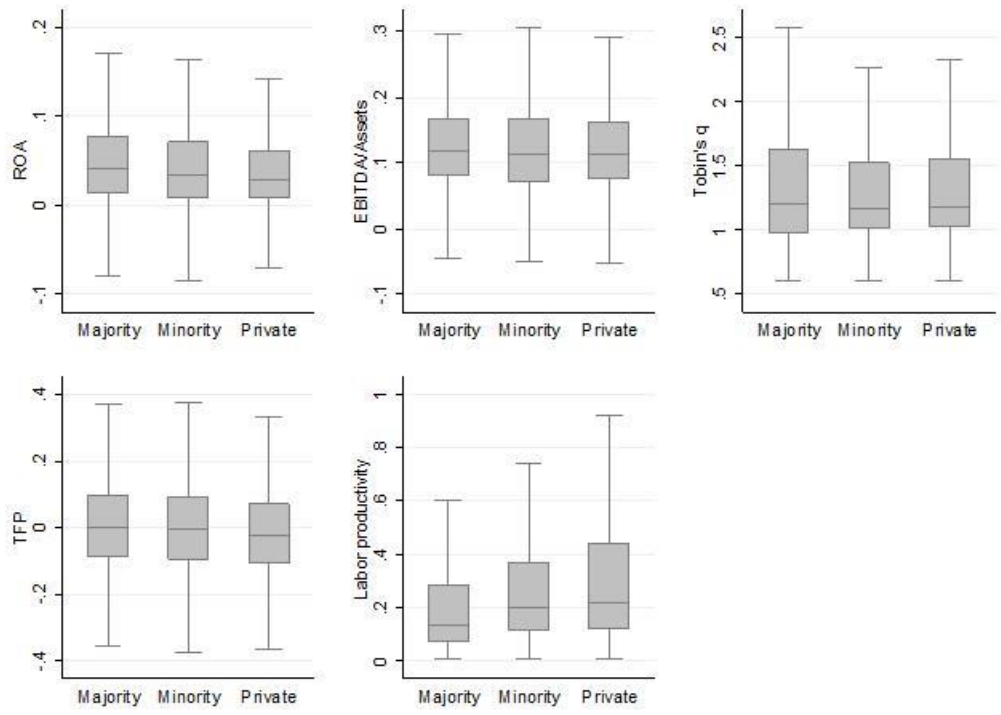

Figure A2. SOEs and private firms: heterogeneity in observed performance

Table A1. Balancing test using propensity score matching

		SOE majority	Private	Bias re-duction	*t*	SOE minority	Private	Bias re-duction	*t*
Ln(Assets)	Unmatched	8.013	7.993		0.09	8.149	7.993		0.83
	Matched	8.140	7.909	-1,070.3	0.98	8.271	8.184	43.8	0.43
Fixed capital	Unmatched	0.442	0.327		4.78**	0.354	0.327		1.29
	Matched	0.439	0.437	98.0	0.07	0.355	0.351	85.5	0.17
Leverage	Unmatched	0.585	0.679		-4.87**	0.633	0.679		-2.82**
	Matched	0.599	0.586	85.7	0.52	0.637	0.635	95.7	0.11
GDP per capita	Unmatched	11.383	20.536		-9.77**	18.682	20.536		-2.04*
	Matched	12.194	11.593	93.4	0.48	19.221	18.628	68.0	0.55
Rule of law	Unmatched	5.064	6.318		-7.92**	5.981	6.318		-2.35*
	Matched	5.102	4.946	87.6	0.65	6.029	5.988	87.9	0.24
Polity	Unmatched	4.450	8.432		-8.88**	6.833	8.432		-4.25**
	Matched	5.420	4.692	81.7	0.91	7.543	7.494	96.9	0.10
Market capitalization	Unmatched	65.793	98.624		-6.31**	89.526	98.624		-2.01*
	Matched	71.301	70.106	96.4	0.17	90.198	90.541	96.2	-0.07
Ease of credit	Unmatched	5.165	6.358		-9.55**	5.942	6.358		-3.77**
	Matched	5.301	5.133	85.9	0.92	5.965	5.933	92.3	0.25
Skilled labor	Unmatched	5.791	6.339		-7.73**	6.010	6.339		-5.00**
	Matched	5.830	5.825	99.1	0.05	6.025	6.012	96.0	0.16
Comp. legislation	Unmatched	5.284	5.981		-7.79**	5.843	5.981		-1.74
	Matched	5.329	5.210	82.9	0.86	5.867	5.830	72.6	0.41

* $p < 0.05$, ** $p < 0.01$. Balancing test using propensity score (kernel) matching and considering cases in the common support.

Table A2. Selection: factors affecting the probability that a given firm will be observed as a majority or minority SOE

	Majority SOE					Minority SOE				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Past performance	0.236	-0.975	-0.079	-0.178	0.015	1.370	-1.422	-0.065	-0.154	-0.495
	(2.089)	(1.874)	(0.169)	(0.484)	(0.344)	(1.167)	(1.196)	(0.135)	(0.377)	(0.256)
Ln(Assets)	0.305**	0.361**	0.291**	0.333**	0.321**	0.261**	0.305**	0.248**	0.228**	0.229**
	(0.091)	(0.104)	(0.108)	(0.116)	(0.107)	(0.058)	(0.070)	(0.068)	(0.071)	(0.067)
Fixed capital	2.092**	2.194**	1.704*	2.030**	2.405**	0.902	0.864	0.736	0.694	0.643
	(0.630)	(0.646)	(0.674)	(0.729)	(0.704)	(0.549)	(0.557)	(0.605)	(0.630)	(0.623)
Leverage	-1.398	-1.789*	-1.897*	-2.140*	-1.938*	-0.403	-0.941	-0.321	-0.422	-0.251
	(0.800)	(0.782)	(0.903)	(0.927)	(0.833)	(0.585)	(0.597)	(0.606)	(0.696)	(0.641)
GDP per capita	-0.077**	-0.080*	-0.088*	-0.073*	-0.076*	-0.060**	-0.067**	-0.064**	-0.044*	-0.045*
	(0.029)	(0.033)	(0.034)	(0.037)	(0.035)	(0.017)	(0.019)	(0.017)	(0.019)	(0.018)
Rule of law	0.470**	0.468*	0.544**	0.589*	0.543*	0.387**	0.317*	0.419**	0.346	0.383*
	(0.179)	(0.194)	(0.207)	(0.236)	(0.219)	(0.139)	(0.155)	(0.146)	(0.178)	(0.165)
Polity	-0.183**	-0.207**	-0.194**	-0.257**	-0.223**	-0.055	-0.015	-0.059	-0.091*	-0.080*
	(0.044)	(0.055)	(0.052)	(0.064)	(0.056)	(0.030)	(0.034)	(0.033)	(0.038)	(0.035)
Market capitalization	-0.013**	-0.014**	-0.011**	-0.018**	-0.016**	-0.007**	-0.008*	-0.007**	-0.009**	-0.009**
	(0.004)	(0.005)	(0.004)	(0.006)	(0.005)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)
Ease of credit	0.020	-0.010	-0.029	0.051	0.033	0.046	0.018	0.058	-0.035	0.004
	(0.105)	(0.117)	(0.110)	(0.133)	(0.123)	(0.067)	(0.079)	(0.071)	(0.076)	(0.073)
Skilled labor	-0.187	-0.088	-0.143	-0.179	-0.139	-0.307**	-0.269*	-0.304**	-0.361**	-0.356**
	(0.130)	(0.135)	(0.148)	(0.165)	(0.150)	(0.098)	(0.114)	(0.106)	(0.118)	(0.112)
Comp. legislation	-0.311	-0.136	-0.298	-0.344	-0.335	-0.051	0.137	-0.146	0.152	0.050
	(0.234)	(0.237)	(0.261)	(0.325)	(0.282)	(0.195)	(0.213)	(0.203)	(0.242)	(0.225)
Trend	0.02	0.012	0.043*	0.027	0.025	0.109**	0.106**	0.113**	0.099**	0.107**
	(0.017)	(0.018)	(0.019)	(0.024)	(0.023)	(0.015)	(0.017)	(0.017)	(0.020)	(0.018)
N	5,264	4,182	4,337	3,507	3,918	5,832	4,631	5,090	3,963	4,396
Performance variable	ROA	EBITDA/ Assets	Tobin's q	TFP	Labor productivity	ROA	EBITDA/ Assets	Tobin's q	TFP	Labor productivity
Industry dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

* $p < 0.05$, ** $p < 0.01$. Logit regressions with robust errors clustered on each firm. Standard errors are in parenthesis. All independent variables are lagged (average, two previous years). When assessing the choice of majority ownership, for instance, we consider only the subset of majority SOEs and private firms.