Financing Costs of State-owned Enterprises: Evidence from EU Firm Level Data *

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Abstract

How are investment decisions affected by whether companies are private or (partly) state-owned (SOE)? In a recent and extensive EU firm-level dataset, including non-listed firms, we apply an endogenous selection model to compare capital costs for SOEs and private firms similar in financial characteristics. As a first result, we found that SOEs had lower capital costs compared to private firms. Secondly, we examined how firm profitability as a proxy of a firm's default risk affected capital costs. We found that capital costs of private firms, but not of SOEs, were negatively affected by profitability. We argue that state guarantees are an insufficient explanation for this later finding as in the EU these state guarantees reduce, but do not eliminate the risk of default for SOEs. We speculate that financing costs might be affected by other differences between private firms and SOEs that affect lender's and investor's preferences.

Key words: Corporate finance, State-owned enterprises, Capital costs

1 Introduction

State-ownership remains an important factor around the world (Bruton et al., 2015) as well as in OECD countries (Christiansen, 2011). From the point of view of regulation as well as financial market research, it is important to understand how (partial) state-ownership affects investment into these firms. Furthermore, financing conditions can also shed light on motives and preferences of investors.

In this paper, we examine the average cost of debt of SOEs and private firms using a large firm-level panel dataset (Orbis) in the years 2008-2015. In the European Union (EU), the regulatory framework of competitive neutrality bans preferential treatments (such as explicit debt guarantees) based on specific ownership types for commercial enterprises.¹ In particular, according to EU law, explicit guarantees to commercial ventures constitute state aid and are thus prohibited.² This law is also enforced as, for example, Germany was obliged to abolish explicit guarantees for its savings banks in 2001 (Gropp et al., 2014). As a result, commercial SOEs obtain debt uniquely in the commercial marketplace in OECD and EU countries (OECD, 2014). These facts should mitigate the influence of public policy obligations of SOEs in our data. Another study on competitive neutrality within the OECD (2012) argues that member countries formally apply the same bankruptcy framework to commercial SOEs than to private firms. Hence, non-performing loans or even defaults of SOEs are a real possibility, which rational investors should take into account. Nevertheless, it may be difficult for the government to convince market actors, that it does not provide an *implicit* guarantee for a specific SOE on debt (or against default) (OECD, 2016). If lenders behaved rationally, they should attribute a positive (but possibly lower) default risk to

¹Generally, Article 107 of the Treaty on the Functioning of the EU prohibits state-aid for commercially active SOEs because it could undermine the functioning of the single market. We elaborate further on state-aid and access to finance in 2.1 and also discuss a few exceptions.

²Article 90 of the Treaty on the European Community explicitly subjects public undertakings of “general economic interest” to EU competition law. Articles 107-109 in the Treaty on the Functioning of the EU define the concept of state aid and when it applies to SOEs (at arm’s-length).

SOEs and adjust interest accordingly:

Hypothesis 1. *Under implicit guarantees in the EU, capital costs of SOEs are lower than those of private firms.*

A proxy for default risk is firm profitability (Altman, 1968). Thus, a worse corporate performance should, *ceteris paribus*, increase individual company risk and therefore, a firm's cost of external finance. Given that state guarantees are implicit and imperfect, there is a non-zero default risk for SOEs in the EU and therefore:

Hypothesis 2. *Under imperfect guarantees in the EU, corporate performance should affect capital costs both for private firms and SOEs.*

Empirically, investors do not always maximize their expected individual monetary utility. Previous studies have found evidence of political lending, even if this behavior leads to lower monetary returns or even losses (Sapienza, 2004; Dinc, 2005; Khwaja and Mian, 2005). Moreover, many studies show that investors are willing to accept a sub-optimal financial performance to pursue social or ethical objectives (see Renneboog et al., 2008, for a survey). These preferences affect financial markets to the extent that socially responsible US companies pay less for their debt (Goss and Roberts, 2011). Hence, investors may favor a particular group of companies because of an assumed societal benefit (Brandt and Li, 2003). Under such preferences, investors may not take rational risk considerations fully into account. Thus, we hypothesize as an alternative to Hypothesis 2:

Hypothesis 3. *When investors do not only strive to maximize their own utility, corporate performance could not affect capital costs of SOEs.*

We found that SOEs pay less for their debt than private firms, supporting Hypothesis 1. Furthermore, risk proxies are important determinants of debt costs only for private firms, but not for SOEs. This is evidence for Hypothesis 3 and makes it implausible that implicit state guarantees alone can explain the lower capital costs of

SOEs. Our main specification suggests that average interest rates of SOEs across all debt contracts are between 1.1 percentage points (using a two-sided t-test) and 1.2 percentage points (using regression analysis) lower than those of private companies. Whereas an increase in operating profitability of 1 percentage point decreases interest rates of private companies by 1.36 basis points, firm profitability is not a relevant determinant for SOE interest rates.³ This finding is robust, even under situations of severe sovereign financial distress and indicates that investors treat the two ownership types differently.

This result supports prior research that has shown how government ownership affects the market perceptions of firm value and risk (Borisova et al., 2015; Beuselinck et al., 2017). The results are also in line with prior research arguing that SOEs benefit from facilitated access to debt financing (Brandt and Li, 2003; Li et al., 2009; Chen et al., 2016). We add to the existing literature with the use of a dataset that incorporates financial statements of non-listed firms. Hence, our data includes companies such as municipal property developers and local energy companies that are visible in the local public sphere and to local decision makers. A further strength of the dataset is the considerable amount of available historical ownership data, which we observe yearly. This enables us to construct a much bigger sample of firms with verified ownership information than in most previous studies. Besides implicit state guarantees, previous empirical research related SOE lending to political arguments (Sapienza, 2004; Dinc, 2005). Yet, also social preferences for investments with social externalities could explain lower financing costs of SOEs, if these SOEs combat market imperfections. Future archival and experimental studies are needed to elucidate in more detail to what extent lending and investing is affected by other motives than the maximization of utility in the case of SOEs in EU countries.

³We derive our profitability proxy before financial expenses and thus avoid reverse causality.

2 Methods

2.1 Definitions: Outcome, profitability and state ownership

To evaluate the cost of debt for SOEs and private firms we analyze firm-level data from Orbis. In particular, we check if both ownership types differ concerning the effect of company risk on the cost of debt. We assume that more profitable firms should, on average, pay less for their debt because they face lower probabilities of bankruptcy (Altman, 1968).⁴ Our dependent variable is firm i 's average interest rate in the year t :

$$AVIN_{it} = \frac{INTE_{it}}{LTDB_{it} + STDB_{it}}, \quad (1)$$

where $INTE_{it}$ is the total interest paid of firm i in year t , $LTDB_{it}$ is total long-term debt (of maturity above one year) and $STDB_{it}$ is short-term debt (of maturity below one year).⁵

Profitability should affect a firm's cost of finance because it is a proxy for the quality of management and the underlying firm-level risk. However, the literature identifies no single best way to measure a firm's profitability. Our main proxy is a firm's return on total assets $OROA_{it}$, calculated as operating profit divided by total assets. In this we follow Altman (1968) and Goss and Roberts (2011). Operating profit is defined as all operating revenues minus all operating expenses. We use $OROA_{it}$ as our main risk proxy because it is free of reverse causality. As a robustness check, we estimate our model using the pre-tax return on assets.

Throughout this study, we are particularly interested in a differential impact of profitability on a firm's average interest rate, depending on ownership. To be precise,

⁴We focus on the impact of profitability on the cost of assumed target leverage. Hence, we are not interested in the effect of profitability on firms' debt-to-equity ratios, which is ambiguous in the corporate finance literature (Frank and Goyal, 2009).

⁵Appendix Table A.7 contains descriptions and sources of all variables used in this study. Appendix Section 5.3 lists all data assumptions.

we expect a negative impact of $OROA_{it}$ on $AVIN_{it}$ for private firms because higher profitability decreases the risk of financial distress. Under Hypothesis 2 we would expect a similar effect for SOEs (starting from a different level as stated in Hypothesis 1) whereas under Hypothesis 3 we would expect no effect.

A firm is included in our main regression if we have data for it in at least five consecutive non-missing years.⁶ To determine whether a firm is state-owned or privately owned, we rely on the historical ownership database that forms part of Orbis. It allows us to identify wholly owned subsidiaries or stand-alone firms which carry the ultimate ownership label "public authority, state, government". We introduce an ownership indicator $SOE_i = 1$ if a firm falls into this category. Orbis allows us to distinguish privately owned firms by additional ownership groups. For example, we can determine if a firm is family-owned or in the hands of a private equity fund. Numerous studies conclude that these ownership types affect firms' performance and the cost of debt (Anderson and Reeb, 2003; Anderson et al., 2003; Kaplan and Stromberg, 2009). We are interested in singling out the effect of state ownership on a neutral benchmark. Therefore, we limit our private firm sample to the most common and neutral ultimate ownership type "industrial company". Private firms in our sample are thus either stand-alone industrial companies or 100-percent subsidiaries of such firms and carry the ownership label $SOE_i = 0$. This allows us to generate a sample of 6,868 SOE firm-years and 94,345 private firm-years.

2.2 Data Exclusion Criteria

Our focus on EU data should ensure similar rules and financing conditions for SOEs and private firms, as discussed above. However, some exceptions lead to the exclusion of particular sectors from the data set.

Competitive neutrality might not hold for state-owned banks such as the German

⁶Our results are robust to a decrease and increase in panel balance. Results are reported in Appendix Tables A.6 and Table A.5.

“Kreditanstalt für Wiederaufbau” or the French “Caisse de dépôts et consignations”. Thus, we exclude all financial and public administration firms from our sample. We also exclude all sectors connected with the passenger railway industry because national railway monopolies have received interest-free loans in some member countries – which is similar to a full guarantee.⁷ We further exclude firms incorporated as non-commercial enterprises such as the German *gemeinnützige Gesellschaft mit begrenzter Haftung* (*gGmbH*) and their European equivalents.

As another example of non-neutrality, SOEs can get state support for activities with a non-trivial public policy obligation. A primary example is again state-owned banks and the railway sector, which we exclude from our sample. According to the OECD (2014), SOEs in member countries access debt almost exclusively on the marketplace, whereas compensation for public policy obligations takes the form of equity injections or direct transfers in most member states. In some member states, notably the Czech Republic, Finland and Slovenia, state-aid is non-existent OECD (2014). Hence, our dependent variable $AVIN_{it}$ should be mostly unaffected by direct state support. Nevertheless, we exclude all NACE2 categories with no private firm activity from the estimation sample as an additional safeguard. Summing up, after excluding the above sectors, institutional lending conditions should be similar across ownership types.

2.3 Data Description

Table 1 shows the distribution of SOEs and private firms across countries. Unfortunately, Orbis contains missing values in many control variables, which reduces sample size considerably. For example, the relatively low share of SOEs in France is not rep-

⁷In total, we exclude the NACE2-categories K (“Finance and Insurance”), O (“Public Administration and Defence”), and the 4-digit NACE2 sectors 4212 (“Construction of railways and underground railways”), 4910 (“Passenger rail transport, interurban”), 4931 “Urban and suburban passenger land transport”, and 5221 (“Service activities incidental to land transportation”) from all our regressions.

representative of the French economy.⁸ The other big continental European economies are each represented with a considerable share for both ownership groups. In total, our sample covers 15 EU countries. Despite the high number of missing values, two

Table 1: Country data

Table 1 presents the ownership distributions for our estimation sample across countries.

Country	$SOE_i = 1$: N	$SOE_i = 1$: %	$SOE_i = 0$: N	$SOE_i = 0$: %	Total: N	Total: %
Austria	56	0.82	1,184	1.25	1,240	1.23
Belgium	7	0.10	2,741	2.91	2,748	2.71
Czech Republic	333	4.85	2,516	2.67	2,849	2.81
Germany	2,619	38.13	7,565	8.02	10,184	10.06
Spain	909	13.24	20,047	21.25	20,956	20.70
Finland	371	5.40	1,811	1.92	2,182	2.16
France	5	0.07	27,720	29.38	27,725	27.39
Italy	867	12.62	13,901	14.73	14,768	14.59
Latvia	10	0.15	28	0.03	38	0.04
Poland	1,148	16.72	1,486	1.57	2,634	2.60
Portugal	36	0.52	1,444	1.53	1,480	1.46
Romania	5	0.07	207	0.22	212	0.21
Sweden	470	6.84	12,447	13.19	12,917	12.76
Slovenia	22	0.32	932	0.99	954	0.94
Slovakia	10	0.15	324	0.34	334	0.33
Total	6,868	100.00	94,353	100.00	101,221	100.00

key advantages distinguish our empirical section from many other studies focusing on ownership structure: First, Orbis collects ownership information from official sources, which makes our study less dependent on manual ownership research. Second, our sample size is still much larger than in most other studies using manually collected ownership information.

Figure 1 plots our outcome variable $AVIN_{it}$ and our main variable of interest $OROA_{it}$ over the sample period from 2006-2015. It shows that SOEs pay lower average interest rates in each year (left panel). The $AVIN_{it}$ time series of the two ownership types are very parallel and indicate a persistent difference of around one percentage point between SOEs and private firms in the first three years, which declines to around 0.5 percentage points afterward. The initial increase in average interest rates coincides with tight credit and uncertainty at the height of the financial crisis in 2008. The fall in

⁸We assume sample selection in our data set is uncorrelated with our outcome variable and error term since we only use information that is publicly available. More likely, missing values arise because of differences in data-collecting processes of the dataset provider Bureau van Dijk.

Figure 1: Average interest and operating return on assets

Figure 1 plots the empirical average interest rate $AVIN_{it}$ and average return on assets ROA_{it} over our sample period 2006-2015.

subsequent years points to improved access to finance, likely caused by better economic conditions in general and expansionary ECB monetary policy. The third curve in the left panel represents the ECB's benchmark on new corporate loans. It follows a similar pattern than the average interest curves but declines faster in later years. We explain the increasing difference between the ECB benchmark and our indicators with legacy debt. Besides, most companies in our sample are relatively small and probably borrow at higher interest rates than the average firm. The right panel of Figure 1 shows that SOEs also have lower profitability $OROA_{it}$ than private firms in our sample period. The private firms again exhibit a behavior that is consistent with the financial crisis and weak economic recovery in the EU: profitability decreases sharply during the crisis years 2008 and 2009 and only recovers from 2014, i.e., after the peak of the Eurozone crisis. SOE profitability is showing a weak but persistent trend upwards, which could reflect ongoing efforts to improve the performance of SOEs across Europe.

2.4 Econometric Model

Due to the non-randomness of ownership structure, we employ the endogenous selection model proposed by Semykina and Wooldridge (2010). We assume that two regimes $R^1 \forall SOE_i = 1$ and $R^2 \forall SOE_i = 0$ exist and determine the average cost of debt $AVIN_{it}$. Selection into one regime or the other is not random because the government (or the general public) faces different social, political and economic incentives to own a specific company or not. Our basic outcome model takes the form:

$$AVIN_{it}^R = \mathbf{x}_{it}\boldsymbol{\beta}^R + c_{i1} + u_{it1}, \quad (2)$$

where R indicates whether we are in regime $SOE_i = 1$ or regime $SOE_i = 0$. The vector $\mathbf{x}_{it}$ denotes a $1 \times K$ vector of time-varying explanatory variables and $\boldsymbol{\beta}^R$ denotes differential coefficient estimates depending on the regime R . The unobserved effect c_{i1} is time-constant and u_{it1} is an idiosyncratic error term. The index 1 denotes that the element belongs to our outcome equation. However, whether firm i is state-owned or privately owned is not random, but depends itself on many factors, which potentially cause selection bias. Therefore, we do not estimate Equation 2 directly but model the selection into state ownership with a probit model according to Semykina and Wooldridge (2010):

$$P(s_{it} = 1 | \mathbf{z}_i) = \Phi(\mathbf{z}_{it}\boldsymbol{\delta}_{t2} + c_{i2}) = \Phi(\mathbf{z}_{it}\boldsymbol{\delta}_{t2} + \bar{\mathbf{z}}_i\boldsymbol{\xi}_{t2}). \quad (3)$$

The index 2 denotes that an element belongs to our selection equation (3). The $1 \times L$ ($L > K$) vector of instruments $\mathbf{z}_{it}$ controls for unobserved heterogeneity with a Mundlak (1978) time constant fixed effect $c_{i2} = \bar{\mathbf{z}}_i\boldsymbol{\xi}_{t2} + a_{i2}$ with $\bar{\mathbf{z}}_i = T^{-1} \sum_{t=1}^T \mathbf{z}_{it}$ and $E(a_{i2} | \mathbf{z}_i) = 0$. The vector $\mathbf{z}_{it}$ contains all the exogenous elements of $\mathbf{x}_{it}$ and needs at

least one additional regressor that affects selection. After estimating equation (3) for each year separately, we use the resulting propensities to compute the inverse Mills ratios $\hat{\lambda}_{it}^{SOE=1} = \frac{\phi(\cdot)}{\Phi(\cdot)}$ and $\hat{\lambda}_{it}^{SOE=0} = \frac{\phi(\cdot)}{1-\Phi(\cdot)}$, where $\phi(\cdot)$ represents the standard normal density and $\Phi(\cdot)$ the cumulative standard normal distribution.

We then model the unobserved heterogeneity from equation (2) analogously to the selection equation as $c_{i1} = \bar{\mathbf{z}}_i \boldsymbol{\eta} + a_{i1}$, where $\bar{\mathbf{z}}_i = T^{-1} \sum_{t=1}^T \mathbf{z}_{it}$ and we assume $E(a_{i1} | \mathbf{z}_{i1}) = 0$. Inclusion of the respective inverse Mills ratio to control for endogenous selection leads to our outcome equation:

$$AVIN_{it}^R = \mathbf{x}_{it} \boldsymbol{\beta}^R + \bar{\mathbf{z}}_i \boldsymbol{\eta} + \gamma \hat{\lambda}_{it}^R + \gamma^t \hat{\lambda}_{it}^R \times \psi_t + \psi_t + e_{it1}, \quad t = 1 \dots T, \quad (4)$$

where R indicates the respective terms for either the SOE or the private regime. The interaction term $\hat{\lambda}_{it}^R \times \psi_t$ controls for time variation in unobserved effects and ψ_t is a set of time dummies. The inclusion of the inverse Mills ratio $\hat{\lambda}_{it}^R$ as an additional regressor is standard in the empirical corporate finance literature (Li and Prabhala, 2007). It allows to control for omitted variables such as unobserved private information on the management level or implicit state warranties. The fact that we allow the impact of the selection terms to differ across time (by inclusion of $\gamma^t \hat{\lambda}_{it}^R \times \psi_t$) enables us to control for time-dependent unobservable variables related to state ownership.

We estimate equation (4) by pooled 2SLS and use $\mathbf{x}_{it} \equiv \mathbf{z}_{it1} \subset \mathbf{z}_{it}$, $\bar{\mathbf{z}}_i$ and $\hat{\lambda}_{it}^R$ as instruments. The vector $\mathbf{z}_{it1}$ is a subset of $\mathbf{z}_{it}$ because it excludes the selection-specific instruments used in the probit equation (3). In the main model, we treat all elements of $\mathbf{x}_{it}$ as exogenous, which is why $\mathbf{z}_{it1}$ and $\mathbf{x}_{it}$ contain the same elements. In Section 5.1.1, we report results taking into account potentially endogenous elements of $\mathbf{x}_{it}$, which means that $\mathbf{x}_{it} \neq \mathbf{z}_{it1}$.

Equation (4) is estimated twice, once for SOEs and once for private firms and include the respective selection adjustment terms. After obtaining estimation results, we apply the parametric error correction procedure suggested in Semykina and Wooldridge

(2010). For a detailed description of this procedure, we refer to their study.

In the selection equation (3) we employ a similar set of control variables as Borisova et al. (2012) and Beuselinck et al. (2017), of which Table 2 contains descriptive statistics (along with descriptive statistics for variables and instruments used to estimate the outcome equation (4)).⁹

Table 2: Descriptive statistics

Table 2 presents summary statistics of the dependent variable $AVIN_{it}$, the profitability indicator $OROA_{it}$ and the control variables used in the selection and outcome equations; Based on 101,221 observations.

Variable	Mean	Std.Dev.	Min	Max
$AVIN_{it}$	0.05	0.04	0.00	0.25
$OROA_{it}$	0.04	0.09	-0.54	0.41
LEV_{it}	0.28	0.21	0.00	0.99
$TANG_{it}$	0.31	0.28	0.00	1.00
$\log(SALES)_{it}$	9.42	1.67	1.10	17.93
$\Delta\log(FA)_{it}$	0.00	0.31	-1.69	2.47
$\Delta\log(SALES)_{it}$	-0.00	0.26	-1.74	1.98
$CREDITM_{kt}$	160.53	42.91	37.51	248.94
$GDPG_{kt}$	0.00	0.02	-0.08	0.11
TAX_{kt}	0.30	0.05	0.15	0.39
$INFL_{kt}$	0.01	0.01	-0.01	0.06
$STANG_{st}$	0.28	0.15	0.03	0.77
$LAEF_{it}$	23.12	16.54	0.00	99.71
$GDPPC_{kt}$	36398.86	5010.41	17354.78	45296.46
$SLEV_{st}$	0.18	0.06	0.03	0.60

Specifically, we include all variables in the probit estimate which we initially treat as exogenous in our outcome equation (4). On the firm level, this is the case for our profitability indicator $OROA_{it}$, a firm's asset tangibility $TANG_{it}$, firm size $\log(SALES)_{it}$ and leverage LEV_{it} .¹⁰ On the country level we include a country's credit market size $CREDITM_{kt}$, GDP growth rate $GDPG_{kt}$, the statutory tax rate TAX_{kt} and inflation $INFL_{kt}$. In addition to the exogenous variables from the outcome equation, we include on the firm level an investment proxy $\Delta\log(FA)_{it}$ and a sales growth proxy $\Delta\log(SALES)_{it}$, as well as GDP per capita $GDPPC_{kt}$ on the country level.

The estimation procedure requires us to include at least one additional time-varying instrument that affects selection into state ownership but not the outcome variable

⁹The estimation procedure impedes the use of time constant variables such as a country's legal origin. Appendix Table A.8 presents correlations.

¹⁰We report results for potentially endogenous firm-level variables in Section 5.1.1.

$AVIN_{it}$. We use two instruments: First, in the spirit of Laeven and Levine (2009), we use sectoral asset tangibility $STANG_{st}$. It fulfills the economic criteria for good selection instruments because a higher share of fixed assets is typical for network industries, where SOE are particularly common. It is unlikely to have a causal impact on individual firms' financing cost, given that we control for individual asset tangibility $TANG_{st}$. When using sectoral instruments by Lin et al. (2011) and Lin et al. (2013) reversed causality seems of little concern due to the huge sample size and the requirement that each sector mean derives from at least two companies.¹¹ The correlation between the individual and the sectoral tangibility variables from Appendix Table A.8 is 0.59, which suggests multicollinearity is not a strong concern. The second instrument is the labor efficiency indicator $LAEF_{it}$, which we define as a firm's labor costs divided by its operating revenue. The economic reasoning behind the performance ratio $LAEF_{it}$ as an instrument is previous empirical findings, which relate state ownership to less productive workers (Dewenter and Malatesta, 2001). It is also reasonable to assume that it does not directly affect the dependent variable $AVIN_{it}$. The correlation from Appendix Table A.8 is -0.01 and supports this argument.

In a second step, we estimate our outcome equation (4) using the exogenous regressors from above, the respective inverse Mills ratios (including the time interactions), as well as time dummies. Thus, our model contains commonly used firm and country-level control variables in bond price regressions.¹² Semykina and Wooldridge (2010) propose to begin with a fixed effects two-stage least squares (FE-2SLS) and test the signifi-

¹¹Only 1 percent of firms are based in sectors with less than 400 firm-years because we calculate sectoral instruments with a much larger sample, i.e., using observations with missing values in other control variables.

¹²Similar firm and country controls are suggested by Fama and French (1993), Borisova et al. (2015), and Goss and Roberts (2011). A disadvantage of our data is that we are not able to control for a set of firm and debt-contract specific factors because we do not observe this data. On the firm-level, this is primarily the case for the market-to-book ratio, which we do not observe for our non-traded firms. We believe debt-contract related factors are less of a concern in our case because we are primarily interested in the impact of firm-level determinants on the average cost of debt, i.e., across all debt contracts of a firm. Since our firms are predominantly medium-sized, we argue that conventional debt contracts should be roughly similar within firms.

cance of the selection terms $\hat{\lambda}_{it}^R$ and $\hat{\lambda}_{it}^R \times \psi_t$ using a Hausmann test. In the absence of selection, FE-2SLS is preferable to the Semykina and Wooldridge (2010) correction procedure, which leads to a larger root mean square errors. However, we can reject the null hypothesis of no selection by a wide margin for both ownership types ($p < .001$ for both tests).

3 Results

Our empirical analysis has the primary goals to check if capital costs of SOEs are lower than those of private firms and to test Hypotheses 1, 2, and 3. We start with two-sided t-tests to see if the descriptive $AVIN_{it}$ difference between SOEs and private firms is meaningful. Then, we analyze the impact of firm risk, which we proxy with the operating return on assets $OROA_{it}$, on a firm's average interest rate $AVIN_{it}$. If implicit state guarantees are imperfect and the primary driver of lower borrowing costs, we should see a significant impact of $OROA_{it}$ on $AVIN_{it}$ for both ownership types, albeit with a smaller magnitude for SOEs. If the risk proxy $OROA_{it}$ does not affect the borrowing costs of SOEs at all, this is indirect evidence of other factors driving borrowing costs, such as political considerations or social lending.

Table 3: Statistical tests

Table 3 presents tests for differences in means of the dependent variable $AVIN_{it}$ by year; Based on 101,221 observations; *** Significant at 0.1 percent level; ** Significant at 1 percent level; * Significant at 5 percent level.

Year	Mean $SOE_i = 1$	Mean $SOE_i = 0$	Difference	t-statistic
2007 – 2015	0.0436	0.0546	-0.0110***	-22.70
2007	0.0417	0.0661	-0.0244***	-6.84
2008	0.0471	0.0712	-0.0241***	-13.43
2009	0.0429	0.0579	-0.0151***	-10.13
2010	0.0428	0.0501	-0.0073***	-5.59
2011	0.0446	0.0543	-0.0097***	-8.05
2012	0.0456	0.0551	-0.0095***	-7.74
2013	0.0432	0.0526	-0.0093***	-7.22
2014	0.0419	0.0510	-0.0091***	-6.74
2015	0.0411	0.0464	-0.0053***	-3.45

Table 3 contains yearly t-tests for differences in $AVIN_{it}$ -means between our owner-

ship groups ¹³. SOEs pay less for their debt than private firms in all years – the difference is significant at 0.1-percent in each test. The spread is not constant: It ranges from a maximum of almost 2.5 percentage points at the height of the financial crisis to a much lower 0.5 percentage points in 2015. Our results thus strongly support Hypothesis 1. Additionally, we see that SOEs had easier access to debt in times of crisis, a finding that is in line with a study for publicly listed SOEs by Borisova et al. (2015).

Finally, we proceed to estimate equation (4) by pooled 2SLS for the two ownership groups separately. It is important to note that the estimates control for selection into the state or private ownership regime due to the inclusion of the inverse Mills ratios. Additionally, they contain a Mundlak (1978) fixed effect that absorbs unobserved heterogeneity on the firm-level.

Table 4 presents our basic regression results. They are based on $N_A = 6,868$ SOE firm-years and $N_B = 94,353$ private firm-years. Firm risk, proxied with firm performance $OROA_{it}$, is highly significant for private firms (Column B). For private firms, a ceteris paribus increase in firm profitability by one percentage point will decrease the average debt cost by 0.0136 percentage points or 1.36 basis points. This is what we expected: the more profitable a firm is, the lower its funding costs should be because of lower default risk. This result is in line with findings by Goss and Roberts (2011) and Borisova et al. (2015).¹⁴ Importantly, firm risk, proxied with firm performance $OROA_{it}$, does not affect the funding rate of SOEs (Column A) and show an opposite sign than for private firms. This suggests that company-associated risk is not a key explanatory factor for average interest rates of SOEs. The finding is not in line with assuming implicit and imperfect state guarantees (Hypothesis 2). Instead, it supports Hypothesis 3 and indicates additional channels affecting the capital costs of SOEs.

The selection term λ_{it}^{SOE} has a significantly negative sign and confirms that own-

¹³Slight deviations in the statistics compared to Figure 1 are due to missing values after data cleaning.

¹⁴Both studies confirm a negative impact of firm profitability on the cost of debt. Magnitudes, however, differ because of alternative definitions of the dependent variable.

Table 4: Basic result

The table presents switching regressions based on $N_A = 6,868$ and $N_B = 94,353$ observations, respectively; A firm has non-missing values in at least 5 consecutive years from 2007 to 2015; The dependent variable is $AVIN_{it}$; Estimates take into account endogenous selection into state ownership. Selection is instrumented with sectoral asset tangibility $STANG_{st}$ and the employee efficiency measure $LAEF_{it}$; *** Significant at 0.1 percent level; ** Significant at 1 percent level; * Significant at 5 percent level.

	A: SOE <i>Coeff.</i> (<i>s.e.</i>)	B: Private <i>Coeff.</i> (<i>s.e.</i>)
$OROA_{it}$	0.0170 (0.0157)	-0.0136*** (0.0023)
LEV_{it}	-0.1024*** (0.0080)	-0.1303*** (0.0020)
$TANG_{it}$	0.0215*** (0.0065)	0.0166*** (0.0022)
$\log(SALES)_{it}$	0.0011 (0.0021)	0.0005 (0.0006)
$CREDITM_{kt}$	0.0001 (0.0000)	0.0000 (0.0000)
$GDPG_{kt}$	0.0124 (0.0335)	0.0346** (0.0122)
TAX_{kt}	0.0632* (0.0307)	-0.0471*** (0.0098)
$INFL_{it}$	-0.0557 (0.0640)	-0.0527 (0.0285)
λ_{it}^{SOE}	-0.0123* (0.0060)	
λ_{it}^{PRI}		-0.0003 (0.0014)
Fixed Effects	Yes	Yes
Time Dummies	Yes	Yes

ership is not random. The effects of other control variables have reasonable interpretations: LEV_{it} negatively affects $AVIN_{it}$ of both SOEs and private firms. This may seem surprising at first because the higher the debt level, the higher the risk of default. Though, it is important to remember that we look at a firms' average interest rate for all long and short-term debt obligations. Firms which can issue much debt are likely to be more creditworthy overall and should have a lower marginal cost for the initial unit of debt. Besides, they may benefit from a flatter interest rate curve. This could lead to lower average interest rates for higher levered firms. $TANG_{it}$ positively affects average interest rates, probably because firms with more fixed assets can afford to take

on more expensive debt.

These results are robust as examined in several sensitivity analyses focusing on endogeneity, the definition of the dependent variable, and implicit guarantees during macroeconomic distress (see Section 5.1 in the Appendix). We also report tests relating to the model and data set up, such as varying exclusion criteria regarding the preferential treatment of SOEs, changes in panel balance as well as an alternative risk proxy. Additionally, we conduct but do not report the following tests: First, a different firm size proxy $\log(\text{total assets})$; second, inclusion of a debt maturity proxy; third, variations in the selection instruments;¹⁵ and forth, variations in the dependent variable interval.¹⁶ Results for all specifications are available upon request.

4 Conclusion

We reported analyses of firm-level data showing that the more profitable a private firm, the less it paid for its debt. The reason behind this result is that profitability functions as a proxy for a firm’s default risk. This relation did not hold, however, for SOEs. Their overall cost of debt was lower compared to private firms, even though they performed worse. Further, the capital costs of SOEs did not depend on their profitability.

The most common explanation for lower financing costs is implicit state guarantees to bondholders. However, the implicit state guarantees will not reduce the default risk of an SOE to zero in the EU, due to political efforts to equate financing conditions between private firms and SOEs. Therefore, our finding that profitability is not related to capital costs for SOEs might require an additional explanation. Although officially prohibited, SOEs could profit from political lending or lenders could take other goals

¹⁵We use a set of different employee efficiency measures as well as the country-level variable *public sector quota of GDP* instead of sectoral asset tangibility $STANG_{st}$.

¹⁶Our main result allows a maximum $AVIN_{it}$ of 25 percent a year and a time average of 15 percent. We alternatively use 15 percent as a yearly maximum for $AVIN_{it}$ as well as ten and five percent as cut-offs for the time average per firm.

besides individual profit maximization into account, for example, when SOEs are perceived to have positive externalities for the community.

Overall our results showed that state-ownership affects capital costs in the EU. Thus, even so proclaimed as a political goal, financing conditions are not equal among private firms and SOEs. Instead of additional regulations, future research could examine in more detail perceived differences of private firms and SOEs from the perspective of individual and institutional lenders or investors in the EU.

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5 Appendix

5.1 Firm-level sensitivity analysis

This Section contains our main firm-level sensitivity analysis. In addition to the items below, we confirm the differential impact of firm profitability $OROA_{it}$ on average interest $AVIN_{it}$ for the following model variations: First, a different firm size proxy $\log(\text{total assets})$; Second, inclusion of a debt maturity proxy; Third, variations in the selection instruments;¹⁷ and forth, variations in the dependent variable interval.¹⁸ Results for all specifications are available upon request.

5.1.1 Instrumental variables

In this section, we address potential reverse causality concerns from our baseline result of the firm-level control variables, and in particular, financial leverage LEV_{it} . Financial leverage should affect our dependent variable $AVIN_{it}$ because the relative share of debt financing should affect the average interest rate a firm pays. However, LEV_{it} could also be affected by $AVIN_{it}$ in the sense that companies only use as much debt as they can afford at their specific average interest rate.

To disentangle these effects, we make use of the specific methodological approach of the Semykina and Wooldridge (2010) framework, which allows us to re-estimate our basic model and instrument the firm-level variables LEV_{it} , $TANG_{it}$, and $\log(SALES)_{it}$ using all exogenous information and the instruments sectoral leverage $SLEV_{st}$, as well as the time lags $TANG_{i,t-1}$, and $\log(SALES)_{i,t-1}$. By using lagged variables as *instruments* and not as *proxy variables*, we avoid a widespread misconception in empirical social sciences that lagged explanatory variables avoid simultaneity bias (Reed, 2015).

¹⁷We use a set of different employee efficiency measures as well as the country-level variable *public sector quota of GDP* instead of sectoral asset tangibility $STANG_{st}$.

¹⁸Our main result allows a maximum $AVIN_{it}$ of 25 percent a year and a time average of 15 percent. We alternatively use 15 percent as a yearly maximum for $AVIN_{it}$ as well as ten and five percent as cut-offs for the time average per firm.

We use sectoral leverage $SLEV_{st}$ as an instrument instead of lagged leverage because endogeneity concerns are strongest for this variable. Sectoral leverage is an important determinant of a firm’s capital structure (Frank and Goyal, 2009). Given the fact that 99 percent of sectoral averages draw on more than 400 firm-years, $SLEV_{st}$ should not be a significant determinant of individual average interest rates. We test the validity of these instruments using the Kleibergen-Paap rk LM statistic for under-identification, the Stock-Yogo test for weak instruments, and the Hansen J-statistic for over-identification. All these tests suggest the proposed specification is suitable. Table A.1 presents the results.

Compared to the estimates from Table 4, the coefficients of $OROA_{it}$ are stronger in magnitude. For SOEs, the model predicts a positive relation, which is not statistically significant (Column A). For private firms, the model suggests that an increase in profitability of 1 percentage point will decrease the dependent variable by 0.0266 percentage points or 2.66 basis points (Column B). The selection term λ_{it}^{SOE} still has a negative sign but fails to meet conventional significance thresholds. The coefficient of instrumented LEV_{it} retains its sign in both columns but is significant only in Column B. The other significant control variables from Table 4, $TANG_{it}$, $GDPG_{kt}$, and TAX_{kt} , retain their signs but are not significant in the SOE regression (Column A). In contrast, magnitudes are stronger in the model for private companies (Column B). We conclude from this robustness check that potential reverse causality of firm variables and in particular financial leverage does not fundamentally alter our results from above.

5.1.2 Net income profitability

Throughout this study, we have used a firm’s operating profit to calculate the profitability proxy $OROA_{it}$. Even though we believe this is the most appropriate measure because we need not worry about reverse causality, it is not the most commonly used indicator in practitioners’ work. Banks, when deciding on credit contracts, evaluate firms

Table A.1: Endogenous firm-level controls

The table presents switching regressions based on $N_A = 6,747$ and $N_B = 91,451$ observations, respectively; A firm has non-missing values in at least 5 consecutive years from 2007 to 2015; Dependent variable is $AVIN_{it}$; Estimates take into account endogenous selection into state ownership and endogenous firm-level variables LEV_{it} , $TANG_{it}$, and $\log(SALES)_{it}$; Selection is instrumented with sectoral asset tangibility $STANG_{st}$ and the employee efficiency measure $LAEF_{it}$; Firm-level controls are instrumented with sectoral leverage $SLEV_{st}$, $TANG_{it-1}$, and $\log(SALES)_{i,t-1}$; *** Significant at the 0.1 percent level; ** Significant at the 1 percent level; * Significant at the 5 percent level.

	A: SOE <i>Coeff.</i> (<i>s.e.</i>)	B: Private <i>Coeff.</i> (<i>s.e.</i>)
$OROA_{it}$	0.0374 (0.0247)	-0.0266** (0.0098)
LEV_{it}	-0.0347 (0.0704)	-0.1870*** (0.0385)
$TANG_{it}$	0.0234 (0.0149)	0.0482*** (0.0099)
$\log(SALES)_{it}$	0.0015 (0.0031)	0.0010 (0.0011)
$CREDITM_{kt}$	0.0001 (0.0001)	0.0000 (0.0000)
$GDPG_{kt}$	0.0330 (0.0351)	0.0356* (0.0148)
TAX_{kt}	0.0552 (0.0320)	-0.0447*** (0.0133)
$INFL_{it}$	-0.0853 (0.0760)	-0.0065 (0.0373)
λ_{it}^{SOE}	-0.0096 (0.0073)	
λ_{it}^{PRI}		0.0005 (0.0021)
Fixed Effects	Yes	Yes
Time Dummies	Yes	Yes

using widely reported financial indicators. Thus, the reverse causality of post-financial performance profitability measures may be lower than one might expect. Hence, we re-estimate our baseline model using ROA_{it} as a profitability proxy, which we define as net income divided by total assets. Table A.2 presents the results.

Compared to the baseline result from Table 4, the coefficient of ROA_{it} for SOEs has a negative sign but remains statistically insignificant (Column A). The magnitude of the effect for private firms has increased to -0.0357, suggesting a decrease in the average interest rate of 3.57 basis points for a profitability increase of one percentage

Table A.2: Net income return on assets

The table presents switching regressions based on $N_A = 6,749$ and $N_B = 92,057$ observations, respectively; The profitability measure ROA_{it} is a firm's net income divided by total assets; A firm has non-missing values in at least 5 consecutive years from 2007 to 2015; Dependent variable is $AVIN_{it}$; Estimates take into account endogenous selection into state ownership; Selection is instrumented with sectoral asset tangibility $STANG_{st}$ and the employee efficiency measure $LAEF_{it}$; *** Significant at the 0.1 percent level; ** Significant at the 1 percent level; * Significant at the 5 percent level.

	A: SOE <i>Coeff.</i> (<i>s.e.</i>)	B: Private <i>Coeff.</i> (<i>s.e.</i>)
ROA_{it}	-0.0146 (0.0158)	-0.0357*** (0.0025)
LEV_{it}	-0.1035*** (0.0082)	-0.1328*** (0.0020)
$TANG_{it}$	0.0194** (0.0066)	0.0137*** (0.0022)
$\log(SALES)_{it}$	0.0014 (0.0021)	0.0013* (0.0006)
$CREDITM_{kt}$	0.0001 (0.0000)	0.0000 (0.0000)
$GDPG_{kt}$	0.0138 (0.0338)	0.0359** (0.0121)
TAX_{kt}	0.0628* (0.0310)	-0.0463*** (0.0094)
$INFL_{it}$	-0.0383 (0.0649)	-0.0439 (0.0284)
λ_{it}^{SOE}	-0.0094 (0.0052)	
λ_{it}^{PRI}		0.0001 (0.0006)
Fixed Effects	Yes	Yes
Time Dummies	Yes	Yes

point (Column B). The effect remains significant at the 0.1-percent level. The selection indicator λ_{it}^{SOE} is weaker in magnitude than in the primary result (-0.0094 compared to -0.0123) and is not statistically significant anymore. Coefficients and significance levels of other controls do not differ much from the benchmark. We conclude from this that our result is robust to a more commonly used but econometrically inferior specification of firm profitability.

5.1.3 Implicit guarantees during sovereign debt crises

We now address the question whether implicit state guarantees alone offer a sufficient explanation for lower SOE funding rates. In empirical terms, this question has already been answered in the sense that political considerations have been found to affect debt allocations and costs (Sapienza, 2004; Dinc, 2005) significantly. Hence, the purpose of this robustness check is not to refute established results on implicit guarantees but to reconsider their predictions in the light of our data. Many studies have argued that state ownership shields companies from adverse effects during financial crises such as debt constraints and reductions in firm value (Borisova and Megginson, 2011; Borisova et al., 2015; Beuselinck et al., 2017). Similarly, Faccio et al. (2006) find that politically connected firms are more likely to be bailed out. What these studies have in common is that they implicitly assume solvency of the respective government because they focus on data from solvent countries or defaults of individual companies in normal economic times. The exceptional situation of public finances in some eurozone member states during our sample period allows us to analyze the average cost of debt in situations when the governments themselves were cut off from capital markets. A total of eight member states requested financial aid from the EU, namely Cyprus, Greece, Hungary, Ireland, Latvia, Portugal, Romania and Spain.¹⁹ During the programs, all countries were under scrutiny from the European institutions and the International Monetary Fund (IMF). As a consequence, a government's ability to act independently in case of an SOE default were severely constrained. Moreover, program countries usually had to comply with reform and privatization obligations to bring their budget deficits under control. We argue that in such a situation, implicit state warranties should become irrelevant because investors have lost trust in the government's ability to service debt. Figure 2 plots our dependent variable $AVIN_{it}$ for Latvia, Portugal and Spain. If implicit guarantees are the only explanation for cheaper funding rates, we would

¹⁹Unfortunately, from these countries Orbis only contains sufficient company ownership data for Latvia, Portugal, and Spain.

Figure 2: Average interest rates in Program countries

Figure 2 plots the empirical average interest rate $AVIN_{it}$ for Portugal and Spain.

expect the difference between the two groups disappear before the beginning of the respective adjustment programs. Latvia and Portugal requested financial assistance in 2011, whereas Spain only did in 2012. Spain and Portugal experienced significant sovereign downgrades from rating agencies prior and during this period.²⁰ Figure 2 reveals that Spanish and Latvian average interest rates of SOEs remain roughly parallel over the whole period (left and central panel). Importantly, there is no significant change in the years of the economic adjustment program, a time when the European institutions scrutinized the Latvian and Spanish governments, and bail-outs of (non-financial) state firms less likely. In contrast, the Portuguese spread between SOEs and private firms is much lower in 2010-2014 than in previous years. Specifically, the SOE curve approaches the average interest rate of private companies in 2010 and 2011, i.e., immediately prior and at the beginning of the adjustment program. This finding indicates that implicit guarantees have disappeared.²¹

Table A.3 presents t-tests for differences in means for all three countries during their adjustment programs. We use yearly data, so the time interval for both tests exceeds

²⁰The rating agency Standard and Poor's downgraded Portugal from A+ in January 2009 to BB in January 2012 – a downgrade of 2 slots. Spain was downgraded from AA+ in January 2009 to BBB- in October 2012 – also a downgrade of 2 slots.

²¹It should be noted that the Portuguese curve is based on a smaller sample of 199 firm-years compared to 678 for Latvia and 2,516 for Spain. These numbers deviate from the ones reported in Table 1 because they include observations with missing values in other control variables.

Table A.3: Country tests

Table A.3 presents tests for differences in means of the dependent variable $AVIN_{it}$ for Latvia, Portugal and Spain during their respective economic adjustment programs; *** Significant at 0.1 percent level; ** Significant at 1 percent level; * Significant at 5 percent level.

Year	Mean $SOE_i = 0$	Mean $SOE_i = 1$	Difference	t-statistic
Latvia 2011 – 2014	0.0420	0.0587	-0.0167***	-6.01
Portugal 2011 – 2014	0.0499	0.0534	-0.0035	-0.79
Spain 2012 – 2014	0.0407	0.0512	-0.0105***	-6.95

the actual time interval of the adjustment programs, a fact that allows for a time lag of the effect. Irrespective of government solvency, Latvia and Spain exhibit significantly lower average interest rates for SOEs than for private firms during their respective adjustment programs. We take this as evidence, that implicit state guarantees alone are unlikely to explain funding rates of state-owned enterprises in these countries. In Portugal, the difference is not significant during the adjustment program, a fact that instead points to implicit guarantees.

We conclude that preferential allocation of debt offers a complementing explanation for the non-existence of spreads in Latvia and Spain during their adjustment programs: In a period of recession and falling living standards, the perceived positive externality of public ownership may bias fund allocation more strongly than in economically prosperous times. In Portugal, this argument is less convincing, which could point to different institutional environments.

5.1.4 Additional restrictions to ensure commercial activity

A key assumption of our ORBIS data analysis is that sample SOEs operate under the same legal framework than private firms. We already take numerous precautions in our baseline result to ensure this is the case. In this robustness check, we enforce even stricter criteria by dropping a broader selection of industries with potential public service obligations. Besides the already excluded categories “K: Finance and Insurance”, “O: Public Administration and Defence” and railway sectors, we exclude the NACE2 categories “P: Education” and “Q: Human Health and Social Work”. Furthermore, we

only include sectors which contain both ownership groups. Thus, we ensure that all remaining SOEs operate in commercial sectors of the economy and, consequently, face the same regulatory framework as private companies. Table A.4 presents estimation results.

Table A.4: Commercial activity

The table presents switching regressions based on $N_A = 6,115$ and $N_B = 28,037$ observations, respectively; A firm has non-missing values in at least 5 consecutive years from 2007 to 2015; Dependent variable is $AVIN_{it}$; Estimates take into account endogenous selection into state ownership; Selection is instrumented with sectoral asset tangibility $STANG_{st}$ and the employee efficiency measure $LAEF_{it}$; Estimates exclude all sectors with a possible public service obligation and contain only sectors with both ownership types; *** Significant at 0.1 percent level; ** Significant at 1 percent level; * Significant at 5 percent level.

	A: SOE <i>Coeff.</i> (<i>s.e.</i>)	B: Private <i>Coeff.</i> (<i>s.e.</i>)
$OROA_{it}$	0.0120 (0.0164)	-0.0105** (0.0039)
LEV_{it}	-0.1043*** (0.0086)	-0.1136*** (0.0033)
$TANG_{it}$	0.0188** (0.0070)	0.0134*** (0.0032)
$\log(SALES)_{it}$	0.0011 (0.0021)	0.0003 (0.0009)
$CREDITM_{kt}$	0.0001 (0.0000)	0.0000 (0.0000)
$GDPG_{kt}$	-0.0082 (0.0347)	0.0076 (0.0198)
TAX_{kt}	0.0636* (0.0318)	-0.0150 (0.0154)
$INFL_{it}$	-0.0755 (0.0650)	-0.0030 (0.0505)
λ_{it}^{SOE}	-0.0104 (0.0057)	
λ_{it}^{PRI}		0.0004 (0.0031)
Fixed Effects	Yes	Yes
Time Dummies	Yes	Yes

The additional restrictions reduce the sample size significantly, to $N_A = 6,155$ for the SOE model and $N_B = 28,037$ for the private-firm model, respectively. The differential impact of $OROA_{it}$ is unaffected by these additional data restrictions. The coefficient is not significant in the SOE model (Column A) and significant at the 1-

percent level and of similar magnitude than in Table 4 in the private firm model (Column B). The selection term is non-significant. The coefficient of leverage LEV_{it} and $TANG_{it}$ are highly significant and similar in magnitude to the baseline result in both models. We conclude from this robustness check that differences in the legal framework of SOEs due to public service obligations do not cause our results.

5.1.5 Variation in Panel balance

Our baseline result from Table 4 requires that we observe data of each company in at least five consecutive years. This threshold is arbitrary and could influence our results. To exclude this possibility, we re-estimate our outcome equation (4) using two different requirements for inclusion, namely seven and three consecutive years. Table A.5 contains the results for an increase in panel balance.

The increase in panel balance leads to a significant drop in the number of observations: The SOE model (Column A) draws on $N_A = 4,074$ observations. The private firm model (Column B) uses $N_B = 28,376$ observations. The main variable of interest $OROA_{it}$ has a similar pattern than in the baseline model from Table 4. Whereas the risk proxy $OROA_{it}$ does not significantly affect the average interest rate $AVIN_{it}$, the coefficient in Column B is -0.0178, suggesting an $AVIN_{it}$ decrease of 1.78 basis points for a one percentage point increase of $OROA_{it}$. The selection indicator λ_{it}^{SOE} is still negative, but not significant anymore. The pattern of other control variables is mostly similar – except for the TAX_{kt} variable, which is not significant in the private firm model (Column B). We conclude from this robustness check that an increase in panel balance does not significantly alter our results.

Table A.6 presents the results for a decrease in Panel balance. If we include all companies for which we observe data in three consecutive years, the SOE model (Column A) draws on $N_A = 8,785$ observations and the private firm model (Column B) on $N_B = 131,562$ observations. The impact of $OROA_{it}$ remains unchanged to previous results, as does the effect of leverage LEV_{it} and asset tangibility $TANG_{it}$. The selection

Table A.5: Increased Panel balance

The table presents switching regressions based on $N_A = 4,074$ and $N_B = 28,376$ observations, respectively; A firm has non-missing values in at least 7 consecutive years from 2007 to 2015; The dependent variable is $AVIN_{it}$; Estimates take into account endogenous selection into state ownership; Selection is instrumented with sectoral asset tangibility $STANG_{st}$ and the employee efficiency measure $LAEF_{it}$; *** Significant at 0.1 percent level; ** Significant at 1 percent level; * Significant at 5 percent level.

	A: SOE <i>Coeff.</i> (<i>s.e.</i>)	B: Private <i>Coeff.</i> (<i>s.e.</i>)
$OROA_{it}$	0.0234 (0.0218)	-0.0178*** (0.0046)
LEV_{it}	-0.0963*** (0.0099)	-0.1143*** (0.0035)
$TANG_{it}$	0.0248** (0.0078)	0.0102** (0.0035)
$\log(SALES)_{it}$	-0.0003 (0.0027)	0.0004 (0.0011)
$CREDITM_{kt}$	0.0001 (0.0001)	0.0000 (0.0001)
$GDPG_{kt}$	0.0025 (0.0360)	0.0365 (0.0244)
TAX_{kt}	0.0879* (0.0445)	-0.0224 (0.0327)
$INFL_{it}$	-0.0864 (0.0852)	0.0016 (0.0573)
λ_{it}^{SOE}	-0.0100 (0.0059)	
λ_{it}^{PRI}		0.0011 (0.0066)
Fixed Effects	Yes	Yes
Time Dummies	Yes	Yes

term λ_{it}^{SOE} retains its sign but misses significance thresholds. A significant difference between the baseline result from Table A.1 is that inflation $INFL_{it}$ is negatively significant in both models. This surprising result could be explained by the exceptional deflationary environment and monetary policy during our sample period. We conclude from this robustness check that a decrease in panel balance does not change our results significantly.

Table A.6: Decreased Panel balance

The table presents switching regressions based on $N_A = 8,785$ and $N_B = 131,562$ observations, respectively; A firm has non-missing values in at least 3 consecutive years from 2007 to 2015; The dependent variable is $AVIN_{it}$; Estimates take into account endogenous selection into state ownership; Selection is instrumented with sectoral asset tangibility $STANG_{st}$ and the employee efficiency measure $LAEF_{it}$; *** Significant at 0.1 percent level; ** Significant at 1 percent level; * Significant at 5 percent level.

	A: SOE <i>Coeff.</i> (<i>s.e.</i>)	B: Private <i>Coeff.</i> (<i>s.e.</i>)
$OROA_{it}$	0.0211 (0.0131)	-0.0115*** (0.0019)
LEV_{it}	-0.1089*** (0.0074)	-0.1365*** (0.0017)
$TANG_{it}$	0.0194** (0.0062)	0.0189*** (0.0020)
$\log(SALES)_{it}$	0.0014 (0.0019)	0.0003 (0.0005)
$CREDITM_{kt}$	0.0000 (0.0000)	0.0000* (0.0000)
$GDPG_{kt}$	0.0092 (0.0305)	0.0442*** (0.0110)
TAX_{kt}	0.0397 (0.0297)	-0.0443*** (0.0087)
$INFL_{it}$	-0.1211* (0.0590)	-0.0516* (0.0246)
λ_{it}^{SOE}	-0.0069 (0.0052)	
λ_{it}^{PRI}		0.0007 (0.0008)
Fixed Effects	Yes	Yes
Time Dummies	Yes	Yes

5.2 Additional tables

Table A.7: Variable definitions

Firm level	(Source: Orbis)
SOE_i	Binary indicator: 1 indicates state ownership.
$INTE_{it}$	Total interest paid by firm i in year t .
$LTDB_{it}$	Total long-term debt of firm i in year t (maturity > 1 year).
$STDB_{it}$	Total short-term debt of firm i in year t (maturity < 1 year).
$AVIN_{it}$	Total interest / total debt of firm i in year t .
$OROA_{it}$	Operating profit / total assets of firm i in year t .
ROA_{it}	Net income / total assets of firm i in year t .
LEV_{it}	Total debt / total assets of firm i in year t .
$TANG_{it}$	Asset tangibility: fixed assets / total assets of firm i in year t .
$\log(SALES)_{it}$	$\log(\text{Sales})$ of firm i in year t .
$LAEF_{it}$	Costs of employees / Operating revenue of firm i in year t .
$\Delta \log(FA)_{it}$	Investment proxy: $\log(\text{fixed assets}_{it}) - \log(\text{fixed assets})_{i,t-1}$.
$\Delta \log(SALES)_{it}$	Sales growth: $\log(\text{turnover}_{it}) - \log(\text{turnover})_{i,t-1}$.
Country level	
TAX_{kt}	Statutory tax rate of country k in year t .
$CREDITM_{kt}$	Domestic credit provided by banking sector in country k and year t as percentage of GDP (Source: Worldbank).
$GDPG_{kt}$	Annual GDP growth in percent in country k and year t (Source: Worldbank).
$GDPPC_{kt}$	GDP per capita in country k and year t , PPP at constant 2011 international USD (Source: Worldbank).
$INFL_{kt}$	Consumer price inflation of country k in year t (Source: Worldbank).
Sector level (4-digit NACE2 code)	
$SLEV_{st}$	Average Total debt / total assets of sector s in year t .
$STANG_{st}$	Average Asset tangibility: fixed assets / total assets of sector s in year t .

Table A.8: Correlation Matrix

Table A.8 presents correlations of the dependent variable LEV_{it} , state ownership SOE_i and the control variables used in the regression models. 101,221 observations.

	SOE_i	$AVIN_{it}$	$OROA_{it}$	LEV_{it}	$TANG_{it}$	$\log(TA)_{it}$	$CREDITM_{kt}$	$GDPG_{kt}$	TAX_{kt}	$INFL_{it}$	$STANG_{st}$	$LAEF_{it}$	$\Delta\log(FA)_{it}$	$\Delta\log(SALES)_{it}$	$GDPG_{kt}$	$SLEV_{st}$
SOE_i	1.00															
$AVIN_{it}$	0.07	1.00														
$OROA_{it}$	0.06	0.04	1.00													
LEV_{it}	-0.07	-0.26	-0.18	1.00												
$TANG_{it}$	-0.33	-0.10	-0.06	0.30	1.00											
$\log(SALES)_{it}$	0.03	0.04	0.06	-0.10	-0.14	1.00										
$CREDITM_{kt}$	0.11	-0.01	-0.08	0.12	-0.09	-0.07	1.00									
$GDPG_{kt}$	-0.06	-0.01	0.08	-0.02	0.07	-0.02	-0.27	1.00								
TAX_{kt}	0.17	0.03	0.01	-0.11	-0.28	0.07	0.36	-0.11	1.00							
$INFL_{it}$	-0.03	0.08	0.01	0.02	0.02	0.06	0.03	0.11	0.03	1.00						
$STANG_{st}$	-0.31	-0.09	-0.04	0.23	0.59	-0.17	0.00	0.04	-0.14	0.00	1.00					
$LAEF_{it}$	-0.05	-0.01	-0.14	-0.08	0.07	-0.24	0.04	-0.01	0.06	-0.03	0.02	1.00				
$\Delta\log(FA)_{it}$	0.00	-0.07	0.05	0.02	0.03	0.02	-0.02	-0.03	0.04	0.12	-0.00	-0.00	1.00			
$\Delta\log(SALES)_{it}$	0.01	0.01	0.18	-0.00	0.02	0.07	-0.04	0.09	0.02	0.16	0.01	-0.06	0.18	1.00		
$GDPG_{kt}$	0.04	0.04	0.07	0.08	0.02	0.04	-0.08	0.17	0.19	-0.09	0.03	0.09	0.01	0.03	1.00	
$SLEV_{st}$	-0.20	-0.07	-0.05	0.30	0.42	-0.16	0.08	-0.01	-0.05	0.07	0.73	-0.10	0.02	0.01	0.05	1.00

5.3 Data assumptions

- State ownership:
 - Stand-alone firms and wholly owned subsidiaries that carry the Orbis ultimate ownership label "Public authority, state, government" in year t .
- Private ownership:
 - Stand-alone firms and wholly owned subsidiaries that carry the Orbis ultimate ownership label "Industrial company" in year t .
- We impute up to two years of missing ownership data if the owning entity and the owning share remained unchanged over this period.
- We only use unconsolidated financial data (BvD conscode "U1" and "U2").
- We drop duplicates in terms of id and year.
- We use only data from EU countries. Thus, we ensure a similar regulatory environment is present for all firms.
- Only observations with at least 5 consecutive firm-years in LEV_{it} from 2006-2015 are considered. The result does not depend on this restriction.
- $AVIN_{it} \in [0; 0.25]$. We drop observations with a larger time mean of 0.15. The results do not depend on this assumption.
- $LEV_{it} \in [0; 1[$. We presume that a fully leveraged firm should be a reporting error since every incorporation form we know requires some equity.
- $TANG_{it} \in [0; 1]$.
- The firm-level variables $OROA_{it}$, ROA_{it} , $\Delta \log(SALES)_{it}$ and $\Delta \log(FA)_{it}$ are winsorized at the top and bottom one percent to make our results less dependent on outliers.