State-Owned Enterprises across Europe

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Abstract

Relying on an extensive and elaborate firm-level database (AMADEUS), this paper givers an overview of State-Owned Enterprises active in 27 European countries over a fifteen-year period (2002-2015). After running trough our data-gathering procedure, this paper presents evidence that government presence within firms operating in the business economy is not only a Transition Economy phenomena. State ownership is widespread among the European continent and has increased for some countries. This type of ownership is to a large extent concentrated in mining, energy, transport, the postal and telecommunications sector. Albeit a fair amount of heterogeneity exists among the variety of legal origins we have in our data. Showing a great extent of concentration for the English legal origin and a presence in virtually every sector for socialist legal origin countries. Looking at country characteristics and government presence in firms in our data, we find that state presence is higher for countries characterised by a higher level of corruption and less civil liberties. Also less developed countries tend to have a higher state presence at the country-level. Taking the analysis to the firm-level, we find that firms with a larger state shareholding are less productive, less profitable and have a higher employment to sales and a higher wage cost to employee level. Also here we find evidence of heterogeneity across legal origins. We find that state firms become more efficient, employ less workers and are more profitable in countries with less corruption and a higher level of development. Also the ratio investment to assets, long-term debt to assets and assets per employee increases with the amount of government shareholding in a firm. Whereas the ratio cash-flow to assets declines. Findings which are consistent with several theories on State Capitalism.

Keywords: Europe, State Ownership, Firm Heterogeneity, Firm-level data

JEL-Classification: H11 L32 O52

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1 Introduction

In 2012, the weekly magazine The Economist devoted a series of articles on the increasing interference of governments into the private sector (The Economist (2012a); The Economist (2012b)). Both these articles appeared in the magazine in a very short time frame. The former is an extensive report on state capitalism in emerging countries. Here The Economist asks herself whether, given the crisis of free market capitalism, this form of capitalism can pose a viable alternative to the Western variety. In the latter article the magazine discusses the increase of state interference in Western countries, by discussing shareholdings and active participation by the French and German government in business. Conclusion: Big Brother is back, not only in emerging economies, but also in the West.

For this paper, the goal is to examine participation by "Big Brother" within firms. Our goal here is to investigate the extent to which state entities are involved in European firms. To what extent do states act as a shareholder in the economy? In which countries and industries are we most likely to find this type of shareholder in firms across the European continent? Does this shareholding of governments have any effect on firms? Looking at existing academic literature, a couple of articles investigate the ownership composition of firms but in a general manner, examples on this are Faccio and Lang (2002) and La Porta et al. (1999). Other articles on the contrary concentrate on specific forms of ownership. In Dahlquist and Robertsson (2001) the focus is on foreign investors and the type of firms targeted in Sweden. Lastly, the article by La Porta et al. (2002) is the most similar in spirit as the exercise we present in this article. Here the authors assess for 92 countries the extent to which the largest banks are owned by states, the institutional characteristics of countries with a large ownership interest and the correlation between this ownership and growth trajectories Relying on a comprehensive an firm-level dataset AMADEUS, we will extent the article by La Porta et al. (2002) and examine government ownership across firms operating in the business economy. In a sense our article thus acts as a complement to the latter contribution.[1] Up to this day there has been some work undertaken by various institutions to investigate the extent to which firms are owned by states: see Armoldus et al. (2016), Kowalski et al. (2013), OECD (2010) and very recently OECD (2017). The article by Kowalski et al. (2013) uses Forbes500/2000 data and examines the extent to which state-owned enterprises participate in trade and FDI. In addition this study examines the importance of these state firms in the economy worldwide. In OECD (2010) and OECD (2017) the authors rely on surveys oriented towards national statistical agencies over a broad set of countries. The most extensive study is a report conducted for the European Commission. In Armoldus et al. (2016) a database similar to our has been established, but for eight Eastern European countries and a smaller amount of sectors. The latter article is more micro-oriented in nature, as it relies to a great extent on firm-level analyses comparing state firms and private firms over a variety of indicators. The study we present combines aggregate country-level elements with firm-level analyses for a large European panel of firms over more than twenty countries in a time frame of fifteen years.

[1] We define the business economy as that part of the economy comprising firms active in sectors with codes 10-74 of the NACE revision 1.1 classification, but ignoring financial and insurance type of firms active in sectors 65-67.

Regarding the manner of state intervention in the economy one can distinguish four different theories, four rationales for states to get involved more directly by means of setting up (or buying shares into) companies. In Musacchio and Lazzarini (2014) the authors elaborate on these four views on state interventionism or *state capitalism*. The first view, the *industrial policy view* sees state interventionism as a necessity to correct market failures. In this sense governments can alleviate capital constraints for firms by establishing state-owned financial institutions.[2] Also state investors can orient investments towards activities yielding the highest benefits to the economy, or the state can give birth to novel industries, and contribute hereby to the development of (new) industrial activities and the country as a whole Robinett (2006). The *social view* is the second broad reason on why states intervene directly in the economy. Here a state can invest in firms in order to change the focus towards other objectives than solely the objective of maximising profit or shareholder value. The *political view* makes up the third view. This view is more negative in the sense that it stresses the fact of government failure. In this view politicians aim at maximising self-interest. In Schleifer and Vishny (1994) a bargaining model is introduced between politicians and state firms' managers. Here a politician's utility is a function of social welfare and bribes. Recently some empirical evidence on this view has emerged. A couple of articles concentrate on government's control of the banking sector in developing countries, Brazil Carvalho (2014) and India **?**. While the latter provides evidence on increases in agricultural lending in an election year, the former finds that firms receiving loans from government controlled banks, expand employment far more in politically close-combat regions during election years. Moreover it appears that these effects persists over time within this region, negatively affecting other regions' economic development. For France Bertrand et al. (2007) find that CEOs of listed firms with connections with French politicians, alter employment decisions of their firms, in order to support the re-election of connections. With effects being larger for close-combat regions. Finally, the last view on this matter, is the *path-dependence view*. This view takes a more aggregate stance than the previous ones. This due to the fact that it explains the extent of state interventionism by means of a country's institutional and historical process (Musacchio and Lazzarini (2014)). The fact, for instance, that despite several rounds of privatisation, see Megginson and Netter (2001), there still is a fair amount of state shareholdings in firms (or state firms), can be explained by this view. This is to say that the establishment of state shareholdings as well as the efforts to reduce these, all have to take into account the existing interests of various actors, some powerful actors might oppose privatisation for instance, Durant and Legge Jr (2002) for a case in France and (North, 1993, p7).[3]

In this paper we construct a database on state firms across Europe. The constructed database relies on firm-level data stemming from ownership files pro-

[2] In the cited article above by La Porta et al. (2002) the authors do find a significant correlation between the level of financial development of a country and the presence of governments in top banks within their sample of countries.

[3] In Megginson (2005) the author elaborates on five reasons for government intervention, which broadly fall into the categories outlined above: the protection of technology, the preservation of employment, ideological reasons, rationales related to feudal societies and political factionalism, i.e. the desire to preserve the interests of the own group.

vided by Bureau Van Dijk's (BvDEP) AMADEUS database. Relying on a word searching procedure outlined below we are able to derive state-ownership at the firm-level for a twenty-seven European country panel over a fifteen-year period.[4] In defining state involvement, by means of shareholdings within firms, we follow Jaslowitzre et al. (2016) and construct our procedure in this way as to take into account all levels of government and nationalities of these state investors. Moreover in following this procedure we keep in mind that government-owned investment vehicles might act as an investor. In addition we keep our procedure flexible enough to be able to track the level, be it federal or regional or local, of state investors as well as their nationality and their type, be it Sovereign Wealth fund or general state investors. By following this procedure, we thus allow for a great amount of heterogeneity in state ownership for our database. In addition thanks to previous work undertaken on the database we have at our disposal, see Merlevede et al. (2015), we can match our observed government ownership within a specific firm with appropriate balance-sheet data. The next section gives an overview of this database/dataset and our procedure to identify state shareholders amongst firms. Before doing all this, first we will introduce the AMADEUS database. We elaborate on its capabilities and the information the database has. An indication on the representativeness is also part of this section. Secondly in that section we discuss the procedure on how we were able to identify state-ownership and what we consider to be a state-owned enterprise (SOE). We conclude the second section by giving some examples on state firms and use these to illustrate our procedure below. In the third part of this paper we present descriptive evidence on European state firms. We give an overview of some listed firms with state investors in Europe. Next we present statistics documenting the importance of state firms across our 27 countries and amongst the various industries we have in our dataset. We redo the latter exercise and examine the importance of state firms across the different Legal Origins in our dataset. In the fourth section we try to link various country variables to several measures of government interference in the economy by means of state firms. In a similar spirit as La Porta et al. (2002) we examine correlations between various institutional factors and government interference in the business economy. Section five digs into firm-level analysis. In this section we examine whether state firms differ with regard to others, regarding various characteristics: employment, wages, several financials. We pay close attention to efficiency differences between state firms and private firms. We measure this efficiency of firms by relying on a semi-parametric model as in Levinsohn and Petrin (2003a) and Wooldridge (2009). Section six concludes this paper.

[4]These countries are: Austria (AT), Belgium (BE), Bulgaria (BG), Croatia (HR), the Czech Republic (CZ), Denmark (DK), Estonia (EE), Finland (FI), France (FR), Germany (DE), Great-Britain (GB), Hungary (HU), Ireland (IE), Italy (IT), Latvia (LV), Lithuania (LT), the Netherlands (NL), Norway (NO), Poland (PL), Portugal (PT), Romania (RO), Russia (RU), Spain (ES), Slovakia (SK), Slovenia (SI), Sweden (SE) and Ukraine (UA).

2 Database and Construction of the Dataset

2.a The AMADEUS database

Our paper relies on the AUGAMA (Augmented AMADEUS) database compiled by Merlevede et al. (2015). In the latter paper the construction of AUGAMA is outlined in detail as is the coverage and representativeness. This AUGAMA database on itself is constructed by making use of several version of the AMADEUS database by Bureau Van Dijk Electronic Publishing (BvDEP). This database, as well as other databases by BvDEP[5], have been used extensively in the past by researchers trying to investigate a variety of subjects, both within a certain country (e.g. Javorcik (2004) and Lenaerts and Merlevede (2015)) as well as over countries (e.g. Budd et al. (2005); Ferrando and Ruggieri (2015), Kalemli-Ozcan et al. (2014) and Klapper et al. (2004)). To elaborate on the database, AMADEUS brings together a variety of information on firms: contact information, balance-sheet information, the activity of the firm, ownership of the firms through it's shareholder structure and international activity by means of foreign affiliates.[6] BvDEP brings all this together trough a variety of sources: amongst others, the company gathers information from statistical agencies, websites and annual reports.[7] To get to the full database we relied on for our identification procedure, we have combined several versions of the database.[8] Due to the fact that BvDEP gives each firm in the database a unique identifier which is fixed over versions, we are able to link the correct information over all the versions. Several reasons can be given why we did not restrict ourselves to the most recent version of the database. Firstly a single issue of AMADEUS includes at most ten years of data. Also with regard to ownership links between entities, a single issue of the AMADEUS database only includes a static ownership structure (Merlevede et al. (2015)). For our purposes reliance on a single issue of the database would prove to be insufficient. Our procedure relied to a great extent on ownership information files provided by AMADEUS. For a great amount of firms in the database AMADEUS is able to outline the shareholders of firms in a specific year. In addition the database provides information on the Global Ultimate Owner (GUO) of the firm in question.

2.b Representativeness of AUGAMA

In this section we provide some information on the representativeness of the constructed AUGAMA database by Merlevede et al. (2015).
A first indication on this can be found in table 1. To get an idea on the coverage of our data, AUGAMA is compared to the Structural Business Statistics

[5]The most familiar of these being the ORBIS database. This database is more internationally oriented than AMADEUS, as the latter 'only' covers Europe.

[6]Information on exports is lacking for most countries in our data. The only exceptions on this are France and the Czech Republic. Also do note that AMADEUS' main focus is oriented towards the business economy. The banking sector is not the main focus of this BvDEP product. To get a view on the financial sector, one should rely on BANKSCOPE.

[7]Desai et al. (2003) and Sebnem et al. (2015) provide an overview on these sources.

[8]To be more specific, for this exercise versions 72, 84, 96, 108, 119, 124, 132, 144, 156, 168, 180, 192, 204, 220, 228, 240 and 253 were combined.

database by Eurostat.[9] Table 1 compares coverage with regard to SBS over a couple of variables and broad economic sectors.

Looking at table 1 we see that coverage varies across countries with regard to the variables in the table. For instance in Estonia on average we observe 86.9% of the firms recorded by Eurostat. This figure is even higher for employment and turnover (98.6% and 97.7%). Regarding the number of firms in comparison with financials, we notice that see that the percentages denoting coverage for these financials are higher in general. This is an indication that AUGAMA and hence AMADEUS might be able to better observe and include larger firms.[10] Looking at the last four columns we compare the distribution of firms within AUGAMA across two broad sectors with SBS. Here we notice that our database is more oriented towards manufacturing. Table 2 below gives information with regard to the coverage of AUGAMA for the size distribution of firms.

For most countries considered the ranking of the various size classes coincide with that of SBS (the first group has the largest percentage, then the second...). The comparison of the corresponding cells of AUGAMA with that of SBS, however indicate that AUGAMA is somewhat skewed towards larger firms in terms of the number of employees. This skewness varies across countries, and for some countries like e.g. Spain, Finland and Estonia amongst others, this bias is very small. When looking at the sample for which TFP can be estimated this bias tends to increase somewhat. But again this also varies across countries. Before we conclude this subsection on the AMADEUS database and it's representativeness we give an indication on the coverage with regard to shareholder names we observe in the data. In the figure 1 below we provide an indication on this. We relied amongst others on these shareholder names to identify a government investor in the firm.

We see here as well that the coverage improves over time for firms. Over time we are able to observe for more firms the names of their shareholders. Though this is not reported here, the same applies for the names of the GUO and the type of the shareholder of the firms. We see a steep increase around the year 2002. Since we have quite a large increase in this year, we take this year as the first year for our sample for the exercises that follows below. We restrict our sample to the year 2015.[11]

[9] This database collects a variety of information on firms operating in the European Union, across a range of sectors. This information relates to business demographics, costs related to inputs and variables related to outputs. In order to assemble the database, Eurostat relies on several sources: surveys, the official business register and other administrative sources. See `http://ec.europa.eu/eurostat/cache/metadata/en/sbs_esms.htm`

[10] This is somewhat logical as for these firms are obliged to deliver their annual accounts to official agencies.

[11] A cautionary note however is in place. For Russia and Ukraine we were also able to identify firms with state shareholdings in 2015, but the data on balance-sheets for firms in the respective countries is limited to the year 2014. Whenever we perform a cross-country comparison we restrict the year to 2014 for this reason.

Table 1: *AUGAMA* versus Eurostat Structural Business Statistics (SBS): Representativeness.

	SBS 2002–2007	AUGAMA as share of SBS 2002–2007				SBS 2007		AUGAMA 2007	
	# firms	# firms	# empl.	turnover	costs of empl.	share of firms in manufacturing	share of firms in services	share of firms in manufacturing	share of firms in services
AT	269,426	11.0%	46.5%	40.8%	34.6%	10.0%	90.0%	22.2%	77.8%
BE*	333,564	42.3%	85.0%	81.3%	87.7%	9.1%	90.9%	14.2%	85.8%
BG	221,116	17.6%	60.3%	83.5%	66.4%	11.8%	88.2%	15.2%	84.8%
CZ	871,067	11.4%	74.7%	76.0%	72.5%	16.9%	83.1%	19.7%	80.3%
DE	1,714,904	14.6%	32.4%	42.0%	36.1%	11.0%	89.0%	21.0%	79.0%
DK	198,369	18.4%	41.9%	36.7%	45.8%	8.7%	91.3%	14.2%	85.8%
EE	38,270	86.9%	98.6%	97.7%	62.1%	12.2%	87.8%	16.2%	83.8%
ES	2,499,620	36.9%	71.3%	75.1%	72.1%	7.9%	92.1%	17.2%	82.8%
FI	186,972	28.2%	49.1%	47.1%	39.9%	12.0%	88.0%	17.3%	82.7%
FR	2,158,887	23.6%	62.1%	63.9%	62.9%	10.2%	89.8%	14.0%	86.0%
GB	1,571,916	10.0%	80.0%	65.8%	67.1%	8.9%	91.1%	22.0%	78.0%
HU*	551,119	8.5%	35.2%	38.7%	35.7%	10.4%	89.6%	19.2%	80.8%
IT	3,790,324	15.0%	55.8%	58.8%	57.8%	13.1%	86.9%	30.7%	69.3%
LT	88,187	22.8%	52.5%	61.9%		11.6%	88.4%	20.4%	79.6%
LV	60,581	18.7%	54.9%	57.1%	7.0%	11.1%	88.9%	16.5%	83.5%
NL**	497,613	5.2%	54.5%	42.9%	39.0%	8.6%	91.4%	18.4%	81.6%
NO	198,926	38.6%	72.5%	65.8%	72.5%	12.0%	88.0%	11.9%	88.1%
PL	1,452,512	6.5%	46.8%	50.3%	27.9%	13.3%	86.7%	30.9%	69.1%
PT	711,778	34.0%	30.9%	34.9%	33.6%	10.9%	89.1%	16.0%	84.0%
RO	389,286	67.6%	87.7%	36.1%	34.6%	12.6%	87.4%	15.8%	84.2%
SE	514,925	32.2%	64.5%	78.6%	79.2%	10.9%	89.1%	13.6%	86.4%
SI	91,065	24.2%	80.8%	80.2%	79.6%	17.8%	82.2%	30.6%	69.4%
SK	42,525	40.7%	78.4%	89.3%	89.2%	14.3%	85.7%	21.4%	78.6%

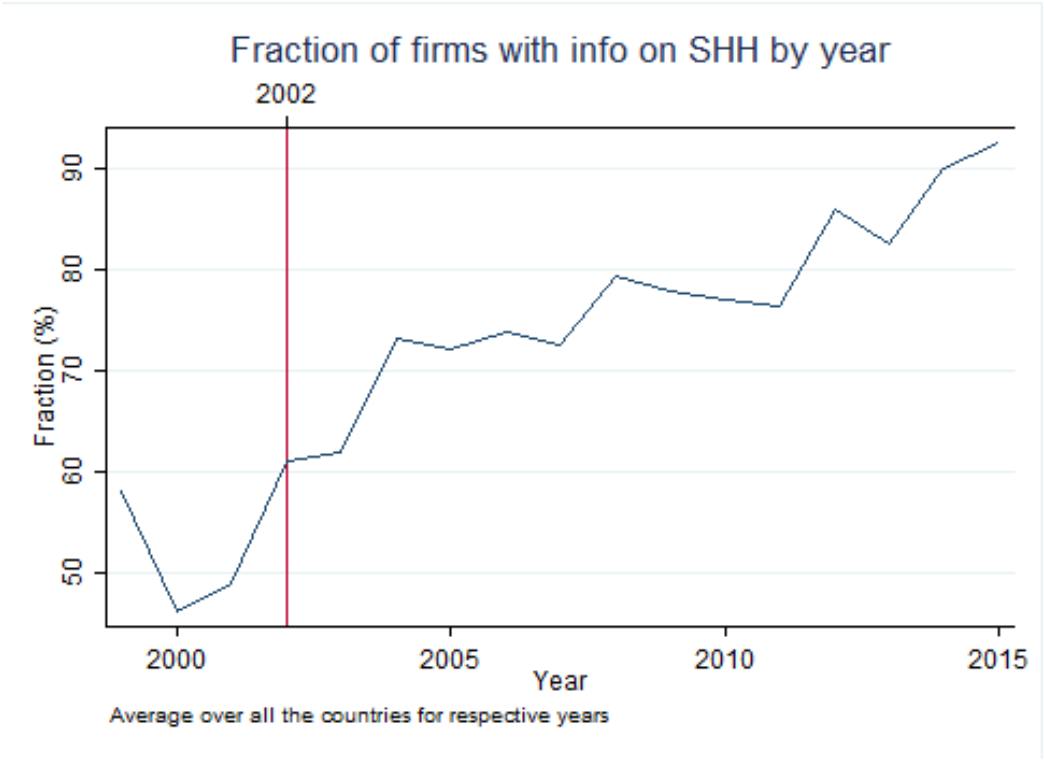
Note: source, Merlevede et al. (2015). *For BE and HU the period under consideration is 2003-2007. **For NL, some firms were removed after manual inspection. This due to the fact that these were outliers. For HR, RU and UA unfortunately there was no SBS-data available. Firms in our database were assigned to a specific country-industry-year cell and this was aggregated. Afterwards ratios comparing the respective AUGAMA cells with SBS are calculated. Lastly averages were calculated for each country over the period in the table.

Table 2: *AUGAMA* versus Eurostat Structural Business Statistics (SBS): Firm Size Distribution.

	SBS (2002–2007 average)				AUGAMA (firms with employment) (2002–2007 average)				AUGAMA (firms with TFP) (2002–2007 average)			
	1–19	20–49	50–249	250+	1–19	20–49	50–249	250+	1–19	20–49	50–249	250+
AT	94.3%	3.7%	1.7%	0.3%	52.1%	21.6%	20.4%	5.9%	17.8%	14.4%	42.8%	25.1%
BE	96.3%	2.5%	0.9%	0.2%	87.6%	8.1%	3.5%	0.7%	36.3%	30.2%	27.5%	6.0%
BG	94.9%	3.1%	1.7%	0.3%	75.3%	12.3%	10.0%	2.4%	60.4%	19.2%	16.6%	3.9%
CZ	97.5%	1.4%	0.8%	0.2%	69.1%	14.6%	13.0%	3.3%	65.8%	15.8%	14.7%	3.8%
DE	92.6%	4.4%	2.3%	0.5%	69.3%	15.6%	12.2%	3.0%	40.7%	19.5%	28.9%	10.9%
DK	93.6%	4.2%	1.9%	0.3%	80.2%	11.8%	6.6%	1.4%				
EE	91.0%	5.7%	2.9%	0.4%	86.1%	8.8%	4.5%	0.6%	85.8%	9.2%	4.4%	0.6%
ES	96.7%	2.3%	0.8%	0.1%	86.6%	9.5%	3.4%	0.5%	84.7%	10.8%	3.9%	0.6%
FI	96.2%	2.3%	1.2%	0.3%	88.9%	7.2%	3.2%	0.7%	88.3%	7.7%	3.3%	0.6%
FR	96.2%	2.5%	1.0%	0.2%	84.7%	9.7%	4.6%	1.1%	83.4%	10.4%	4.9%	1.2%
GB	94.6%	3.3%	1.7%	0.4%	40.3%	18.3%	31.0%	10.5%				
HU	96.0%	1.5%	0.7%	0.1%	74.1%	13.1%	10.0%	2.9%	73.4%	13.4%	10.2%	2.9%
IT	98.2%	1.3%	0.5%	0.1%	75.6%	15.2%	8.1%	1.1%	74.3%	16.0%	8.5%	1.1%
LT	93.2%	4.6%	2.6%	0.3%	52.1%	24.8%	19.8%	3.2%				
LV	91.8%	5.2%	2.7%	0.4%	64.2%	19.2%	14.4%	2.2%	47.1%	16.9%	27.7%	8.4%
NL	94.7%	3.4%	1.6%	0.3%	43.6%	19.1%	30.2%	7.0%	55.8%	16.6%	21.5%	6.1%
NO	99.0%	2.7%	1.2%	0.2%	87.6%	8.4%	3.3%	0.6%	85.8%	9.7%	3.8%	0.7%
PL	97.6%	1.3%	0.9%	0.2%	35.9%	21.7%	33.3%	9.2%	36.2%	22.9%	32.7%	8.2%
PT	97.1%	1.8%	0.8%	0.1%	90.7%	6.0%	2.8%	0.5%	89.2%	7.0%	3.3%	0.5%
RO	93.6%	3.7%	2.3%	0.5%	88.9%	6.4%	3.9%	0.8%	88.1%	6.8%	4.1%	0.9%
SE	97.2%	1.8%	0.8%	0.2%	92.1%	5.2%	2.2%	0.5%	91.4%	6.1%	2.2%	0.3%
SI	96.2%	2.1%	1.3%	0.3%	78.0%	10.8%	8.5%	2.7%	76.5%	11.6%	9.1%	2.8%
SK	89.0%	4.9%	4.7%	1.1%	66.2%	11.4%	17.3%	5.2%	63.1%	12.0%	19.1%	5.8%

Note: source, Merlevede et al. (2015). In this table the representativeness of AUGAMA is compared with Eurostat's SBS-database according to firm size categories. For each country-year firms were classified according to the four size categories. Next, the number of firms in each category was counted and divided by the total number of firms in a country-year. Lastly, this value was averaged over the period 2002-2007.

Figure 1: Coverage of shareholder name in AUGAMA/AMADEUS



Note: this figure shows on average over all the countries the percentage of firms for which we are able to observe at least one shareholder name.

2.c Identification of State Firms

Before we outline our identification procedure, it might be appropriate to clarify what we mean by a state firm or an SOE.[12] In this article we define a state firm as an enterprise in which the ownership of state entities within a certain firms exceeds 10%. Regarding state entities we take a broad view and follow Jaslowitzre et al. (2016) and look at all possible entities, regardless of the level (local, federal or regional) and the nationality of the state investor. We do not exclude investments undertaken by government pension funds or sovereign wealth funds. Regarding the ownership threshold, a similar border as international institutions is used to distinguish a foreign direct investment from a portfolio investment. Or put differently, to separate the desire for a lasting interest from an investment mere for financial reasons. See on this for instance the definition by UNCTAD [13]. In the literature on state firms, there is no common definition and no advise on how high this threshold should be. For instance OECD (2010) in his overview is fairly general on this, and uses different definitions for different

[12] Throughout this text we will use these words interchangeably.
[13] http://unctad.org/en/Pages/DIAE/Foreign-Direct-Investment-%28FDI%29.aspx

countries. In Armoldus et al. (2016) a 20% threshold is used. We thus apply a smaller border, but are flexible enough as we also make a distinction between majority-owned SOEs and their counterparts. Also we do not discard any of the constructed government ownership variables, even though they do not exceed the threshold.[14] As we do not limit ourselves to a certain level of government nor to domestic state entities, we make sure that we are able to track these investors at different types of government level or nationality. We construct several variables allowing us to assess for each firm the extent to which this firm is owned by local-regional-federal governments, domestic or foreign governments, besides the general indicator for government ownership. And since some states are owners of investment vehicles, we also try to identify these companies in our dataset and make a category for firms with sovereign wealth funds as a shareholder. In Stephen (2007) an outline of state-owned investment vehicles is given.

To identify which firms have a state entity as a shareholder, we employ a procedure to look for certain words pointing towards a state entity. AMADEUS provides information on owners of the firms in the data, via the variables: **shhtype, legalform** or **GUO-type**. With these variables firms' owners are categorised in certain groups. To give an example on this, if there is a shareholder of a certain firm A named John Doe, AMADEUS might label this shareholder's type "Individual". Similarly if a shareholder is a certain firm B, a possible type is "Private Equity firm". In the same spirit some of these types point towards shareholders which are government entities. These categories are for instance: "State", "Public Authority" or combinations of these words. Moreover these shareholder types are the same across our country panel. Therefore whenever we encounter these words within the three variables outlined above, we label a firm as potentially state-owned, since we do did not yet take into account the ownership within the firm in question. Unfortunately for many shareholders or GUOs the type was missing.
Therefore we had to resort to a more 'brutal' method look for government entities within shareholders' or GUO's name-cells for each firm-year. We browsed trough firm files having activities in countries we were familiar with the language and checked for shareholders/GUOs whose name might point towards state ownership. We translated these into the varieties of languages present in our dataset.[15] Tables, table 17A1a and table 17A1b in the appendix give an overview on the words we used in the described procedure.

In the end after using this method we end up with a dataset of *potential* state firms. To fully identify state firms, we rely on information capturing the direct, total ownership or the ownership stake of the GUO of these identified state shareholders.
Besides this application of the 10%-threshold, we also considered a firm to be state-owned if it's GUO is a state entity, irrespective of the amount of owner-

[14] For instance if there is only one government shareholder, e.g. City of Ghent, who owns 5% of the shares of firm X, we do not discard this state shareholder. We keep this shareholder and hence observe a total government ownership of 5% in this firm. What we do say is that this firm is not an SOE, since 5% is smaller than the threshold.

[15] To give an example on this: a potential name for a shareholder can be "City of C". The first word of this string, City, points towards a level of government. In Dutch the word for City is "Stad" and in French "Ville". So we made our procedure investigate whether "City of", "Ville de" or "Stad" appeared in our dataset.

ship.[16] Our data also allows us to introduce some heterogeneity in the state shareholders we observe. The shareholder files provided by AMADEUS contain information on the nationality of the investor. By using this we are able to separate foreign and domestic shareholders. In addition for each of the state shareholders we have identified the level of government at which they operate. We make a distinction in three levels: federal, regional and the local level of government. To achieve this purpose we relied on a similar word searching procedure as we applied to identify state shareholders.[17] So to sum up we have a dataset at our disposal which has the following information for each firm in our dataset: the extent of state-ownership, the nationality of the state investor, the level of the latter (federal, regional or local) and whether this investor is a Sovereign Wealth Fund. Moreover for each firm we have made ownership categories: the amount of state-ownership overall, the amount of foreign state-ownership and the amount of ownership separated by each level of government. Also whenever a firm is owned by a foreign and a domestic state entity, we label this firm as having a *Hybrid Nationality*. In the same spirit, if we observe a firm which is owned by a local and regional entity, we label this firm as a *Hybrid Level* state firm. A last category we added was whether the investor could be labelled as a Sovereign Wealth Fund (SWF) [18] Also we have taken into account other government controlled funds managing SOEs, see Guberna (2014).

With regard to the ownership percentages of shareholders within firms, if we observed missing values for our ownership stakes of certain shareholders or GUOs for some years, we filled-out previous information by using Stata's *Carryforward* command. In the end of this procedure we end up with a database on private firms and state firms, operating in twenty-seven European countries, over a variety of industries over more than a decade, from 1999-2012. We have compared the identified state firms after our procedure to other sources: Bałtowski and Kozarzewski (2016), OECD (2010) and official government sources.[19] Besides this we also performed manual checks for each country separately to make sure the database we have is reliable.

[16] In AMADEUS several definitions for the GUO can be used and applied. We opt for the one where the GUO owns at least 25% in the firm. If we only identify a government GUO and no other government shareholders, we say that this firm is state-owned, but not majority-owned.

[17] For instance a shareholder/GUO with a name containing the words: 'City of' will be classified as a shareholder operating at the local level of government. In a similar vein a shareholder name containing 'State of' will be a federal state entity. We carefully checked for potential flaws in this procedure and we have therefore assigned some cases to the right level manually.

[18] In order to do this we relied on information by the Sovereign Wealth Fund Institute: `https://www.swfinstitute.org/`. This institute gathers information on these kind of funds and their activities worldwide. Whenever we encountered an investor categorised by this institute a SWF, the investor is considered a SWF.

[19] Some countries publish annual reports with a clear overview of the firms in which they have invested in, the activities of the firm, it's realisations and the like. See for instance the website of the Dutch Ministry of Finance: `https://www.rijksoverheid.nl/onderwerpen/staatsdeelnemingen` For France: `https://www.economie.gouv.fr/agence-participations-etat`. This is the site for l'Agence des Participations de l'État.

2.d Examples of state firms

After applying this procedure we illustrate the validity of our approach by presenting some examples on state firms we observe in our data. In the appendix of Kalemli-Ozcan et al. (2014), the authors demonstrate the strength of AMADEUS in capturing foreign ownership links through a variety of examples. We believe that AMADEUS should be equally capable of detecting state ownership. The **first example** of a firm which we identify as being state-owned is the Belgian firm NMBS-SNCB `http://www.belgianrail.be/nl`. This is the Belgian public railway firm, responsible for the transportation of passengers. Based on our procedure this firm has been picked out as a state firm since by means of the type of Global Ultimate Owner, i.e.: State, Public Authority. Indeed looking at the name of this company's GUO: we see the Belgian state. On the other hand the shareholder of this firm is the NMBS Holding company, with a total ownership of 100%.
As a **second example** we consider the case of Proximus, until 2015 better known as Belgacom: `https://www.proximus.be/en/personal.html`. This is a major Belgian firm active in the telecommunication sector and listed on the national stock exchange, the Bel20 stock-exchange in Brussels. Our procedure identified Proximus as a state firm based on the shareholder type variable in AMADEUS. For Proximus this variable takes the value: State, Public Authority. For this company the shareholding is far more dispersed. In 2007 for instance our ownership files from AMADEUS recorded twenty different shareholders.[20] Here the state of Belgium appears as a shareholder, controlling about 53,5% of the shares in Proximus, corresponding to the share to be found in the financial report of 2007. The state of Belgium also acts as a GUO for this company.
Since we are also able to observe state firms at the local municipality level, as a **third example** on this we present the company FN Herstal, `http://www.fnherstal.com/`. FN Herstal is a Belgian company active in the defence and hunting industry. The firm is located in the city of Herstal in the Liège province in Belgium. Looking at the shareholder files from AMADEUS, we see two state shareholders on the basis of which we labeled FN Herstal as being a state firm: firstly the Walloon region and secondly the city of Herstal. The former also acts as the GUO of the company. Both shareholders were identified on the basis of their shareholder type.
For the **fourth example** we present a firm for which the state shareholders we identify stem from different countries. Here we look at the German global car manufacturer Volkswagen, `https://www.volkswagenag.com/`. As was the case for Proximus, this firm is controlled by a multitude of shareholders: domestic and foreign. Based on the information provided by AMADEUS, we identify two main state shareholders: the first is linked to one of the German Länder, Niedersachsen. The second state shareholder is the State of Qatar, through its investment vehicle Qatar Holding. In 2009 the state of Qatar exercised its right to purchase a stake in the Volkswagen group. After using this the state of Qatar acquired 17% of the voting rights. This information is available to us in the database with shareholder information. We observe similar information

[20] The number of shareholders is much bigger. AMADEUS records ownership by the general public in the category public. About 40% of the shares falls under this category.

in the Zephyr database.[21] According to the information in the latter database the state of Qatar undertook an operation increasing the stake in Volkswagen from 0 to 17%. BvDEP labelled the deal as an acquisition of a minority stake. With regard to the domestic state shareholder, Niedersachsen, AMADEUS informs us that in 2009 this shareholder has about 20% of the shares in the firm. This information confines with those mentioned in the annual reports of the Volkswagen Group.

The table below, table 3 gives an overview of some listed firms with at minimum one state shareholder amongst the investors in the firm in question. This exercise is somewhat similar as is the case in OECD (2010). In addition we have included information on the state shareholder(s) and some extra information on the firm.[22] For this table we have made a distinction in two categories, Listed State Firms and Listed Firms with a State Shareholder. The latter category gives some examples on listed firms for which we identified a state entity as a shareholder, but here the level of ownership did not exceed 10%. The listed firms are active in a wide array of sectors, ranging from manufacturing of food products and medical equipment (15 and 33). Also companies active in the transporting sector (60, 62 and 63) and R&D (73) make up part of the list. When browsing through the state investors, we mainly see investors form the own country, but at varying levels of government. At the federal level, the Belgian state in Belgacom, and the local level government entity, e.g. Turun Kaupunki (the village of Turun). We also observe ministries, state agencies and pension funds as investors. Some companies in the list have multiple state investors: for the airport of Vienna (Flughafen Wien AG) these investors operate at different levels as well (province level and the local level). Also we observe that the investment of states does not appear to restrict itself to the own border. Some investors also go abroad, and are in a sense multinational. The Norwegian government for example in 2009 had 8.47% of the shares in the Axis-Shield Plc. We also observe an entity from the USA in the list, the state of New-Jersey pension fund.

[21] Zephyr is another database by BvDEP providing information on worldwide mergers and acquisitions, for instance the type of deal, the firms involved in the deal, the acquired stake, etc.

[22] Do note that this list is far from complete. Due to space constraints we have restricted ourselves to two state shareholders at most for each firm. Some firms, like the Italian Iren Spa, recorded many state shareholders (here we observe more than 70 state-like shareholders at the local level). Moreover for some countries the number of listed firms with a state investor, e.g. Bulgaria or Russia, was fairly large. Also for this reason we did not include all the listed firms, and restricted ourselves to two firms per country.

Table 3: Examples of listed state firms

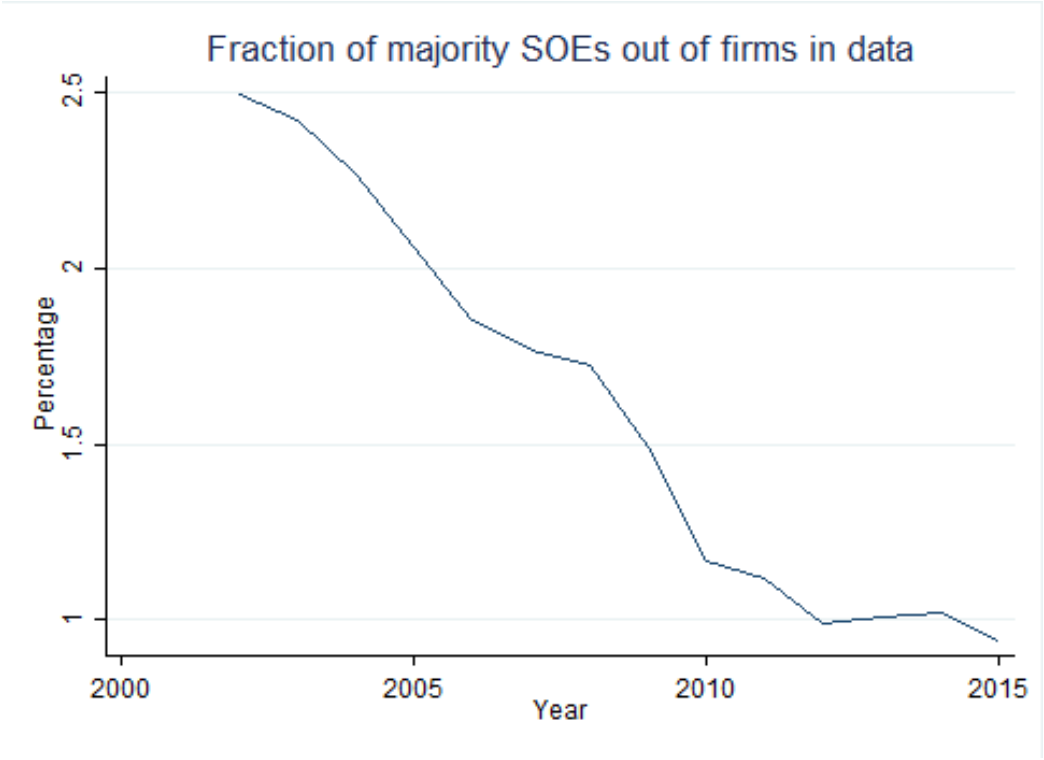
Country	Firm	Nace Code	State Shareholder	Ownership Stake	State Shareholder	Ownership Stake	Employees
Listed State firms							
AT	BURGENLAND HOLDING AKTIENGESELLSCHAFT	74	wiener stadtwerke holding ag	10%			2
AT	FLUGHAFEN WIEN AKTIENGESELLSCHAFT	63	province of lower austria	20%	stadt wien	20.00%	3,000
BE	BELGACOM	64	etat belge	53.50%			16,804
BE	ELIA SYSTEM OPERATOR	40	publi-t	33.01%			
CZ	CEZ, A.S.	40	state of czech republic (ministry of finance)	65.99%			7,500
CZ	MERO CR, A.S.	60	state of czech republic (ministry of finance)	100%			150
DE	BERCHTESGADENER BERGBAHN AKTIENGESELLSCHAFT	60	schÖnau am kÖnigssee district	81.93%			30
DK	KØBENHAVNS LUFTHAVNE A/S	63	danish state	39.5%			1,898
DK	NUNAMINERALS A/S	73	grØnlands landsstyre	43%			16
EE	EESTI TELEKOM AS	74	estonian development fund	3%	state of estonia (finance ministry)	24.17%	14
ES	COMPANIA ESPANOLA DE PETROLEOS SA	23	international petroleum investment co.	47.06%			11,807
FR	AEROPORTS DE PARIS (A.D.P.)	63	government of france	60.38%			12,096
FR	AIR FRANCE-KLM (AIR FRANCE)	74	government of france	16%			104,721
HR	CROATIA AIRLINES D.D.	62	republic of croatia	94%			1,172
HR	DURO DAKOVIC HOLDING D.D.	74	ministarstvo financija	18.83%			22
IE	AER LINGUS GROUP PUBLIC LIMITED COMPANY	62	bank of ireland nominees limited (nri)	3,12%	minister of finance republic of ireland	25.35%	3,844
IE	UNITED DRUG PUBLIC LIMITED COMPANY	51	bank of ireland nominees limited	19.84%	bank of ireland asset management limited	3.83%	3,971
IT	ACEA S.P.A.	40	comune di roma	51%			6,687
IT	ACSM S.P.A.	40	comune di como	24.76%	comune di milano	2.00%	424
LT	AB ALYTAUS TEKSTILE	17	state fund of property	69.56%			6
LT	AB KLAIPEDOS NAFTA	63	lietuvos respublikos ukio ministerija	70.63%			309
LV	LIEPAJAS AUTOBUSU PARKS AS	60	liepaja city council	34.85%			303
NL	BEURS ROTTERDAM N.V.	70	gemeente rotterdam	50%			39
NO	CERMAQ ASA	15	nÆrings- og handelsdepartementet	43.54%			
PL	BOGDANKA S.A. LUBELSKI WEGIEL	10	skarb panstwa / state treasury	65.5%			
PL	CIECH S.A.	51	skarb panstwa / state treasury	36.68%			6,972
RO	APOLLO SA	55	apaps (agency for privatization and management of state ownership)	70%			
RO	ARCELORMITTAL TUBULAR PRODUCTS IASI SA	27	autoritatea pentru valorificarea activelor statului	17%			540
RU	15-I TAKSOMOTORNYI PARK	60	departament imushchestva goroda moskvy	49%			77
RU	17 TAKSOMOTORNYI PARK	60	departament imushchestva goroda moskvy	49%			45
UA	APOSTOLIVSKIY KOMBIKORMOVIY ZAVOD	15	state of ukraine	100.00%			97
Listed firms with state shareholder							
BG	ALBENA AD	55	obshtina balchik	7.13%			1,652
BG	ALFA WOOD BULGARIA AD	20	state of bulgaria	0.12%			230
DE	BOCHUM-GELSENKIRCHENER STRAßENBAHNEN AKTIENGESELLSCHAFT	60	stadt gelsenkirchen	3.36%			2,136
ES	CINTRA CONCESIONES DE INFRAESTRUCTURAS DE TRANSPORTE S.A.	63	state of new jersey common pension fund	3.06%			108,117
FI	AMER SPORTS OYJ	33	op finland value fund	0.3%	the local government pensions institution	0.23%	6,362
FI	ASPOCOMP GROUP OYJ	32	turun kaupunki	0.65%			101
GB	ADVANCE DEVELOPING MARKETS TRUST PLC	74	derbyshire county council	4.52%			
GB	AXIS-SHIELD PUBLIC LIMITED COMPANY	33	government of norway	8.47%			517
LV	GRINDEKS AS	24	state social insurance agency	2.29%			734
NL	EUROPEAN AERONAUTIC DEFENCE AND SPACE COMPANY EADS N.V.	35	government of france	0.06%			
NO	AKER BIOMARINE ASA	73	statoil pensjonskasse	0.17%			
PT	BRISA-AUTO ESTRADAS DE PORTUGAL S.A.	45	state of new jersey pension fund	2.08%			1,566
PT	EDP - ENERGIAS DE PORTUGAL S.A. (EDP)	40	international petroleum investment co.	2.00%	societe nationale pour la recherche d exploitation de transport par canalisationde transfo	2.04%	32
SE	AARHUSKARLSHAMN AB (PUBL)	51	government of norway	0.70%			2,131
SE	AB ELECTROLUX	29	national swedish pension fund	2.20%	fourth swedish national pension fund	1.50%	50,633
UA	ARSELORMITTAL KRIVIY RIG	27	state of ukraine	0.10%			40,049

The table above gives information on a number of listed firms for which we identified state shareholders. The NACE-number is based on revision 1.1. The percentages in the columns are direct ownership percentages in the firms by the respective shareholder. The names of the firms/shareholders are the names as we observe them in the AUGAMA database. This table is for 2009 as in OECD (2010). The names of the firm in the second column might therefore have changed in the meantime. Also note that this list is not exhaustive as explained in the text.

3 State Firms across Europe

After this extensive list of examples in the previous section, we move on towards a more aggregate picture of state presence in Europe. Figure 2 2 gives an overview on the number of majority-owned state firms as a fraction of all the firms we observe in our data. Note that for this exercise and the following we apply some mild cleaning. We drop firms which report at least once during the period of observation a negative value for assets, their sales number, age or their number of employees. Furthermore firms failing to report assets, employment and sales simultaneously in a given year are dropped. We also exclude firms with consolidated financial statements, this to avoid double counting in several variables of interest.

Figure 2: Share of majority SOEs out of total number of firms in data



Note: this figure depicts the fraction of firms with an ownership stake of at least 50% due to state shareholders as a percentage of all firms in the data, averaged over all the countries for the respective years.

As is clear from the picture over the whole period the share in 2002 and 2015 drops by about 1.5 percentage points. Over these years however a different speed of privatisation can be seen. The period around the economic crisis shows a more flatter curve. Afterwards the decline continues and for recent years in

our data the fraction stay stable.
In figure 3 3 we present a general picture on the share of employment generated due to SOEs in the first year of the retained sample (2002) and the last year (2014).[23] The picture shows a high persistence in state employment levels. Countries which had a high level of state employment, tend to have a higher level as well in 2014. But overall the importance of state firms declines for most countries in our dataset. This decline however is very mild. The fact that we see a very stable share in employment is in favour of the path-dependence view as discussed in the first part of this paper. Globally we see that countries which Musacchio and Lazzarini (2014) label as "Former Command Economies" are oriented towards the far right in these two graphs.[24] Overall we see a tendency for countries in the eastern part of Europe to exhibit a higher fraction of state employment. For countries in Western-Europe these share are far more aligned and more or less constant, as countries' dots lie very closely to the 45-degree line. Here France s a notable country in the figure. The bottom part of this figure concentrates on domestic state-ownership. More countries now have a position above the 45-degree line. For some countries the change with respect to the upper part is quite extensive. For example in Russia firms owned by domestic state shareholders grew far more important regarding the extent to which they create employment with respect to the year 2002. This difference amounts to fifteen percentage points.

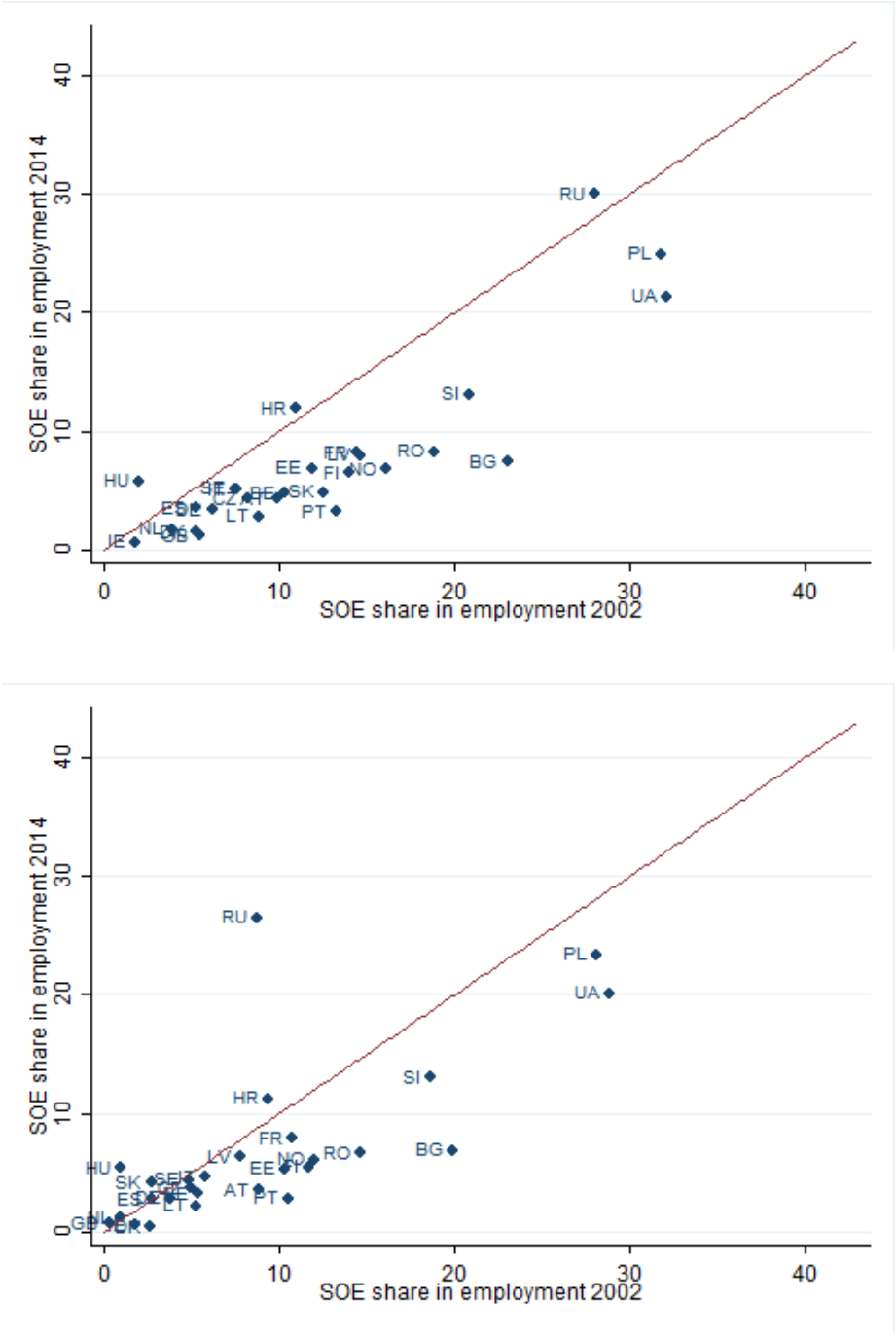
Figure 4 presents the importance of state firms over NUTS2-regions in Europe. In this figure we compare the level of economic development (upper part) with the share of regional employment provided by state firms. According to one aspect of this Industrial View the share of state-ownership should be higher in regions characterised by a lower level of development. According to this view, the state can act as a kind of development catalyst to orient and bring the region on a path for development. Therefore looking at this figure one would expect a negative correlation between these two variables. In the figure the upper part denotes the income of the region, expressed as a percentage of the average across European regions. The bottom figure presents the share of employment due to state firms out of the total employment we observe for that region-year in our dataset. This figure represents the average regional income/state share over the period 2002-2015. The pattern according to the social view is more vivid in the eastern part of Europe. On the other hand some of the regions with the highest extent of economic development, also show a high share of state employment.[25]

[23] See the remark above. Since we lack data on Russia and Ukraine we take this year as our final year for this figure and a couple of figures, tables which follow hereafter.

[24] In the text the authors include the following countries in this group: China, the Czech Republic, Finland, India, Poland, Russia, the Slovak Republic and Vietnam.

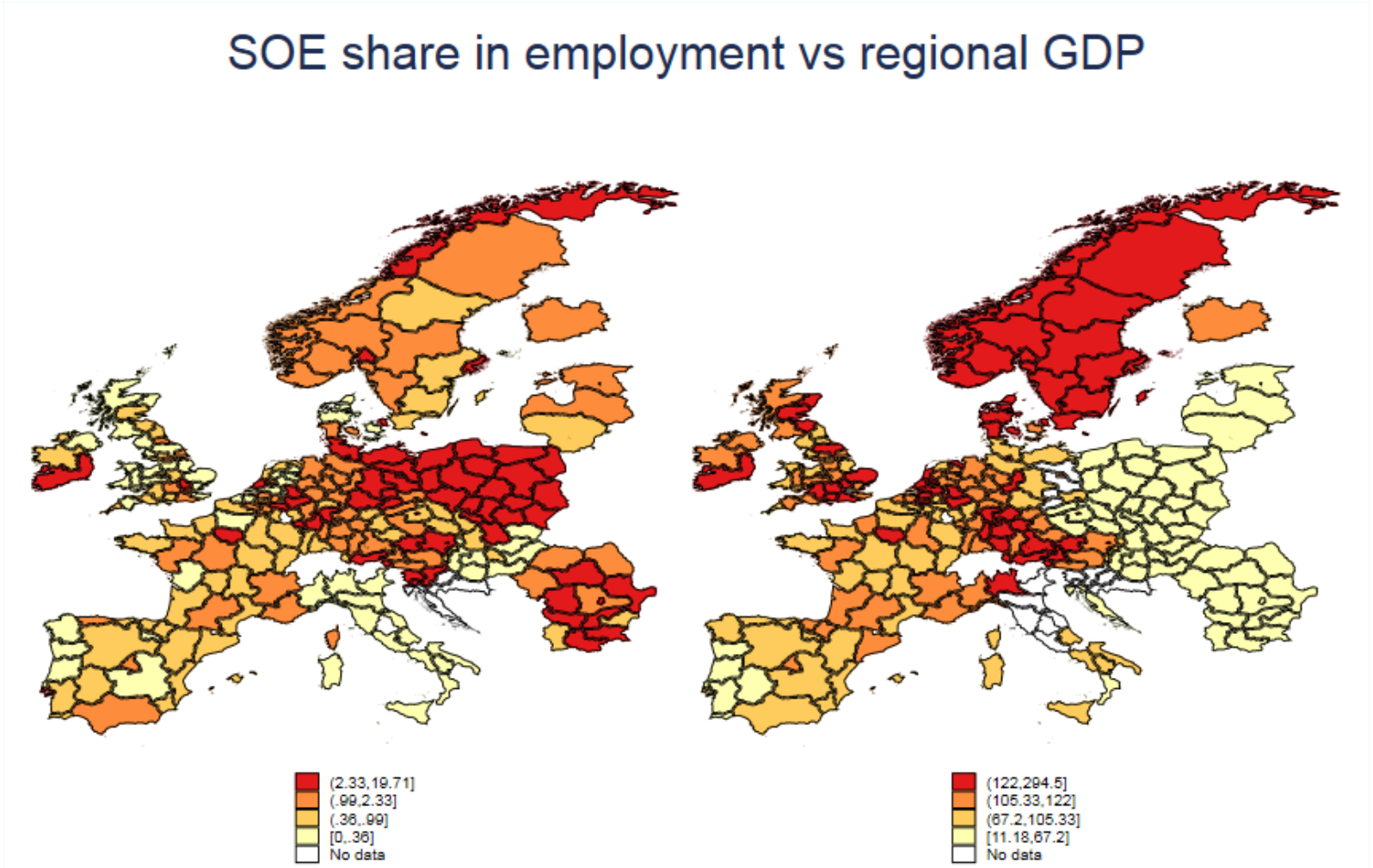
[25] Of course we can not exclude other views when looking at this picture.

Figure 3: State firms across countries



Note: For all countries in the dataset, this figure gives the share of employment in state firms out of the total employment over sectors with codes 10-74 in our dataset for 2002 and 2011. In the bottom figure we only take into account firms with at least 10% of domestic state ownership.

Figure 4: Regional income per capita and state firms' regional employment share



Note: The left figure denotes the income per capita, expressed as a percentage of the EU-average for each region (Source Eurostat, NUTS2-level). The right figure represents the share of employment due to state firms out of total regional employment in the data. The figures are averaged over the years 2002-2015. The raw correlation between these variables is about -0.31.

In the next table, table 4 we go a little bit more in detail and provide some statistics on the importance for each country in our data, and the industries with the highest state employment share averaged over the years 2002-2014. Column 2 and 3 give an overview of the total number of employees we observe for all the firms and for the state firms. In the next column we take the ratio of these numbers. This is a rough indicator on the importance of state firms in the economy. A couple of things mark out. For Ukraine and Bulgaria on average about 34% and 18% of the total employment is due to state firms for our dataset.Interestingly also for our data, Finland records an employment in state firms of about 9%. A couple of other papers mention this high fraction of state firms across Finland, see OECD (2003) and Willner (2003), broadly two reasons can be given for this fact. The first one is related to the fact of a lack of private venture capital, triggering the Finish government to undertake this role. Triggered by the initial success of these firms, state firms quickly expanded into other sectors, where there comparative advantage could be used. Another motive is more of a political factionalism type, and was aimed at counterbalancing the power of the Swedish minority in businesses. Another prominent reason had to do with the desire to keep wages down after WWII. Increasing state-ownership would therefore lower demands for wage increases by labour unions, so one hoped Willner (2003).

In the last three columns in the table, we show the sectors in the economy for which the ratio defined in column four is the highest on average over the years at the sector level. For example in Austria the ratio employment in state firms over total employment, averaged over all sectors and all years is the highest in the sector with code 41. This ratio is the second highest in sector 40 and the third highest in sector 11.[26] For Austria we thus find the highest presence in the energy sector and lastly sector 11 which involves mining activities. Looking at the other countries as well, we see quite a lot of cells with codes starting with a 6 or 4. To a smaller extent sector codes with 2-digit 10-14 appear in the table. These latter sectors involve mining activities.[27]

We continue our analysis with goal to examine state-ownership across Europe by presenting an alternative picture on state presence across the countries and industries in our panel based on the following formula:

$$Stateshare_{jt} = \frac{\sum_{i,\forall i \in j} ShareState_{it} * L_{it}}{\sum_{i,\forall i \ inj} L_{it}}, \forall c \in C \tag{1}$$

This measure is based on the article by Javorcik (2004), who constructs this to assess the extent to which the presence of foreign firms in Lithuania act as a means for productivity spillovers.
Whereas the author relies on sales to construct the measure, we rely on the number of employees as in Aitken and Harrison (1999).[28] The state share for

[26] For convenience we have included a table with the 2-digit codes of the NACE-sectors which we have in our data in the appendix, see table A.2a.

[27] When we look at a similarly constructed table but only including minority firms, this picture changes somewhat and some manufacturing sectors appear. But also sectors from table 6 are prominent in this table.

[28] We have constructed an alternative indicator like Javorcik (2004), but based on operating revenue, since for some countries in our dataset a variable sales is missing for every firm. A

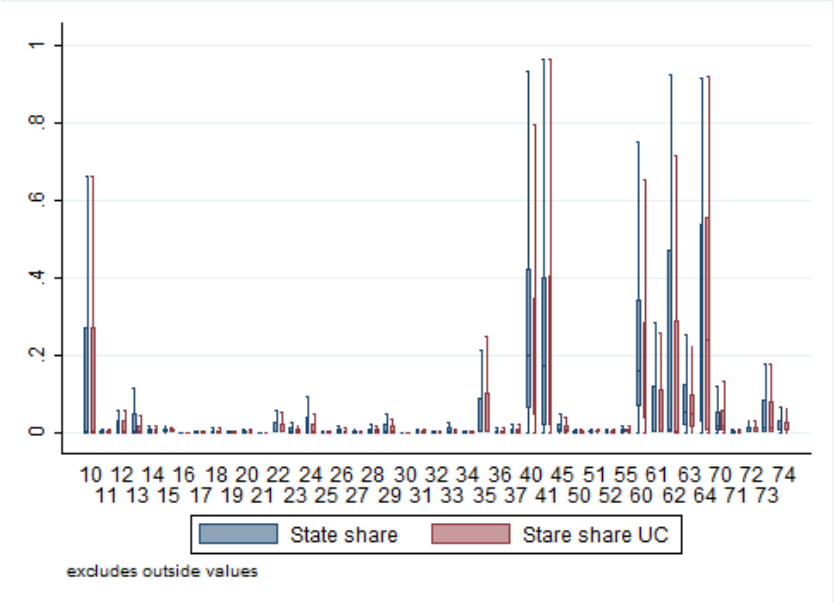
Table 4: Share of employment in state firms and top state sectors

Country	Total Employment in Data	Employment in SOEs	(2)/(3)	Sector 1	Sector 2	Sector 3
AT	1,583,741	112796	7,12%	41	40	11
BE	1,770,529	128586	7,26%	41	40	20
BG	1,083,936	195118	18,00%	41	40	10
CZ	2,511,228	114886	4,57%	62	12	60
DE	17,043,267	812602	4,77%	41	40	60
DK	1,935,284	50746	2,62%	40	64	41
EE	335,468	17657	5,26%	11	40	64
ES	7,174,449	238725	3,33%	16	41	64
FI	949,913	88247	9,29%	40	64	10
FR	7,462,497	695,740	9,32%	64	12	40
GB	12,045,518	495,072	4,11%	64	13	60
HR	722,590	76,296	10,56%	40	62	64
HU	1,344,024	33,839	2,52%	62	23	64
IE	490,380	11,802	2,41%	61	60	16
IT	7,731,998	662,445	8,57%	74	40	41
LT	570,530	27,888	4,89%	40	64	73
LV	518,049	32,635	6,30%	62	40	64
NL	3,128,793	77,299	2,47%	41	40	11
NO	1,180,609	86,205	7,30%	10	64	41
PL	5,026,914	713,702	14,20%	10	40	62
PT	1,698,591	51,463	3,03%	62	41	63
RO	3,452,482	290,490	8,41%	12	10	11
RU	16,125,738	273,0292	16,93%	41	40	62
SE	2,087,047	138,299	6,63%	64	40	41
SI	366,563	41,558	11,34%	62	64	40
SK	904,665	71,539	7,91%	40	11	64
UA	6,773,061	2,334,604	34,47%	14	61	63

The table above shows the total number of employees in all firms for every country in the database (column 2), and the total number of employees working in state firms (column 3). The columns with header Sector 1 to 3 show the 2-digit sector codes (NACE revison 1.1) for which the ratio as in column 4, calculated at the country-sector-year-level, was the highest (column 5), the second largest (column 6) and the third largest (column 7). All values in the table are averages for over the years 2002-2014.

an industry j in year t is thus constructed by multiplying the shareholdings of a state investor in a certain firm i by it's employment level. Afterwards this value is summed over all firms in the industry and divided by the total employment in industry j. We calculate this measure for every country c in our country set C. This variable therefore gives an indication of state presence within industries.[29] Note that at this stage of the article we have not yet investigated to a great extent the outliers, therefore these are excluded. In the appendix the figure for domestic state shareholders is presented over all the countries in our dataset, see figure 15 and figure 16. Looking at the same variables but now across industries, large boxes are present in sectors 10, 40, 41 and sectors 60 to 64. Consistent with the earlier table. Some smaller peaks are found in sectors 12, 22 (Media), 35 (Manufacturing of other transport equipment), sector 70 and 73-74. (Real estate, R&D and Other business activities). Interesting to note is that in virtually every sector in the figure there is some state presence in firms. This is to a large extent driven by former Communist countries. When we look at the distribution of foreign state shareholders over industries in figure 6 we find the highest presence in sectors 35, 40, 60 and 63-64.

Figure 5: Share of state firms across industries

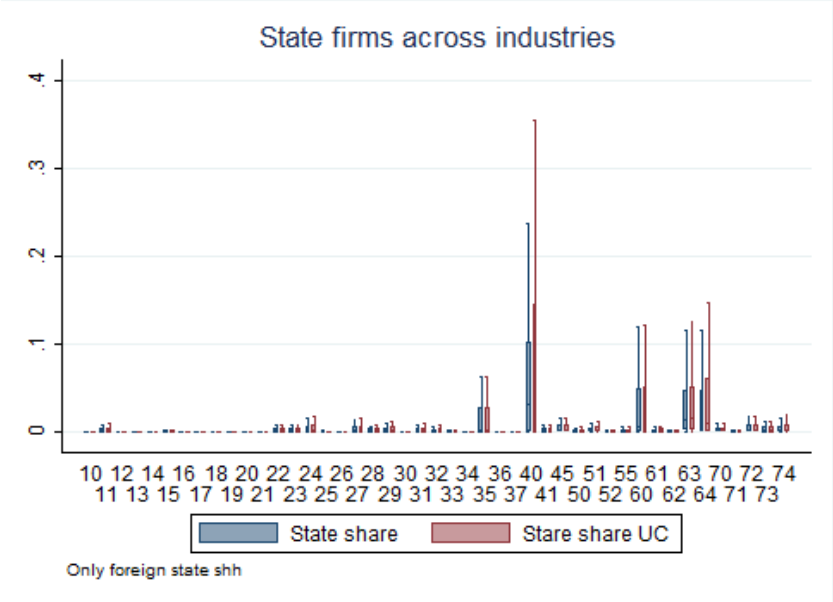


Note: In this figure stakes by domestic state shareholders are presented. The boxes present the distribution of the calculated index as in formula 1. The red boxes denote the calculated index excluding firms with consolidated financial accounts.

simple correlation between these measures yields a value of about 0.81. In the figures we concentrate on domestic state owners, but the correlation between this measure for domestic state investors and the one including foreign state investors (all state investors) is even larger, 0.95.

[29] The industry set J is composed out of the industries making up table A.2a in the appendix.

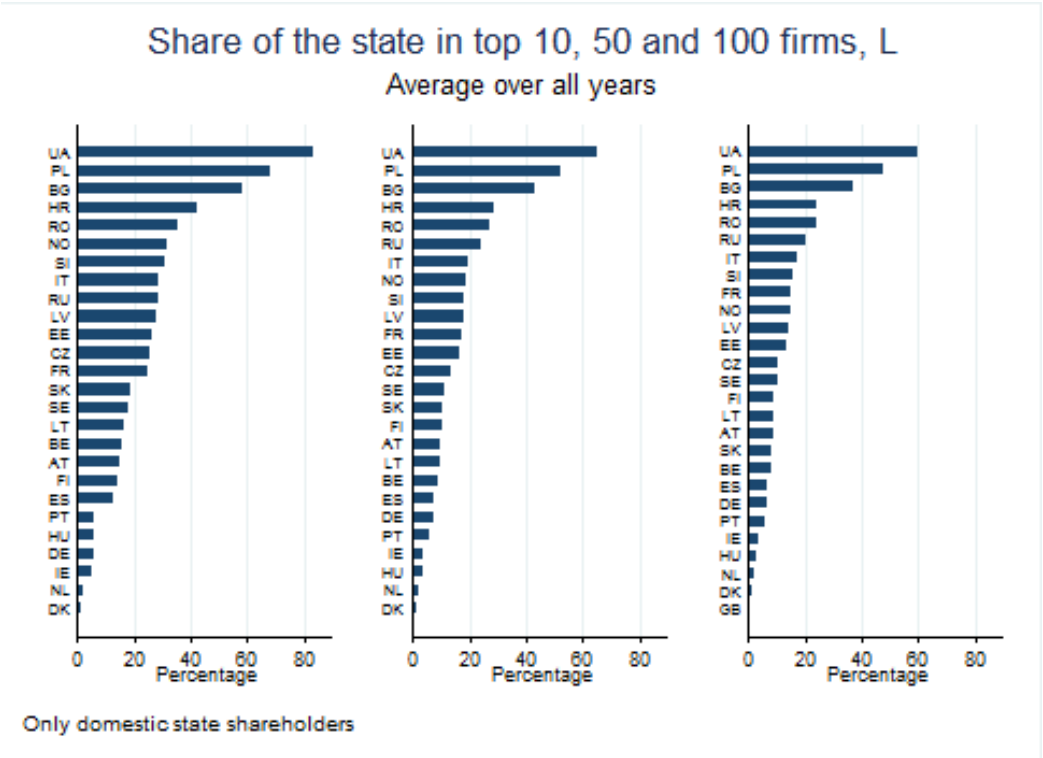
Figure 6: Share of state firms across industries



Note: Sectoral classification is based on NACE revision 1.1. Years 2002-2015. In this figure shareholdings of foreign state shareholders are included. The red and blue boxes are similar as in the figure above

In figure 7 below we take another perspective and calculate similar variables as La Porta et al. (2002). For each country in our dataset the average shareholdings of domestic state shareholders within the countries' 10, 50 and 100 biggest employers were calculated. We did this for every year in our dataset. The figure presents an average of this exercise over the period 2002-2014. We see that the positioning of countries remains quite stable over the three figures. In general Eastern European countries show a higher shareholding in these largest firms. Ukraine, Poland and Bulgaria make up the top-three. Ukrainian state shareholders on average have a shareholding of 80% within the ten largest firms. This decreases to 60% for the hundred largest firms. In the Western part of Europe the largest roles are for Norway, Italy and France.

Figure 7: Share state shareholdings in top 10, 50 and 100 firms



This figure presents the average shareholdings in the countries' largest 10, 50 and 100 firms. We have classified the firms each year based on their recorded number of employees. The government shareholdings within these largest employers were then averaged over the whole period 2002-2014.

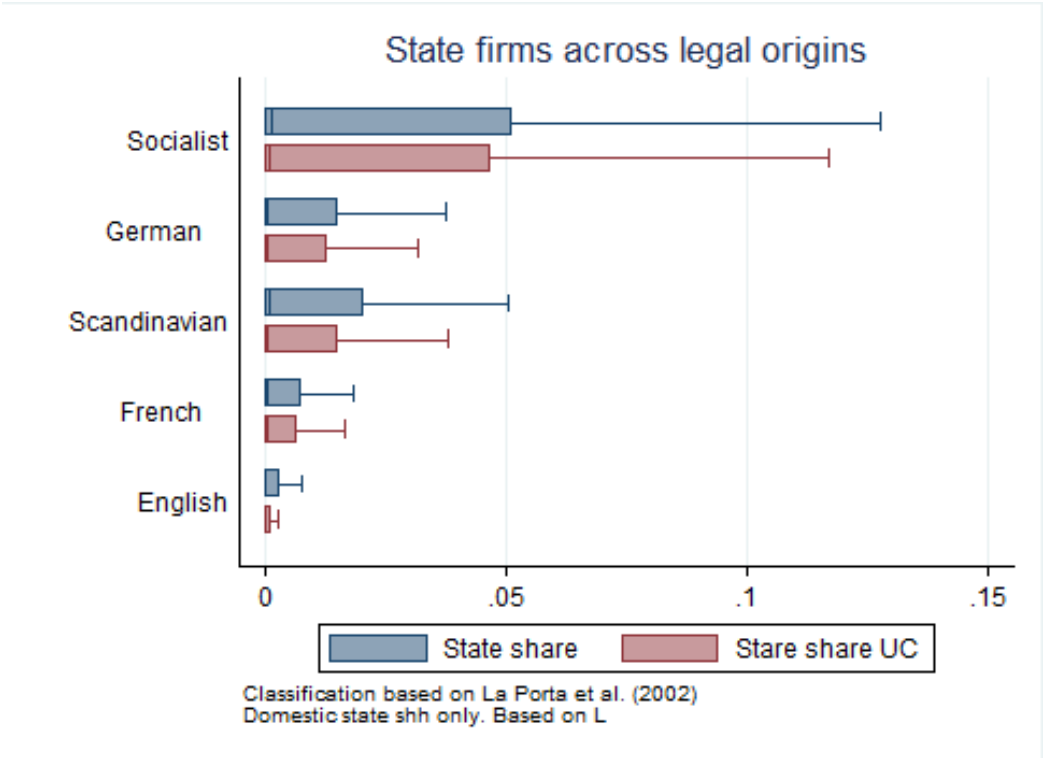
3.a State presence amongst legal origins

Next we introduce some more homogeneity amongst the countries we have in our dataset. The goal of this section is to present some gentle evidence on how state interference by state firms is distributed across country groups. The best classification/clustering of countries to achieve this goal is by means of subdividing the countries in our dataset according to their legal origin: English, German, French, Scandinavian or Socialist. In La Porta et al. (1999) the authors assess various theories of institutional performance by means of assessing the determinants of government quality across countries. In this article the authors go into a great amount of detail on the roots of legal origins. The legal origin/tradition of a country can be seen, they argue, as an approximation of the political orientation of governments and is a significant determinant of institutional outcomes, (La Porta et al., 1999, p.19).[30] The authors rely on this

[30] English common law countries should have a lower interventionist government. This based on the roots of this legal tradition, i.e. the desire of the political class to limit the power of

distinction in a later article on government intervention in the financial sector La Porta et al. (2002). In this article state intervention is defined as the average ownership of states within the countries' ten largest banks. Here on average countries with a Socialist legal tradition exhibit on average a higher ownership, vis-a-vis the other legal traditions. Indeed the English legal tradition takes on the other extreme with the lowest government ownership on average. We pursue a similar approach for our data. Our dataset excludes the financial sector, but includes many other activities. In that sense our article is complementary to the research by La Porta et al. (2002). In figure8 we present a similar figure as in **??**. We also calculate shares of state firms within NUTS2 regions at the regional level defined in a legal origins fashion (figure 9).

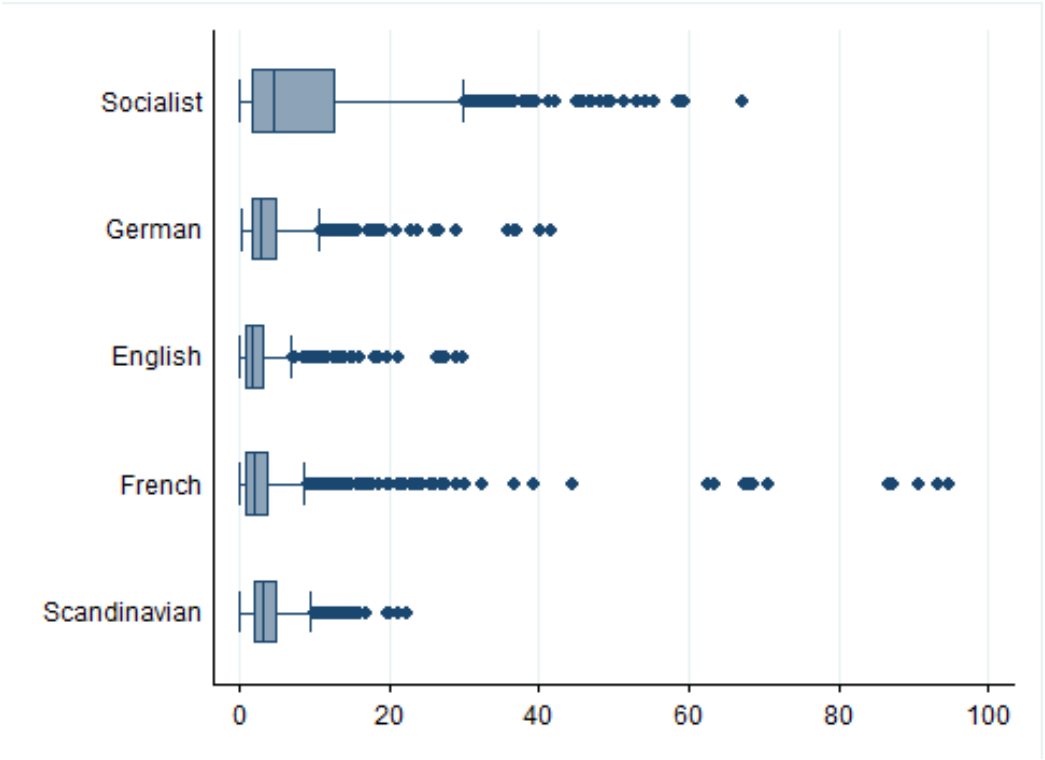
Figure 8: Share of state firms across Legal Origins



Note: Classification based on La Porta et al. (2002). Figures computed for the years 2002-2014. Sectoral classification based on 2-digit NACE revision 1.1.

the Crown. At the other extreme countries with a Socialist legal origin should have a higher government intervention, as the intent of this legal tradition was the maintenance of power and resource extraction (La Porta et al., 1999, p.17). The other legal origins take a middle position and here the distinction is more modest.

Figure 9: Share of state firms across Legal Origins at the regional level



Note: figures computed for the years 2002-2014. Regions are defined at the NUTS2-level.

For our data we see that the English and the Socialist legal tradition are at both extremes of the state share variable. In between we have the Scandinavian legal origins exhibiting a higher box than the French and German tradition. In order to conduct tests for equality of means, we have constructed and relied on several variables at the NUTS2 regional level as in figure 4. We have done this to increase our number of observations, as only relying on simple averages for our country panel would reduce our sample to a great extent. By constructing and comparing means across legal origins at the regional level our sample size increases and we can conduct sensible t-tests of means. The next table 5 presents the results of this test.

The table below shows that on average for regions in the socialist legal origin the state presence measures by these three variables is the highest. For the common law countries there appears to be no significant difference between the German and Scandinavian countries, in contrast to the French legal origin vis-à-vis these latter two origins. The English legal origin records the lowest state share. The state share across industries is highest and most widespread for countries in the Socialist legal tradition. In virtually every sector in this figure we see a box appearing. But here we see the highest concentration in the mining,

Table 5: T-tests for equality of means across legal origins

English vs French	State share L	State share OR	State share TA
x	-0.832*	-0.972*	-2.863***
N	1,819	1,842	1,840
English vs German	State share L	State share OR	State share TA
x	-1.499***	-3.730***	-10.04***
N	1,181	1,181	1,181
English vs Scandinavian	State share L	State share OR	State share TA
x	-1.402***	-3.533***	-8.345***
N	859	859	859
English vs Socialist	State share L	State share OR	State share TA
x	-6.152***	-5.671***	-10.05***
N	1,307	1,307	1,307
French vs German	State share L	State share OR	State share TA
x	-0.667	-2.758***	-7.174***
N	1,982	2,005	2,003
French vs Scandinavian	State share L	State share OR	State share TA
x	-0.570	-2.561***	-5.482***
N	1,660	1,683	1,681
French vs Socialist	State share L	State share OR	State share TA
x	-5.320***	-4.698***	-7.191***
N	2,108	2,131	2,129
German vs Scandinavian	State share L	State share OR	State share TA
x	0.0968	0.197	1.692*
N	1,022	1,022	1,022
German vs Socialist	State share L	State share OR	State share TA
x	-4.653***	-1.941***	-0.0173
N	1,470	1,470	1,470
Scandinavian vs Socialist	State share L	State share OR	State share TA
x	-4.750***	-2.137***	-1.709*
N	1,148	1,148	1,148

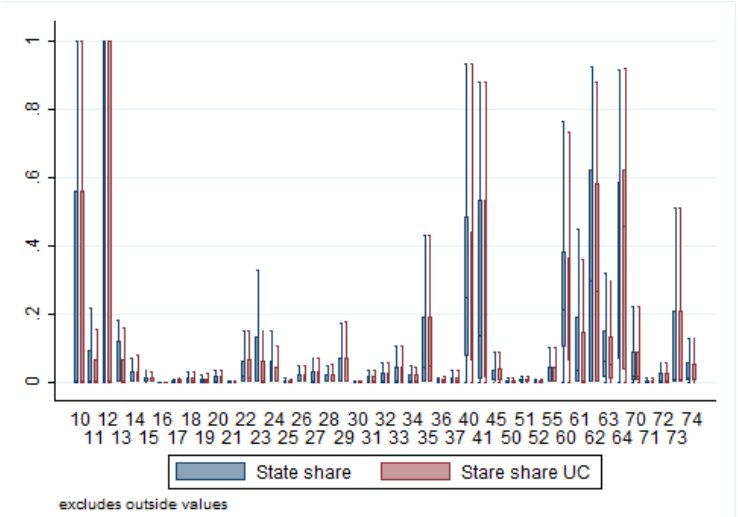
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The table lists the results of a t-test on the mean difference of several measures on SOE presence in the respective regions for our dataset. We calculated the average of the variables in columns over each region in our data. Next we calculated the average for each of these variables in columns over each legal origin separately.

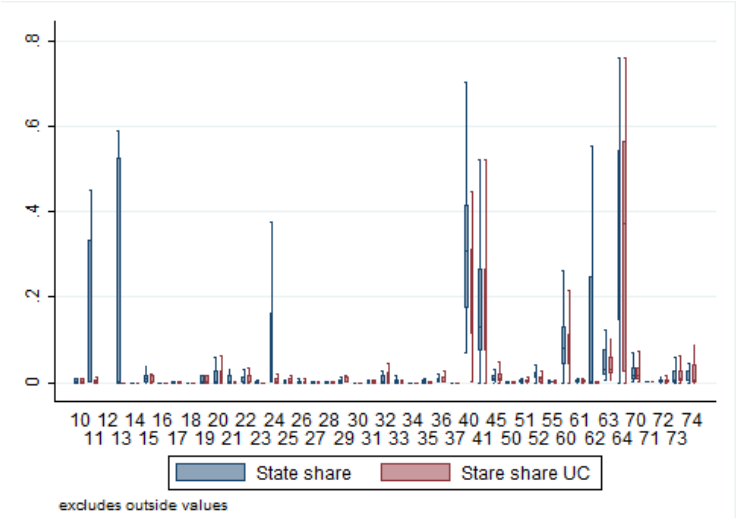
energy, transportation and services sectors. Looking at the Scandinavian legal origin also here we see a fairly large presence over sectors.[31] Here many sectors record at least some presence of state firms. But this to a lesser extent than the countries comprising the socialist legal origin. For the French and German Legal origin state involvement is concentrated and is quite similar across industries, with the French legal origin exhibiting a large state presence in the energy sector (40-41). In the German legal tradition the involvement is somewhat more concentrated in the sectors with codes 60-64. For the French origin we see a spike in sector 35 (manufacturing of other transport equipment). Lastly in the English legal tradition (these are Ireland and the United Kingdom.) We see a large box in sector 40. Also in the sectors 18 and 60-62 we observe a larger government presence. But still the shares in these sectors are smaller comparing this to other legal origins looking at the scale of the y-axis.

[31] This is mainly due to Finland.

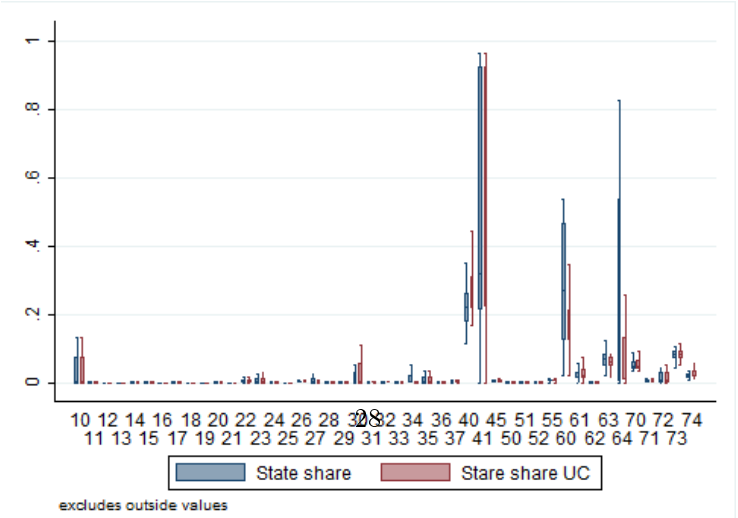
Figure 10a: State share across industries over legal origins (1)



(a) Socialist Legal Origin



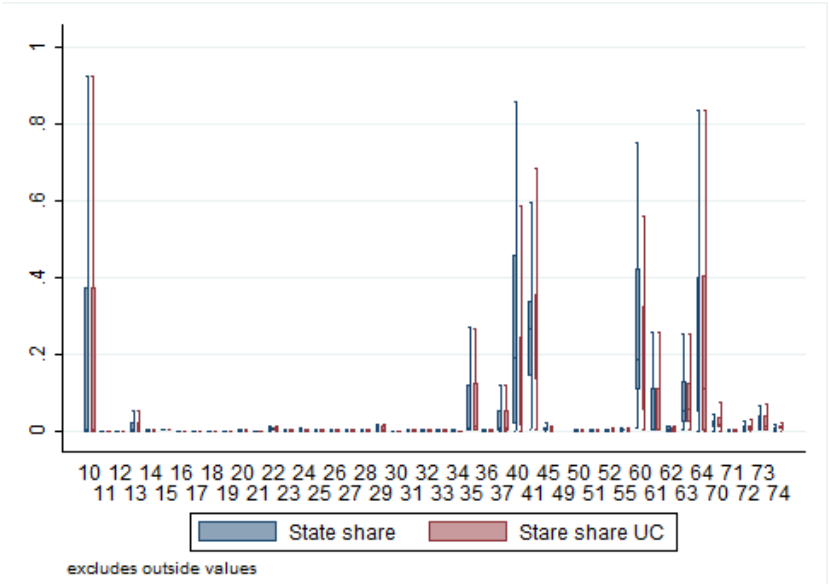
(b) Scandinavian Legal Origin



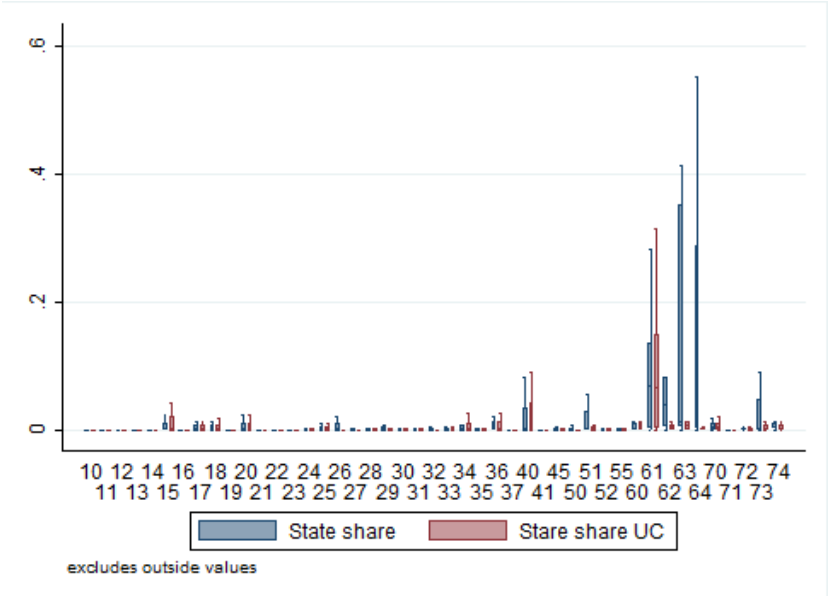
(c) German Legal Origin

Note: See the notes below the next figure.

Figure 10b: State share across industries over legal origins (2)



(a) French Legal Origin



(b) English Legal Origin

Note: Classification based on La Porta et al. (2002). Figures computed for the years 2002-2014. Sectoral classification based on 2-digit NACE revision 1.1.

4 Countries' institutions and state involvement

In this section we try to link some country variables to the presence of state firms in the economy. By doing this, this section aims at assessing the various theories on State Capitalism outlined above. We undertake this exercise via two ways: in one instance we calculate raw correlations between two measures on state firms' presence at the country level and a variety of country variables: measuring financial development, general economic development, political variables and governance variables. We define a countries' state firm share by relying on two similar constructed sectoral measures of state firms (see equation 1): the first by using employment and the second by using operating revenue. Next for each country-year, we calculated a country aggregate by using weights, defined as:

$$W_{jt} = \frac{S_{jt}}{\sum_j S_{jt}} \tag{2}$$

$$W_{jt} = \frac{L_{jt}}{\sum_j L_{jt}} \tag{3}$$

$$W_{jt} = \frac{TA_{jt}}{\sum_j TA_{jt}} \tag{4}$$

In these equations S, L and TA denote sales, employment and total assets. We weigh each sector, for a certain country-year cell, by this specific sector j's share in total output or by it's contribution to total employment or the share in total assets. The data for calculating the weights are derived directly from the AMADEUS dataset.[32] For the definition, interpretation and source of all the independent variables used in tables 6 and table 7, we revert the reader to the appendix table A.3. The table 6 below gives simple correlation coefficients between various country-level variables and the different state share variables:

As stated above, we make a distinction between several categories of variables. À priori one would expect according to the industrial policy view that the lesser developed a country, be it financially or in a broader sense industrially, the higher the share of state firms in that country should be. In a similar spirit the better the institutional environment, i.e. for instance less corruption, independence of courts, etc., the lower the share of state firms should be. In Faccio et al. (2006) the author examines which country factors correlate with the extent to which firms in the respective countries are politically connected. Here the author finds that more corrupt countries and countries with less press freedom have, on average, a higher share of firms with political connections.[33]

[32] Since it is our interest in this section to look for evidence in favour for theories on State Capitalism, we only take into account the shareholdings in firms by domestic government entities to construct our variables.

[33] Even though our analysis looks at shareholdings of various state entities within firms and not directly at elected officials serving as board members for instance as in Bertrand et al. (2007), we expect that these effects should be the same. This due to the fact that we require the largest shareholder to at least have a percentage ownership of 10% in the firm, thus signalling a desire to exert influence and in this sense appoint politically connected managers in the firm.

If politicians set up state firms/buy-up firms for their own benefit (Schleifer and Vishny (1994)) we would expect more firms in corrupt environments, environments where the courts are less independent and less liberties exist. For the social view it is more difficult to state an expected sign. On the one hand we would expect that less equal countries have a higher SOE share, and that governments therefore use these firms to level out wages. Greater inequality and state firms' share can also be in accordance with the political view. In this sense greater inequality serves as a vehicle for the top x% to use their position and contacts to extract rents by means of state firms.
When we look at table 6, quite a lot of variables are strongly significant. The significance, thought not the level, is also stable over the various variables measuring government involvement in the economy. All four financial variables are correlated to a great extent with our measure of state presence. The lesser ATMs/banks per capita and the market value of stocks traded the lower the share of SOEs. The higher the value of the stock market in a country, the higher this share. These variables all favourably point towards appropriateness of the industrial policy view. The latter variable might signal optimising behaviour of politicians. In this sense by buying up shares of firms, politicians wish to benefit from this higher share valuation. All but one variable measuring general economic development (GDP) and sophistication of the economy (export of ICT/high tech equipment...) correlate with our SOE measures. These correlations are also in favour for the industrial policy view. Next when it comes to the variables measuring political freedom (army, political rights, civil liberties) evidence also points towards political theories for state interference. In general it appears that the higher the score/value of these variables, the higher the amount of state shareholdings in the economy. With regard to corruption this correlation is negative. The lower (higher) the level of corruption (political rights/civil liberties), the less state shareholdings. The variables related to government activities (subsidies and taxes) share a negative sign, but only one out of six cells for these is significant. Other variables measuring regulatory burden show a strong significance level.

$$StateShare_{ct} = \beta_c + \beta_X \mathbf{X_{ct-1}} + \beta_{Budget} Budget_{ct-1} + \beta_{Trade} Trade_{ct-1} + \beta_{IMF} IMF_{ct-1} + \epsilon_{ct} \quad (5)$$

Here the variable $\mathbf{X}$ are the variables outlined in table 6. We lag every variable by one year, this to be able to establish some kind of causality. In every regression we control for a variety of variables, which in the past determined the extent to which governments privatised their portfolio of state firms. The variables we control for are a countries' budget balance, it's degree of openness. In the past when opening up to trade countries began to privatise, with the desire of becoming more efficient and competitive. Furthermore the will to enter the European Community required governments to reduce deficits. Also changes in beliefs in favour of budget surpluses determined privatisations (see chapter two in Musacchio and Lazzarini (2014)). With regard to the choice fixed versus random effects, we automate the procedure in Stata and rely on a Hausman test. Furthermore t-statistics are based on robust standard errors. We also include a dummy taking on the value 1 for the year a country received aid from the IMF

and subsequent years. Table 7 can therefore be seen as presenting some "noise-corrected" correlations between the variety of variables and our countries' SOE share variables. In this table 7 our corrected correlations are more in favour for the political view (Political Rights). Two variables, Military Expenditures and Political Rights, appear to be not significant across all alternative dependent variables. After this correction it appears that countries which are more corrupt, have less civil liberties, a larger army and less independent courts have on average a higher presence of SOEs. Some financial variables are significant as well, thought mostly for our measure based on operating revenue. Regarding the economic development variables, GDP per capita is strongly significant, signalling the higher economically developed a country is the lower government shareholdings of firms on average. We find no evidence with regard to industrial sophistication, as well as the extent to which value added is generated by services or manufacturing. Agricultural value added has a positive sign in our estimations, as well as the share of the population living in rural areas. This positive sign and the lacking of significance for our other VA variables, is in favour of the proposition that SOEs act as a means for industrial development or state-led industrialisation (Robinett (2006); Sachs (1996)). That after this initial shift from agriculture to manufacturing/services, governments might withdraw from firms as the initial push towards development has been undertaken.

Table 6: Correlation between various country characteristics and state firms' sector-weighted presence

	(1) Weighted SOE SH Employment		(2) Weighted SOE SH Sales		(3) Weighted SOE SH Assets	
	rho	N	rho	N	rho	N
Financial Development						
ATM Capita	-0.15512**	248	-0.14723**	248	-0.07782	248
Banks Capita	-0.23175***	247	-0.18208***	247	-0.10267	247
S&P Global	0.16103***	298	0.17564***	298	0.18055***	298
Stocks Traded	-0.23551***	236	-0.10713	236	-0.20034***	236
Economic Development						
ln GDP Capita	-0.46706***	298	-0.39858***	298	-0.50082***	298
Export of ICT	-0.35121***	298	-0.36047***	298	-0.37002***	298
Export High Tech	-0.30404***	298	-0.27328***	298	-0.30882***	298
R&D Technicians	-0.28757***	222	-0.19815***	222	-0.24131***	222
Rural Population	0.14336**	298	0.11801**	298	0.21415***	298
Agriculture VA	0.56534***	298	0.46671***	298	0.55523***	298
Manufacturing VA	-0.04455	298	-0.05533	298	0.01042	298
Services VA	-0.35469***	290	-0.34371***	290	-0.29194***	290
Political Variables						
Army	0.33856***	298	0.29795***	298	0.39913***	298
Military Expenditures	0.55410***	285	0.46198***	285	0.48777***	285
Civil Liberties	0.41284***	298	0.46380***	298	0.50127***	298
Civil Liberties V-Dem	-0.42295***	298	-0.43525***	298	-0.46670***	298
Political Rights	0.36455***	298	0.44172***	298	0.46308***	298
Corruption	-0.39061***	297	-0.37096***	297	-0.45960***	297
Court Independence	-0.36095***	298	-0.38421***	298	-0.46309***	298
Governance Variables						
Income share top 10%	-0.09783	276	-0.02369	276	0.01515	276
Subsidies	-0.04746	298	-0.00695	298	-0.07725	298
Tax Revenue	-0.04912	298	-0.06088	298	-0.15618***	298
Procedures Startup	0.49702***	266	0.46683***	266	0.51727***	266
Product Market Regulation	0.45015***	215	0.50653***	215	0.48176***	215
Property Registration	0.31521***	245	0.30170***	245	0.41100***	245

This table presents simple correlation coefficients between the variables listed in the rows and various definitions of state presence in our dataset. Columns with names "N" denote the number of observations for which these correlations are calculated. For definitions and sources of the variables in this table, see tableA.3 in the appendix at the end of this paper. *, ** and *** point to significance of the correlation coefficients at the 10%, 5% and 1% respectively.

Table 7: SOE presence at country level and country characteristics

	(1) Weighted SOE SH Employment	(2) Weighted SOE SH Sales	(3) Weighted SOE SH Assets
Financial Development			
ATM Capita	-0.028**	-0.012	-0.021*
	(-2.40)	(-1.14)	(-1.92)
Banks Capita	0.000	-0.001	-0.007
	(0.01)	(-0.07)	(-0.55)
S&P Global	0.000***	0.000***	0.000**
	(3.99)	(2.77)	(2.21)
Stocks Traded	-0.000***	-0.000*	-0.000***
	(-2.81)	(-1.77)	(-2.64)
Economic Development			
ln GDP Capita	-0.041***	-0.032***	-0.157***
	(-2.98)	(-2.88)	(-4.29)
Export of ICT	-0.000	-0.001	-0.000
	(-0.17)	(-0.88)	(-0.26)
Export High Tech	-0.000	-0.001	-0.001
	(-0.45)	(-1.27)	(-0.64)
R&D Technicians	-0.000	0.000	0.000
	(-1.07)	(1.25)	(0.12)
Rural Population	0.001**	0.001*	0.001**
	(2.42)	(1.89)	(2.01)
Agriculture VA	0.007**	0.005**	0.009***
	(2.32)	(2.12)	(4.10)
Manufacturing VA	0.001	-0.000	-0.000
	(0.79)	(-0.43)	(-0.12)
Services VA	-0.084	0.057	0.204
	(-0.57)	(0.52)	(0.87)
Political Variables			
Army	0.034***	0.012	0.027**
	(3.07)	(1.23)	(2.42)
Military Expenditures	0.006	0.001	0.005
	(0.99)	(0.12)	(0.85)
Civil Liberties	0.019*	0.020**	0.023**
	(1.92)	(2.42)	(2.53)
Political Rights	0.011	0.008	0.016
	(0.86)	(1.05)	(1.24)
Corruption	-0.001**	-0.001***	-0.001***
	(-2.37)	(-3.06)	(-3.92)
Civil Liberties V-Dem	-0.406**	-0.318*	-0.552***
	(-2.18)	(-1.95)	(-3.28)
Court Independence	-0.010	-0.009	-0.021***
	(-1.40)	(-1.52)	(-3.00)
Governance Variables			
Income Share top 10%	-0.002	-0.001	-0.002
	(-0.98)	(-0.59)	(-0.82)
Subsidies	0.001*	0.001	0.001
	(1.68)	(1.53)	(1.62)
Tax Revenue	-0.000	-0.000	-0.001
	(-0.31)	(-0.33)	(-0.63)
Porecedure Startup	0.005**	0.002	0.002
	(2.49)	(1.50)	(1.05)
Product Market Regulation	0.019	0.009	0.007
	(0.88)	(0.51)	(0.40)
Property Registration	0.000***	0.000*	0.000**
	(5.27)	(1.82)	(2.21)

t statistics in parentheses

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

This table presents results of a general regression of the variables in columns on the row variables. Each row variable presents a separate regression. Each regression controls for the budget balance of the government, trade openness and a dummy whether a country has entered into an IMF programme. All independent (control) variables are lagged one period. The type of estimation used depends on the outcome of the Hausman test statistic. For the definition and source of the variables used, see the appropriate table in the appendix. The minimum amount of observations is 177 and the maximum 241.

5 Differentials between state firms and private firms

The previous sections concentrated on a more aggregate level, the country and industry level. In this section we now move over to some analyses at the firm-level. Here we address the issue whether firms which have a government shareholder in their shareholder portfolio have different characteristics regarding a variety of financial and economic variables.[34] Before presenting actual estimations and figures, the first two subsection of this paragraph give an overview on existing theoretical and empirical literature examining differences between these two types of firms. Next we focus on literature examining state firms and TFP and we elaborate on the technique to estimate TFP.

5.a Theoretical and empirical literature on differences

Why should we expect differences between state firms and other firms? Key is to look at the owner's objective function of this kind of firms. In Schleifer and Vishny (1994) a formal model is developed looking at the interaction between a politician (principal) and a manager (agent) of an SOE to explain higher employment and wage levels in state firms. The authors assume a utility function of the politician which depends positivity on excess employment.[35] This is a similar assumption as in Vickers and Yarrow (1991), who model this function as a weighted sum of social welfare and the politician's own welfare. Since politician's are concerned with maintaining excess employment levels, state firms might enjoy favourable conditions, e.g. preferable access to resources, due to a lower probability of default and a higher chance of being bailed-out (Khwaja and Mian (2005);Bennedsen (2000); Faccio et al. (2006)).[36] Do Note that this bailing-out of public firms to maintain a low level of unemployment can also trigger government intervention in the private sector. This is especially the case for firms which are so-called Systemically Important Agents, see **?**. Due to this lower chance of default, managers of SOEs therefore have lower incentives for cost-minimisation, since a threat of closure by state officials is simply not credible Cavaliere and Scabrosetti (2008). Also it might be difficult to set an objective for state firms, since elected officials may have changed during the existence of the firm Megginson and Netter (2001). The fact that shares of many SOEs are non-traded does not allow the stock market to play its monitoring role and shields this SOEs from a takeover, thereby lowering managerial incentives to increase efficiency Sheshinski and López-Calva (2003). It can also be argued that SOEs achieve a higher efficiency than private firms. This because governments also value a higher consumer surplus for their voters, thereby demanding low prices and an efficient functioning of SOEs Cavaliere and Scabrosetti (2008). A variety of articles takes on an empirical perspective. These articles examine for

[34] Our main interest however concentrates on differentials in employment level, wage level, efficiency (TFP) and profitability (roa).

[35] This excess employment is the amount of employment in addition to the level of employment needed to efficiently produce a firm's output.

[36] Also the pressure of interest groups, e.g. labour unions, might contribute to this excess, and hence a lower productivity, (Bennedsen (2000); Cavaliere and Scabrosetti (2008)).

instance impacts of state ownership on the cost of debt (Borisova et al. (2015)), performance and debt levels (Dewenter and Malatesta (2001); Boubakri et al. (2012)), corporate governance (**?**) and firm value during crises (Beuselinck et al. (2017)).

5.b Efficiency (TFP) of state firms: literature and estimation

Research on the state firms has examined to a great extent how state ownership can impact performance and has looked at the consequences of privatisation, by assessing the change over a variety of indicators. A couple of empirical studies within a variety of settings on the matter are Claessens and Djankov (2002), Dewenter and Malatesta (2001), Omran (2004) and for an excellent overview, see Megginson and Netter (2001). All papers arrive more or less to the same conclusion: privatization increases sales, labour productivity and profitability.[37] The article by La Porta and López-de Silanes (1999) examines the consequences of privatisation episodes for a dataset comprising virtually every privatised Mexican firm. They find in line with the above evidence that profitability improves, firms downsize with respect to, blue- and white-collared, labour and investment increases.[38] For their panel of eight European countries, Armoldus et al. (2016) find that state firms are less productive and allocative efficiency tends to be lower the higher state-intensive an industry. The authors rely on a similar methodology as we do in this article to measure productivity. A couple of articles focus on Total Factory Productivity. By means of a Data Envelopment Analysis, the results in Arocena and Oliveros (2012) uncover that Spanish SOEs are *not* the most inefficient companies within their respective industries, but that their productivity improves after privatization. In contrast Saygili et al. (2001) does not find any evidence on this for a small sample of firms within the Turkish cement industry. In Boardman et al. (2016) beneficial long run effects of privatisation Canadian firms are demonstrated. Productivity of privatised firms keeps on increasing, even in the long run, contributing to welfare gains for Canada worth amounting to billions of dollars.[39]

In order to estimate this TFP, we rely on the estimation method by Olley and Pakes (1996) who develop a semi-parametric estimation procedure to deal with two well known issues in the estimation of productivity, the endogeneity bias and selection bias. If we take a simple Cobb-Douglas production function in

[37] A cautionary note however is given in Dewenter and Malatesta (2001). Even though privatisation is associated with increasing profitability, the majority of this increase took place before this transfer in ownership. So government managers are perfectly capable of running these companies in profitable manner.

[38] The authors have survey responses at their disposal. When asked what the main reason was for the increase in profits after privatisation, respondents claimed the replacement of former management and new production processes.

[39] In Boardman et al. (2009) a formal cost-benefit analysis is undertaken to investigate the welfare impact of the privatisation of Canadian National Railway (CN) in 1995. Estimates point to a welfare increase amounting to 4 billion dollar in the authors' conservative case. Their benchmark case estimates this increase to be far higher, as amounting to 15 billion dollar.

logs:

$$y_{it} = \alpha_0 + \alpha_l l_{it} + \alpha_k k_{it} \alpha_m m_{it} + \omega_{it} + \epsilon_{it} \tag{6}$$

Typically the researcher interested in estimating production functions and productivity ($\alpha_0; \omega_{it}$) has to rely on balance-sheet information, reporting information on the use of labour (l), materials (m) and capital (k) for each firm. The researcher has no information on the level of productivity of firms in the dataset. This productivity level is part of the error term. The endogeneity bias states that as productivity is part of the error term in this specification, the estimated elasticities ($\alpha_k; \alpha_l; \alpha_m$) will be biased, because a firm will base it's input use on it's productivity. The extent of this bias depends on the characteristics of the input, fixed or variable. Therefore the error term and the inputs in the equation above will be correlated. For an intuitive overview on this and estimation procedures Van Beveren (2012). As stated above, in Olley and Pakes (1996), the authors circumvent this issue by using a two-step estimation procedure, relying on a proxy variable the amount of investment of a firm. We use the method by Levinsohn and Petrin (2003b) who advocate using an alternative proxy, material inputs.[40] We draw on the method by Wooldridge (2009). Here the author demonstrates that the LP-estimator (Levinsohn-Petrin) can be estimated in a GMM-framework. If estimated in this way standard-errors are more convenient to obtain and the estimator is more efficient and the estimates do not suffer from autocorrelation. Furthermore his approach solves issues with regard to the timing of input use.

5.c State ownership and firm outcomes empirical estimations

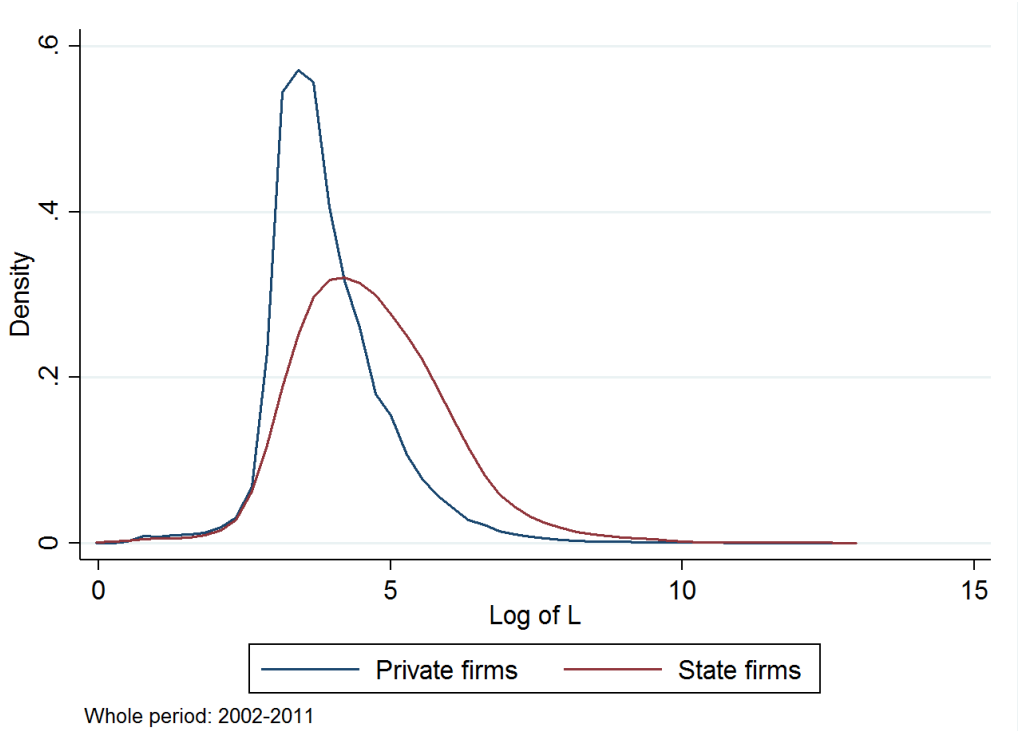
Before moving to figures and regression tables, we elaborate on the applied cleaning measures. We cleaned the data used for this part along several lines. First firm-year combinations with simultaneously missing values for total assets, number of employees, fixed assets and operating revenue were dropped. Next firms with in any given year in the sample, with negative values for the variables: age, total assets, number of employees or sales were dropped entirely from our sample. Since we take logs out of several variables, number of employees being one, firms with 0 employees drop out. Next we drop firms with consolidated accounts and firms with growth rates in number of employees exceeding 100% in absolute value. Also firms with on average an employment number smaller than 20 were excluded. After all these steps, we end up with 572,120 firms and 2,782,245 observations. On average a firm is 4.86 year in the sample.

The first two figures, figure 11 and figure 12, in this section give an overview of the distribution of employment hereby comparing state firms and (always) private firms without foreign ownership, this over the whole dataset for all the years. The second figure does this for each legal origin separately. On average

[40] They advocate using material or energy inputs, due to the reason that investment for many firms in zero or negative. Their procedure works in a similar manner as Olley and Pakes (1996).

over all the data we have in our sample used in this section, we see that for state firms the employment distribution is to the right. The same is true when we redo the analysis for each legal origin country. A noticeable difference however is the kernel plot for the German legal tradition. Here both distributions closely coincide with each other, rendering only a small difference with regard to employment numbers between private and state firms.[41]

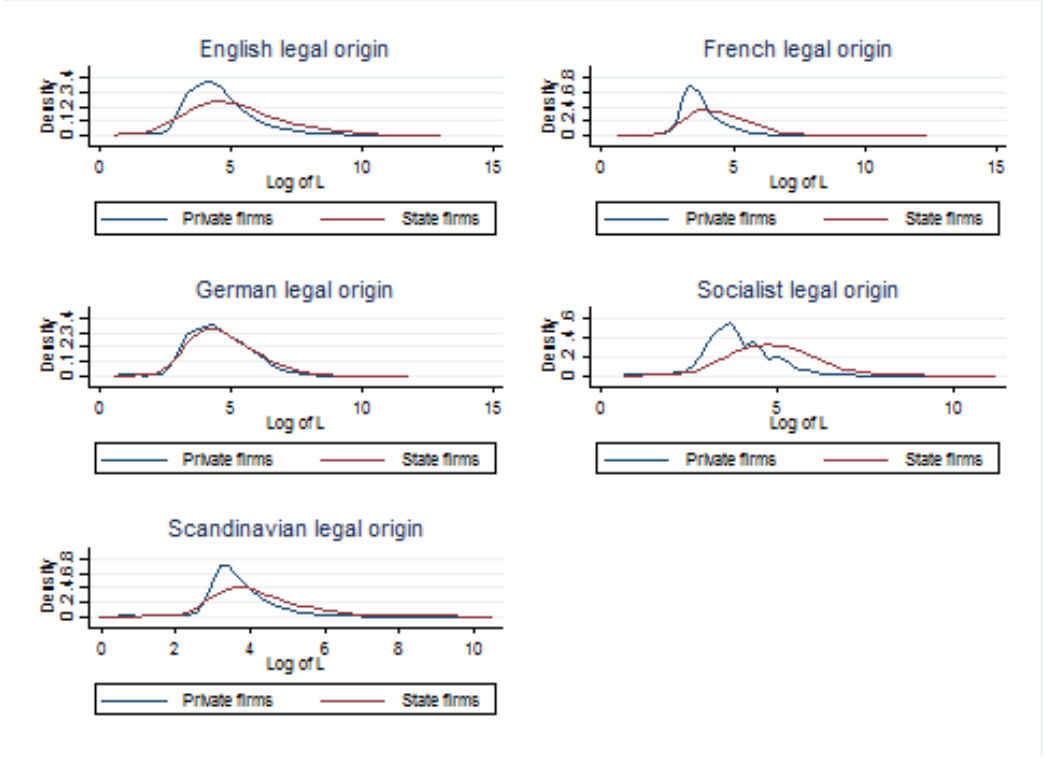
Figure 11: Private firms' and state firms' employment distribution



Note: The type of Kernel used is a standard Epanechnikov kernel. The bandwidths used are of the Silverman rule-of-thumb, as described in (Henderson and Parmeter, 2015, p. 32-33). Firms with on average less than 20 employees were removed from the dataset.

[41] Kolmogorov-Smirnov tests for the equality of these densities all reject the hypothesis that the distribution for private firms does *not* contain smaller values with regard to number of employees in the entire dataset, as for every legal origin.

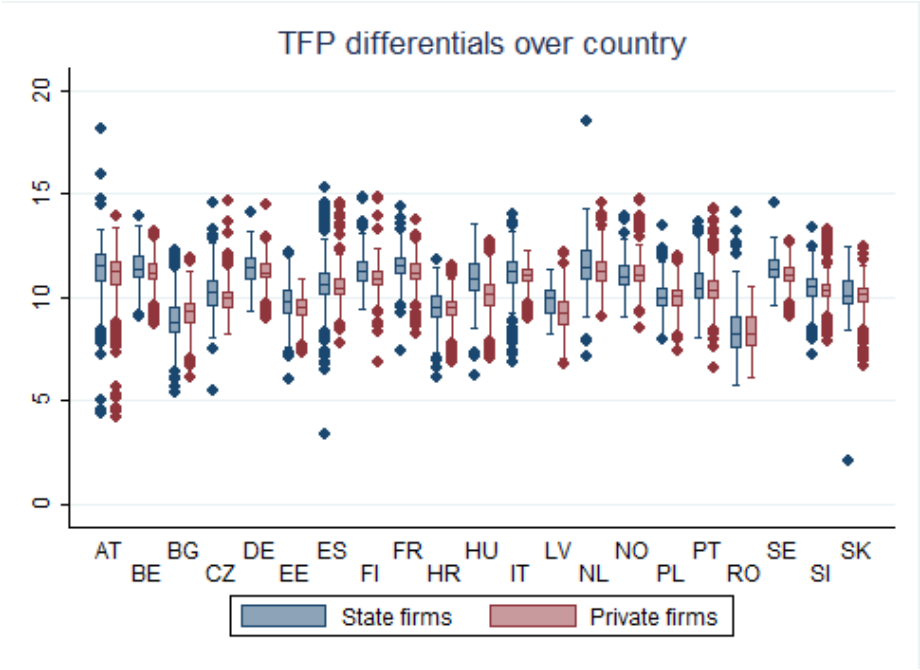
Figure 12: Employment distribution across legal origins



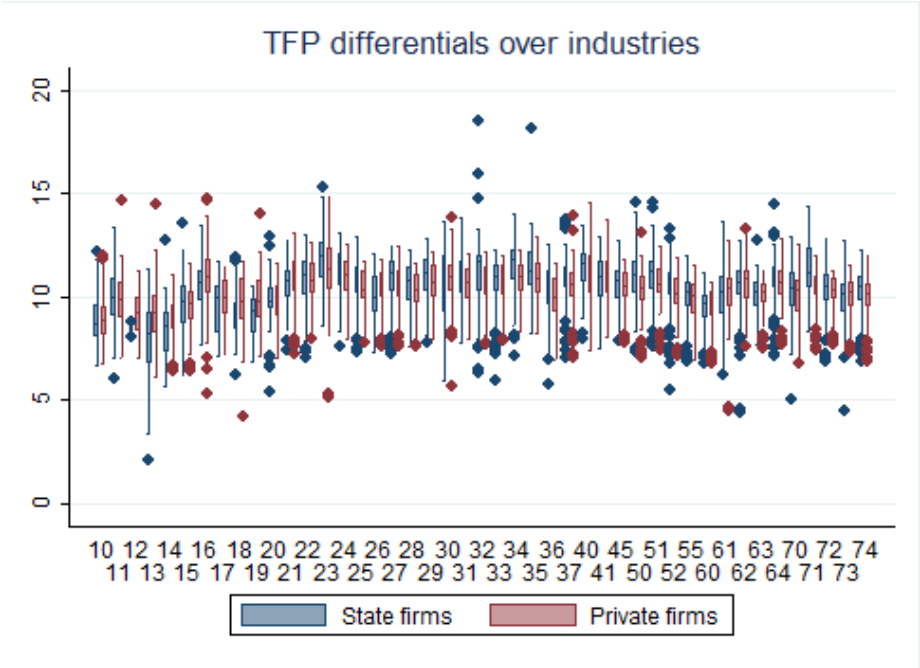
Note: A standard Epanechnikov kernel is used for each figure. The Silverman rule-of-thumb bandwidths are used, as described in (Henderson and Parmeter, 2015, p. 32-33). Firms with on average less than 20 employees were removed from the dataset.

Next we examine differences with regard to TFP across countries and sectors, see figure 13a and figure 13b. Looking at figure 13a, for most countries we do not see any difference between private and state firms. For a few countries the boxes do not overlap, or overlap slightly: EE, LV and SE (Estonia, Latvia and Sweden). Looking at the industries (see figure 13b) the picture is rather similar (in sectors 30, 34 and 64 there is only a slight overlap). Of course these figures do not apply any controls. Therefore we estimate a bunch of regressions, following the method in Bernard et al. (2007) and Geishecker et al. (2009), who focus on exporters and multinational firms respectively.

Figure 13: Total Factory Productivity differential between private and state firms



(a) Country differential



(b) Industry differential

Note: These figures present the distribution of TFP across state firms and private firms.

We estimate regressions according to the equation below:

$$ln\mathbf{Y_{it}} = \beta_0 + \beta_z Z_{it} + \beta_{for} FD_{it} + \beta_{soe} State_{it} + \eta_c * \eta_j * \eta_t + \epsilon_{it} \qquad (7)$$

In every regression we control for firm-level characteristics (Z), the firm's age and the number of employees (logs) in the previous period.[42] Besides these variables, we control for a firm's foreign ownership status, by means of a foreign ownership dummy (FD) indicating if a foreign owner owns at least 10% within the respective firm. Regarding state ownership, we explicitly take into account the extent of state-ownership by making use of the observed stake due to state shareholders within the firm. This allows us to calculate for instance directly the productivity differential for firms with for instance 50% state ownership, vis-à-vis firms with 65% ownership.[43] Included in the estimations are the most strict fixed effects at the country-industry-year-level. We cluster standard errors at the country-industry level (see Moulton (1990)). Moreover we estimate this regressions only for firms which have a number of employees higher than 19 on average, since AMADEUS tends to be somewhat more representative for these firms. The main variables we concentrate on are differentials with regard to the level of employment, wages, TFP and return on assets (roa). An overview of these variables is given in table 8, in which summary statistics are presented divided by the type of firm, for the estimation sample.[44]

Looking at the table above we see that state firms and private firms tend to differ over several variables. On average state firms are older, less profitable, have more employees per level of sales and have a higher wage costs and are more productive. Of course these numbers in the table above are simple averages without any controls and including outliers. In what follows we do apply a bunch of controls and exclude outliers. Table 9 presents our base estimation in assessing differences between a variety of firm types. Here we assess differences over four variables, which we call our "main" variables.

[42] In regressions for which the number of employees per sales acts as a dependent, we control for the total assets during the previous period. In addition for regressions where ln Wage Cost per worker acts as a dependent, we include and control for ln TFP as well and the lag of total assets. We excluded outliers for these estimations. Firms with a value for a variable in the vector on the left-hand side below the first percentile or above the 99th percentile in a country-industry-year-size cell were excluded. Here four size categories are defined: micro (employment between 1-20), small (employment between 19 and 50), medium (employment between 49 and 250) and large (employment above 249.).

[43] Note that the scale of our percentage state ownership variable runs from 0 to 1.

[44] Do note that for our estimation sample we have only included firms for which we were able to calculate the TFP. This means that some countries, six in total, drop out for the estimations entirely.

Table 8: Summary statistics state firms vs private firms in regression sample.

	N	Mean	Median	SD	Min	Max
Private Firm						
Age	2,379,313	23.48	19.00	18.20	1.00	150.00
ln Employment*	2,379,313	-11.60	-11.65	1.36	-25.21	0.00
ln Wage Cost**	2,047,209	13.94	13.98	1.33	0.00	25.59
ln TFP	1,837,585	10.37	10.52	1.22	-9.44	20.07
roa	1,435,240	0.23	0.08	0.41	0.00	1.68
Investment to Assets	1,78,7158	0.35	0.29	0.30	0.00	1.68
Cash Flow to Assets	2,057,207	0.13	0.06	0.17	0.00	1.00
Export to Sales*	162,020	0.03	0.25	2.94	-14.99	15.68
Intangibles to Assets	2,088,842	0.02	0.00	0.07	0.00	1.00
ln Sales Productivity	2,379,313	11.60	11.65	1.36	0.00	25.21
Assets per Worker	2,365,791	11.49	11.44	1.48	-5.93	24.86
LT Debt to Assets	1,933,104	0.20	0.04	0.45	0.00	3.37
Taxrate	1,761,102	0.23	0.23	0.38	-1.21	2.45
HHI	1,507,443	0.01	0.00	0.03	0.00	1.00
State firm						
Age	72,345	26.58	18.00	23.46	3.00	150.00
ln Employment	72,345	-11.67	-11.65	1.80	-23.28	0.00
ln Wage Cost	65,278	14.84	14.80	1.43	2.49	27.55
ln TFP	56,029	10.53	10.57	1.40	-0.05	18.68
roa	47,939	0.17	0.07	0.30	0.00	1.68
Investment to Assets	57,187	0.54	0.55	0.37	0.00	1.68
Cash Flow to Assets	64,044	0.11	0.05	0.16	0.00	1.00
ln Export to Sales	4,021	0.47	0.79	2.73	-11.33	10.63
Intangibles to Assets	65,127	0.03	0.00	0.09	0.00	1.00
ln Sales Productivity	72,345	11.67	11.65	1.80	0.00	23.28
Assets per Worker	72,095	12.38	12.24	1.82	-4.01	21.68
LT Debt to Assets	62,557	0.17	0.00	0.41	0.00	3.37
Taxrate	61,738	0.19	0.17	0.37	-1.21	2.45
HHI	40,094	0.02	0.00	0.07	0.00	1.00

Note: * This variable is measures as the natural log of the number of employees to the sales of the respective firm. ** This variable is the log of cost per employee. *** This variable is only available for two countries: Croatia and France.

Table 9: State firms and private firms productivity differential.

	ln Employees	ln Employees	ln Wage Cost	ln Wage Cost	ln TFP	ln TFP	roa	roa
Foreign Dummy	-0.162***	-0.163***	0.148***	0.148***	0.263***	0.264***	0.014***	0.014***
	(-12.56)	(-12.57)	(15.40)	(15.42)	(16.76)	(16.77)	(11.28)	(11.26)
Listed	0.533***	0.533***	0.089***	0.089***	-0.250***	-0.250***	-0.024***	-0.024***
	(13.76)	(13.76)	(4.87)	(4.87)	(-9.41)	(-9.41)	(-10.30)	(-10.30)
SOE*Listed	-0.185**	-0.193**	0.017	0.021	0.047	0.051	0.016***	0.016***
	(-2.11)	(-2.21)	(0.35)	(0.44)	(0.62)	(0.68)	(2.66)	(2.66)
Crisis*SOE	0.123***	0.123***	0.079***	0.079***	-0.042*	-0.042*	0.001	0.001
	(3.46)	(3.44)	(3.98)	(3.99)	(-1.76)	(-1.74)	(0.43)	(0.42)
State SHH	0.513***		0.138***		-0.403***		-0.038***	
	(9.23)		(5.62)		(-11.36)		(-15.07)	
Domestic State SHH		0.510***		0.140***		-0.401***		-0.038***
		(9.17)		(5.65)		(-11.30)		(-15.03)
Domestic State SHH*Foreign Dummy		0.569***		-0.335***		-0.368**		-0.003
		(3.13)		(-3.90)		(-2.03)		(-0.15)
N	2,782,245	2,782,245	2,139,348	2,139,348	2,149,223	2,149,223	2,187,605	2,187,605
adj. R^2	0.449	0.449	0.800	0.800	0.751	0.751	0.130	0.130

t statistics in parentheses

Estimations include country-industry-year effects. Standard errors clustered at the country-industry level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In the table 9 we make an explicit distinction between the type of government investing in the firm in question. First we use a broad state variable (State SHareHoldings) and for some models we wish to know the effect of a domestic government investing in the firm (Domestic State SHareHoldings).[45] We make this distinction because we believe that domestic governments have different orientations and objectives than governments investing abroad. Domestic governments should act more in the spirit of Schleifer and Vishny (1994) and pursue political/social goals more pronouncedly. Looking at the table in general we see that SOEs employ more people, have a higher wage cost and are less profitable and efficient. The values of the coefficients are economically significant. For our ln TFP for example, firms with 100% of state ownership (of any kind) are on average 40% less efficient than firms with 0% state ownership. For firms characterised by full ownership of any domestic government, the efficiency effect even worsens. These firms are also on average 40% less efficient. Looking at some interactions we see that SOEs listed on a stock exchange are more profitable on average. This might suggest that some sort of financial disciplining is in effect. Our Crisis*SOE variable is also significant for a few variables. After the crisis SOEs seem to employ more personnel and have a higher wage cost. This table confirms the results as in Armoldus et al. (2016), but for a much wider sample of countries and industries.

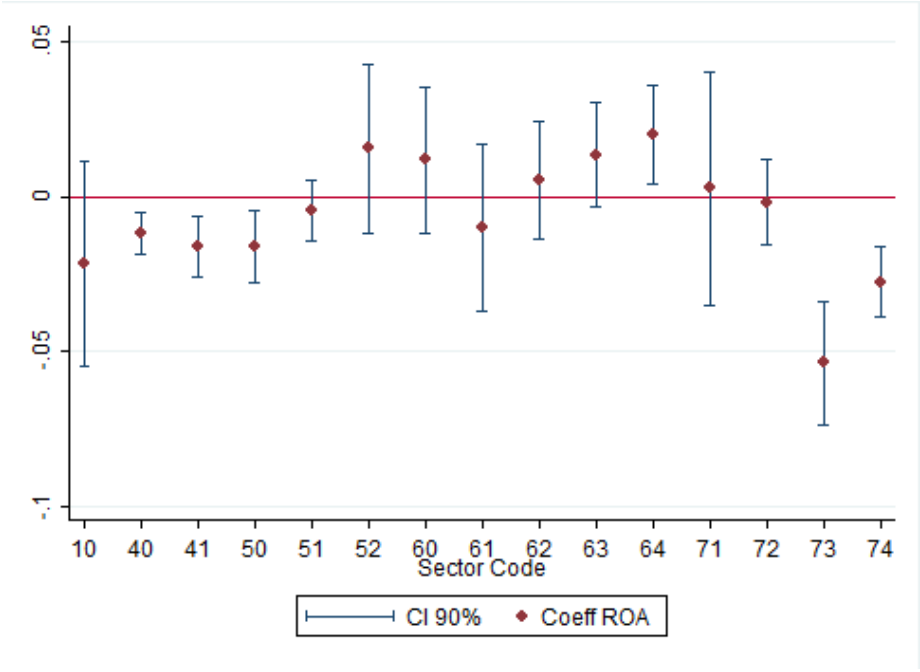
In figure 14 we compare TFP and ROA across a couple of sectors, sectors which we choose based on a large government presence and/or based on sectors for which the OECD constructs indicators on Product Market Regulation (PMR). In Wölfi et al. (2010) the construction of these indices is outlined. The OECD constructs these indices to examine the extent to which certain sectors (the sectors in the figures, excluding sector 10) are regulated. One of the aspects the OECD looks at is the extent to which SOEs are active in these sectors. The figure below presents the result of this exercise.

Looking at the two parts in this figure we see that for five out of the fifteen included industries state firms on average have a lower profitability than their counterparts. For our productivity variable this balance is even more in favour for private firms, as in five out of the fifteen included industries on average private firms are more efficient. In some sectors this difference is striking. In sector 60 for instance (transport by rail) on average state firms are about 40% less productive, but are on average as profitable as their private counterparts. Even though for most sectors with a large amount of state ownership TFP is on average equal across the two types of firms, the lower efficiency of SOEs magnifies the importance of the question whether these firms should be state-owned in the first place. In light of the increasing competition, we can expect that if these factors do not get better, things will get worse for SOEs once the sectors have been fully opened-up for private competition.[46]

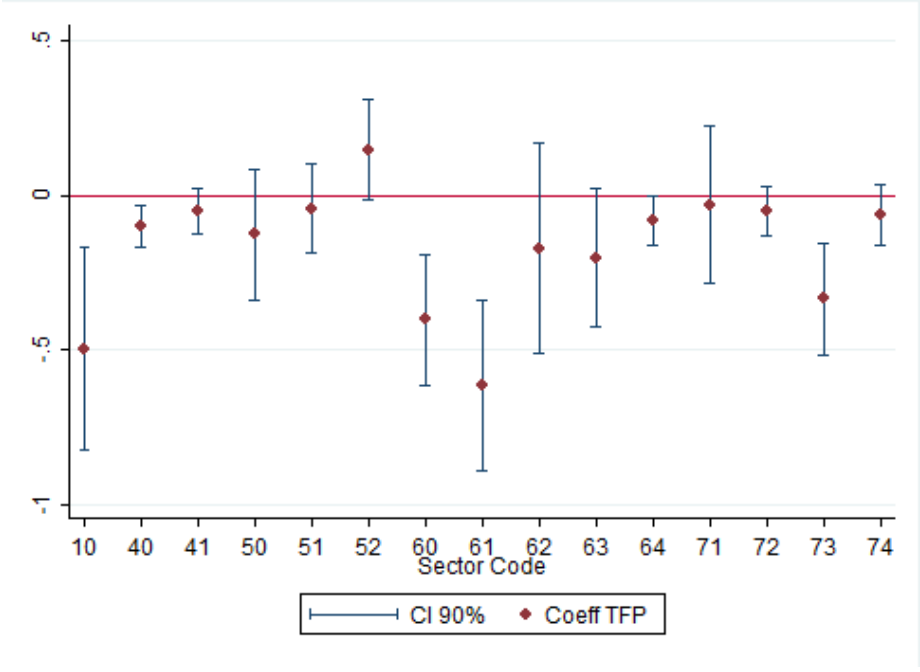
[45] For the latter in order to make a good comparison we include an interaction with the foreign ownership dummy. By doing this we account for the possibility that foreign (be it a foreign state or private firm) might have a differential impact on our Domestic State SHH variable.

[46] In a similar spirit as in Melitz (2003) we can expect that once these sectors have fully-opened up to private firms, entry increases and less productive firms exit the industry. Also market shares will shift towards more productive firms. Taking the lower productivity level of SOEs into account, this implies that we can expect a higher probability of an SOE exit, and that SOEs' market shares in the market will be lower.

Figure 14: ROA and Total Factory Productivity differential across several sectors



(a) Industry differential roa



(b) Industry differential TFP

Note: Width of the graphs are 90% confidence interval for the coefficients on ROA or TFP, estimated over the sectors on the X-axis. The applied estimation is similar as is used in all the tables. The description for sector codes can be found in the appendix.

In the table 10 we have allowed heterogeneity with regard to the legal origins we have in our data. For these estimations we have four of these origins: French, German, Scandinavian and socialist. Here the socialist legal origin serves as our base case. So if we were to look at the coefficients for State SHH (SHareHoldings) and Domestic State SHH, this is valid for the socialist legal origin only. In the table we see that there is a fair amount of heterogeneity across legal origins. Even though the base results in table 10 corresponds to a large extent to the one in table 9, we notice that not in every legal origin state firms are bigger employers (Scandinavian legal origin) or have a higher wage cost (German). Interestingly for our ln TFP variable we see that for all legal origins, excluding French, the coefficients are not statistically different from the socialist legal origin.

In the following three tables we take a flexible approach in the sense that we interact several institutional variables with our variables describing state ownership in firms. In table 11 we look at the interaction between the level of corruption in a country and our state variables from our previous tables and examine whether the level of corruption correlates with the employment/wage/TFP level and the profitability of state firms. In table 12 we do the same but we examine the extent to which economies are regulated. Here we use the OECD PMR variables. Table 13 interacts the level of GDP in a country with the state variables. Table 11 below provides results for the interaction with our state variables and the level of corruption. Globally we see that state firms are on average larger with regard to employment over sales, have a higher wage cost per employee and are less profitable on average. Moreover looking at the interaction with corruption we see that in all specifications these are significant, signalling that the environment and the level of corruption therein, has an impact on a firm's outcome with regard to these variables. A less corrupt environment might enforce (be due to) higher transparency regarding the way SOEs are run, and therefore decrease the scope for politicians to behave self-interested. To be more concrete the lower the level of corruption the more efficient (profitable) an SOE is run (becomes). Also the level of employment within an SOE declines as well as the wage cost. These interactions allow us to calculate the level of corruption for which an SOE's employment level does not differ from a private firm. Looking at the coefficients in model one, if the level of corruption exceeds 175, so above the upper bound for the index, then on average state firms and private firms do not differ with regard to the number of people they employ.

In table 12 above we look at the interaction with the level of PMR, the extent to which a country regulates industries across a variety of dimensions. Broadly we see that the level of PMR interacts significantly with all but one of our "main" variables (ln Employment). Here a higher PMR-level (more regulation) increases the extent to which SOEs employ more workers, have a higher wage cost and reduces profitability. A higher level of PMR, and hence regulation, shields of competition and this might broaden the scope for state firms to employ more workers. A state firm might enjoy a more comfortable position due to the lack of competitors.[47] In fact we see in the last column that the interaction of PMR

[47] This positive interaction might also signal a general desire of the respective country to intervene in the economy by state firms in addition to regulation. State firms might be seen as a complementary measure to achieve regulation, or even a substitute to regulation (see Brandao and Castro (2007)).

Table 10: State firms and private firms productivity differential across legal origins.

	ln Employees	ln Employees	ln Wage Cost	ln Wage Cost	ln TFP	ln TFP	roa	roa
Foreign Dummy	-0.162***	-0.162***	0.148***	0.148***	0.263***	0.263***	0.014***	0.014***
	(-12.55)	(-12.54)	(15.39)	(15.39)	(16.76)	(16.75)	(11.29)	(11.29)
Listed	0.534***	0.534***	0.088***	0.088***	-0.250***	-0.250***	-0.024***	-0.024***
	(13.76)	(13.76)	(4.85)	(4.84)	(-9.40)	(-9.40)	(-10.28)	(-10.28)
SOE*Listed	-0.196**	-0.196**	0.009	0.009	0.041	0.041	0.016***	0.016***
	(-2.25)	(-2.25)	(0.18)	(0.18)	(0.53)	(0.53)	(2.59)	(2.59)
Crisis*SOE	0.123***	0.123***	0.080***	0.080***	-0.042*	-0.042*	0.001	0.001
	(3.52)	(3.52)	(4.05)	(4.05)	(-1.77)	(-1.77)	(0.34)	(0.33)
State SHH	0.585***		0.170***		-0.370***		-0.035***	
	(9.06)		(5.11)		(-5.80)		(-11.89)	
State SHH*French	0.620***		0.113***		-0.383***		-0.022***	
	(4.65)		(4.15)		(-4.45)		(-5.41)	
State SHH*Scandinavian	0.106		0.626***		-0.344***		-0.062***	
	(0.76)		(3.59)		(-6.64)		(-7.73)	
State SHH*German	0.431***		-0.058		-0.506***		-0.046***	
	(2.99)		(-0.84)		(-11.21)		(-7.90)	
Domestic State SHH		0.585***		0.170***		-0.371***		-0.035***
		(9.07)		(5.11)		(-5.80)		(-11.86)
Domestic State SHH*French		0.621***		0.113***		-0.383***		-0.022***
		(4.66)		(4.15)		(-4.45)		(-5.41)
Domestic State SHH*Scandinavian		0.110		0.627***		-0.344***		-0.062***
		(0.77)		(3.59)		(-6.65)		(-7.73)
Domestic State SHH*German		0.431***		-0.058		-0.506***		-0.045***
		(2.99)		(-0.84)		(-11.23)		(-7.84)
N	2,782,245	2,782,245	2,139,348	2,139,348	2,149,223	2,149,223	2,187,605	2,187,605
adj. R^2	0.449	0.449	0.800	0.800	0.751	0.751	0.130	0.130

t statistics in parentheses

Estimations include country-industry-year effects. Standard errors clustered at the country-industry level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 11: State firms and private firms differentials and the level of corruption

	(1) ln Employees	(2) ln Employees	(3) ln Wage cost	(4) ln Wage cost	(5) ln TFP	(6) ln TFP	(7) roa	(8) roa
Foreign Dummy	-0.156***	-0.156***	0.193***	0.193***	0.262***	0.262***	-0.005***	-0.005***
	(-39.13)	(-39.09)	(55.58)	(55.58)	(50.69)	(50.63)	(-7.66)	(-7.74)
SOE*Listed	-0.087	-0.080	-0.031	-0.023	-0.052	-0.062	0.011*	0.007
	(-1.37)	(-1.26)	(-0.73)	(-0.53)	(-0.96)	(-1.16)	(1.69)	(1.13)
Crisis*SOE	0.103***	0.106***	0.098***	0.098***	-0.008	-0.009	-0.003	-0.004**
	(6.58)	(6.81)	(10.77)	(10.85)	(-0.74)	(-0.80)	(-1.58)	(-1.99)
State SHH	0.875***		0.660***		-0.424***		-0.056***	
	(14.81)		(17.84)		(-8.84)		(-10.74)	
Corruption*State SHH	-0.005***		-0.009***		0.000		0.000***	
	(-5.36)		(-15.68)		(0.69)		(2.99)	
Domestic State SHH		0.881***		0.665***		-0.434***		-0.057***
		(14.65)		(17.67)		(-8.91)		(-10.77)
Corruption*Domestic State SHH		-0.005***		-0.009***		0.000		0.000***
		(-5.26)		(-15.43)		(0.69)		(2.98)
N	2,675,634	2,675,634	2,419,036	2,419,036	2,432,814	2,432,814	1,755,945	1,755,945
adj. R^2	0.632	0.632	0.850	0.850	0.770	0.770	0.066	0.066

t statistics in parentheses

Standard errors clustered at the country-industry level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 12: State firms and private firms differentials and Product Market Regulation

	(1) ln Employment	(2) ln Employment	(3) ln Wage costs	(4) ln Wage costs	(5) ln TFP	(6) ln TFP	(7) roa	(8) roa
Foreign Dummy	-0.165***	-0.165***	0.182***	0.182***	0.267***	0.267***	-0.005***	-0.005***
	(-38.11)	(-38.04)	(48.43)	(48.40)	(47.23)	(47.17)	(-6.00)	(-6.10)
SOE*Listed	-0.044	-0.039	0.006	0.007	-0.085	-0.091	0.021*	0.015
	(-0.42)	(-0.38)	(0.09)	(0.10)	(-0.89)	(-0.95)	(1.87)	(1.36)
Crisis*SOE	0.114***	0.116***	0.116***	0.115***	0.005	0.004	-0.004*	-0.005**
	(6.83)	(7.00)	(11.23)	(11.15)	(0.44)	(0.35)	(-1.85)	(-2.15)
State SHH	0.379***		-0.352***		-0.572***		0.003	
	(3.57)		(-5.38)		(-6.19)		(0.33)	
PMR*State SHH	0.077		0.249***		0.118**		-0.025***	
	(1.26)		(6.33)		(2.01)		(-4.33)	
Domestic State SHH		0.385***		-0.337***		-0.577***		0.003
		(3.58)		(-5.10)		(-6.22)		(0.28)
PMR*Domestic State SHH		0.077		0.243***		0.116**		-0.025***
		(1.23)		(6.10)		(1.96)		(-4.31)
N	2,445,153	2,445,153	2,194,430	2,194,430	2,205,534	2,205,534	1,566,482	1,566,482
adj. R^2	0.638	0.638	0.848	0.848	0.692	0.692	0.066	0.066

t statistics in parentheses

Standard errors clustered at the country-industry level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

with our state variables is negative. So even though if we assume that regulation shields of competitors, the SOEs on average do not seem to benefit from this into becoming more profitable.

The last interaction we assess is the one between the log of GDP per capita and our state variables. Also here we see that a higher level of GDP per capita reduces the average size of SOEs and wage cost. The TFP-level is positively correlated with this interaction as is the roa. A higher GDP might reduce the need for SOEs participating in the economy, since a vivid competitive economic environment might already be established. This lowers the need for state firms creating linkages or building up sectors from the bottom-up (as emphasised by the industrial policy view). When we look at a couple of tipping points for roa and ln TFP for instance, a minimum ln GDP per capita above 12.92 and 20.25 is required respectively to counterbalance the negative effect for firms for having a State SHH.

In table 14 below we look at the difference across a variety of other financial variables and how this varies with the degree of state-ownership within a firm. On average state firms have a higher level of indebtedness, are larger, are less innovative (a lower degree of intangible assets over total assets) and tend to invest more. On average the higher the level of government participation in firms, the lower the cash-flow over assets (consistent with results in Megginson et al. (2014)). This higher asset and investment ratio might point towards an empire-building orientation of managers of state firms (Aggarwal and Samwick (2006)), as well as enjoying the privilege of soft-budget constraints. Interestingly state firms pay a lower amount of taxes over profits on average. This coefficient is even larger the higher the stake of domestic governments. Also the ratio exports to sales is on average lower for state firms. As politicians have a desire to serve their constituents, the orientation of sales towards the domestic market increases industry supply and lowers prices for consumers.[48]

Table 15 then looks at the growth rate of our main variables. On average state firms exhibit a lower growth in profitability and to our surprise wages. After the economic crisis however this sign reverses. Even though state firms on average have a higher employment level, the growth rate of employment is on average the same. After the economic crisis state firms have a lower growth rate. For TFP this growth rate tends to be higher on average afterwards.

[48] Another reason might be the lower TFP level of firms with state investors. As a sufficient level of TFP is needed to overcome costs associated with exporting, see Bernard et al. (2007). Even after controlling for TFP this export to sales ratio is negative and significant.

Table 13: State firms and private firms interaction with GDP

	(1) ln Employment	(2) ln Employment	(3) ln Wage costs	(4) ln Wage costs	(5) ln TFP	(6) ln TFP	(7) roa	(8) roa
Foreign Dummy	-0.157***	-0.157***	0.193***	0.193***	0.262***	0.262***	-0.005***	-0.005***
	(-39.38)	(-39.36)	(56.06)	(56.04)	(50.99)	(50.94)	(-7.64)	(-7.72)
SOE*Listed	-0.093	-0.085	-0.050	-0.040	-0.045	-0.056	0.012*	0.008
	(-1.47)	(-1.34)	(-1.16)	(-0.91)	(-0.84)	(-1.06)	(1.91)	(1.31)
Crisis*SOE	0.106***	0.109***	0.105***	0.106***	-0.010	-0.010	-0.004*	-0.005**
	(6.78)	(7.02)	(11.60)	(11.70)	(-0.86)	(-0.92)	(-1.92)	(-2.34)
State SHH	1.819***		2.547***		-0.790***		-0.168***	
	(7.54)		(16.88)		(-4.28)		(-8.22)	
ln GDP per Capita*State SHH	-0.126***		-0.242***		0.039**		0.013***	
	(-5.15)		(-16.19)		(2.21)		(6.28)	
Domestic State SHH		1.828***		2.533***		-0.782***		-0.170***
		(7.44)		(16.52)		(-4.21)		(-8.20)
ln GDP per Capita*Domestic State SHH		-0.126***		-0.241***		0.038**		0.013***
		(-5.07)		(-15.81)		(2.09)		(6.25)
N	2,687,073	2,687,073	2,430,236	2,430,236	2,444,073	2,444,073	1,767,133	1,767,133
adj. R^2	0.636	0.636	0.852	0.852	0.769	0.769	0.066	0.066

t statistics in parentheses

Standard errors clustered at the country-industry level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 14: State firms and private firms differential.

	LT Debt to Assets	Assets per Worker	ln Sales Productivity	Intangibles to Assets	Investment to Assets	Cash Flow to Assets	Taxrate	ln Exports to Sales
State Share in firm	0.015***	0.297***	-0.353***	-0.002***	0.115***	-0.028***	-0.042***	0.515***
	(2.76)	(5.94)	(-10.51)	(-2.88)	(16.28)	(-17.54)	(-6.05)	(2.80)
N	2,970,941	3,199,796	3,042,500	3,208,831	2,451,938	2,923,710	2,859,223	272,004
adj. R^2	0.209	0.456	0.545	0.120	0.225	0.112	0.102	0.398
	LT Debt to Assets	Assets per Worker	ln Sales Productivity	Intangibles to Assets	Investment to Assets	Cash Flow to assets	Taxerate	ln Exports to Sales
Domestic State Share in firm	0.016***	0.288***	-0.365***	-0.003***	0.117***	-0.029***	-0.042***	0.638***
	(2.77)	(5.56)	(-10.50)	(-3.64)	(15.84)	(-17.69)	(-5.80)	(3.38)
N	2,970,941	3,199,796	3,042,500	3,208,831	2,451,938	2,923,710	2,859,223	272,004
adj. R^2	0.209	0.456	0.545	0.120	0.225	0.112	0.102	0.398

t statistics in parentheses

Estimations include country-year, industry-year and firm fixed effects. Standard errors clustered at the country-industry level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 15: State firms and private firms growth differential.

	Employment growth	Employment growth	Wage growth	Wage growth	TFP growth	TFP growth	ROA growth	ROA growth
Listed State firm	0.007	0.007	-0.008	-0.009	0.018	0.018	0.106	0.103
	(0.47)	(0.46)	(-0.75)	(-0.80)	(0.91)	(0.91)	(0.71)	(0.69)
Crisis*State	-0.025*	-0.025*	0.013***	0.013***	0.007*	0.007*	0.009	0.001
	(-1.67)	(-1.72)	(4.51)	(4.45)	(1.76)	(1.76)	(0.24)	(0.02)
State SHH	-0.001		-0.027***		0.000		-0.076**	
	(-0.22)		(-8.38)		(0.02)		(-2.15)	
Domestic State SHH		-0.000		-0.027***		0.000		-0.061*
		(-0.06)		(-8.43)		(0.04)		(-1.70)
N	1,896,829	1,896,829	1,761,807	1,761,807	1,783,265	1,783,265	1,798,946	1,798,946
adj. R^2	0.120	0.120	0.077	0.077	0.110	0.110	0.004	0.004

t statistics in parentheses

Estimations include country-year-industry fixed effects. Standard errors clustered at the country-industry level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In table 16 we repeat the analysis as in table 9, but now we specifically look at a matched sample. We do this in order to correct for endogeneity issue related to state ownership. As explained in an earlier part of this paper, governments might pursue a variety of objectives, e.g. low unemployment. these objectives in turn have an impact on their investment decisions. In order to circumvent this issue, we match a state firms with it's closest private counterpart within a broadly defined industry-year cell within the same country.[49] We rely on a probit model to explain state-ownership in firms and then make use of the predicted probabilities. The variables acting as independents within this probit model are retrieved from studies examining M&A targets by governments (Clò et al. (2017) and Karolyi and Liao (2017)). The latter paper finds evidence that firms targeted in an M&A by states are larger and have a higher sales growth. The former finds that targets have a significantly lower operating performance. In our probit model we control for age, total assets, sales growth and revenue productivity in explaining the treatment status state-ownership. After fitting the model, we rely on the Stata Routine *Mahapick* to get the best private match for the state firms based on the estimated propensity score within a certain country-broad industry-year cell. Table 16 presents similar models as in table 9, but estimated on the matched sample.

The results in table 18 show that even after relying on the matched sample, a firm with 100% state ownership are on average 22-23% less productive and has a roa which is about 3.3 percentage points lower. The wage costs for firms with a full ownership of any type of domestic government is 6% higher and the firm employs 4% more workers, on average. Introducing more heterogeneity with regard to the type of state firm, we see in the table that there is no significant difference regarding the base estimates of the various variables and the listed status of the state firm. The period following the start of the economic crisis does seem to have an effect on two out of four variables in this table.

[49] If a firms throughout the observation period was owned by a state for at minimum one year, this firm falls within the treated group.

Table 16: State and private firms main differentials, matched sample

	ln Employees	ln Employees	ln Wage Cost	ln Wage Cost	ln TFP	ln TFP	roa	roa
Foreign Dummy	-0.015	-0.016	0.114***	0.119***	0.228***	0.225***	-0.001	-0.002
	(-1.05)	(-1.07)	(14.68)	(14.98)	(21.12)	(20.32)	(-0.68)	(-1.24)
Listed	-0.166***	-0.165***	-0.012	-0.012	-0.134***	-0.134***	-0.027***	-0.027***
	(-3.95)	(-3.93)	(-0.55)	(-0.55)	(-4.90)	(-4.90)	(-6.24)	(-6.23)
SOE*Listed	0.033	0.030	-0.015	-0.008	0.034	0.029	0.010	0.008
	(0.53)	(0.49)	(-0.37)	(-0.21)	(0.62)	(0.54)	(1.40)	(1.14)
Crisis*SOE	0.022	0.016	0.048***	0.049***	0.082***	0.082***	-0.001	-0.001
	(0.94)	(0.69)	(4.85)	(4.92)	(5.08)	(5.09)	(-0.35)	(-0.70)
State SHH	0.029		0.060***		-0.222***		-0.032***	
	(1.30)		(6.41)		(-17.19)		(-19.16)	
Domestic State SHH		0.043*		0.063***		-0.233***		-0.033***
		(1.86)		(6.53)		(-17.72)		(-19.25)
Domestic State SHH*Foreign Dummy		0.118		-0.264***		0.059		0.053***
		(1.02)		(-4.53)		(0.52)		(3.63)
N	109,545	109,545	107,469	107,469	108,037	108,037	106,766	106,766
adj. R^2	0.549	0.549	0.906	0.906	0.743	0.744	0.069	0.069

t statistics in parentheses

Estimations include country-industry-year fixed effects. Standard errors clustered at the country-industry level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

6 Conclusion

In this article we have presented an extensive overview of government presence in Europe, covering 27 countries and a period spanning mmore than fifteen years. After application of a name/type searching algorithm on a representative firm-level database AUGAMA (Augmented AMADEUS) we are able to assess to which extent a variety of government owners participate within firms.
Globally in our dataset we document that the share of majority-owned state-owned enterprises was at it's highest in the beginning of the previous decade. We document a decline with varying intensities in the period that followed. We have documented a larger presence of state firms in former Command Economies and in CEEC-countries. Moreover we document a large persistence in the importance of state firms. Providing some indications for the Path-Dependence theory on State Capitalism. Concerning the sectors in which governments participate most frequently, we see that this participation is concentrated to a great extent. The vast majority of state firms are located within a few NACE sectors: mining, energy supply, transport, the postal and telecommunications sectors. But when we look at the different legal origins composing our panel, we see a fair amount of heterogeneity in invested sectors. For socialist countries the state is present in virtually every sector on which we have data. Whereas for the English countries/legal origin the state has only invested to a large extent in electricity generation and water supply, albeit the shareholdings within this sector are somewhat smaller as compared to other legal origins. Over the other legal origins we see a fair amount of resemblance, with some more presence of state firms in the Scandinavian and French origin. When we look at formal country characteristics we see that on average countries characterised by weaker institutions (more corruption, less civil liberties and court independence) exhibit a larger presence of state firms at the country level. For countries with a larger fraction of persons employed in the army this is also the case. Less developed countries, with a larger agricultural sector and rural population also show a higher government presence. Generating some support for the political and industrial policy view on state ownership. Micro-economically when we examine differences for firms characterised by a different extent of state ownership, we find that firms level of employment with regard to sales, wage costs per employee rise with the extent to which governments participate within firms. Efficiency and profitability on the other hand decline with this degree of ownership. On the other hand these factors depend on the legal origin of the firm, as well as the institutional basis and economic development of the country in which the firm is located. Also for other financial variables we record differences with regard to the extent of government ownership within firms. On average the higher ownership by the latter type of owner, the higher the ratio assets to worker and long-term debt to assets. On the other hand we see that on average cash-flow and the tax rate decline with state ownership. These findings coincide with soft-budget constraint theory as well as the notion of theories of self-interested politicians.

Appendix

Table 17A1a: Words used for Identifying State shareholders or state GUOs

afdeling	gobierno	mestská samospráva	província	valstija
ajuntament	gmina	mestsky urad	provincie	valsts
allam	gouvernement	mestský úřad	provincija	valstybe
alue	government	miasto	provins	valstybe
apgabals	governo	miestas	provints	valta
apygarda	grad	ministarstvo	provinz	valtio
arrondissement	grevskap	ministeerium	prowincja	varos
auktorit	grofstva	minister	regering	varos
authority	grófstva	ministère	regeringskanslet	város
autoridad	gubernija	ministrija	regiao	videk
autorit	guvern	ministrstvo	região	vidék
autorizacao	hallitus	ministry	regierung	ville
autorização	hatalom	miniszsterium	region	vlaams
autorytet	hatosag	minisztérium	région	vlada
avtoriteta	hatóság	municipal	regiune	vláda
ayuntamunt	hrabstvi	municipio	regjeringen	volitused
behorde	hrabství	municipiu	republiek	vyriausybe
behörde	hrabstwo	myndighe	republic	wladza
bezirk	investeringsfonden	nazione	república	wojewodztwo
bundesland	investment fund	nozare	republika	województwo
bundesrepublik	igaliojimai	obcina	republiken	xunta de
bundesregierung	judet	obcina	republikk	
by	junta de	obec	respubblica	
cetate	jurisdicao	oblast	respublika	
cidade	jurisdição	okres	rzeczpospolita	
circoscrizione	jurisdiccion	okrug	riik	
citta	jurisdicción	omavalitsus	royaume	
città	kaupunginhallitus	omrade	rzad	

Note: see the notes under the table on the next page.

Table 17A1b: Words used for Identifying State Shareholders or State GUOs (*Cont'd*)

city	kaupunki	område	savivaldybe
ciudad	kommun	opcina	savivaldybe
comarca	kompetence	opcina	sfera
comitat	kormany	opravneni	sovereign
comune	kormány	oprávnění	sritis
condado	kozseg	oras	staat
county	község	oraš	stad
departament	krahvkond	organ	stat
departemang	kraj	osakond	stát
departement	kunnanhallitus	overheid	state
département	kunta	pais	state-owned
didmiestis	laani	panstvo	stedelijk
diputacion	lääni	panstwo	tartomany
distrito	lan	parlamento foral	tartomány
drzava	län	piirikunta	the state
država	land	pilnvaras	tinut
duchovni urad	landeskreis	pilseta	tinut
duchovní úrad	linn	pilseta	uprava
estado	maakond	pilsetas pasval	urad
etat	maakunta	pilsetas pasvaldiba	úrad
état	magistrat	pokrajina	urbe
fylke	megye	principado	valdiba
gemeente	mesto	provinca	valdzia
gemeinde	město	province	valdžia
gewest	mestska samos	provincia	valitsus

This table and the previous one gives information on the words used to identify potential shareholders. These words were used in the Stata procedure.

Table A.3: Definition and sources of variables used.

Variable	Description	Source
ATM Capita	Automated teller machines (ATMs) (per 100,000 adults) logs	Worldbank
Banks Capita	Commercial Bank Branches (per 100,000 adults) in logs	Worldabnk
S&P Global	S&P Global Equity Indices (annual % change)	Worldbank
Stocks Traded	Stocks traded, total value (% of GDP)	Worldbank
ln GDP Capita	GDP per capita (constant 2010 US$)	Worldbank
Export of ICT	ICT goods exports (% of total goods exports)	Worldbank
Export of High Tech	Export of High Tech Products (% of manufacturing exports)	Worldbank
R&D Technicians	Technicians in R&D (per million people)	Worldbank
Rural Population	Rural population (% of total population)	Worldbank
Agriculture VA	Agriculture, value added (% of GDP)	Worldbank
Manufacturing VA	Manufacturing, value added (% of GDP)	Worldbank
Services VA	Services, value added (% of GDP)	Worldbank
Army	Armed forces personnel (% of total labor force)	Worldbank
Military Expenditure	Military expenditure (% of central government expenditure)	Worldbank
Civil Liberties	Index of civil Liberties. Index takes on values from 1 to 7, with 1 most Free.	Freedom House
Political Rights	Index of Political Rights. Values 1 to 7. 1 is the most Free.	Freedom House
Corruption	CPIA transparency, accountability, and corruption in the public sector rating (1=low to 6=high)	Transparancy International
Corruption V-DEM	Corruption index V2XCORR: how pervasive is corruption?	V DEM
Court Independence	Hight court independence v2juhind	V DEM
Subsidies	Subsidies and other transfers (% of expense)	Worldbank
Tax Revenue	Tax revenue (% of GDP)	Worldbank
Procedures Startup (days)	Time required to start a business (days)	Worldbank
Cost of Business	Cost of business start-up procedures (% of GNI per capita)	Worldbank
Property Registration	Time required to register property (days)	Worldbank
PMR	Index of Product Market Regulation in the economy, scale 0 to 6, with 6 most regulation	OECD
Budget Balance	Net lending or net borrowing by government (% of GDP)	Eurostat
Trade	Exports and Imports of goods and services (% of GDP)	Worldbank
IMF	1 in year t until end of sample period if country got support from IMF. 0 otherwise	IMF

Table A.2a: List of the NACE 2-digit industries included in the data.

Broad category	NACE 2-digit	Description
C		**Mining and quarrying**
C	10	Mining of coal and lignite; extraction of peat
C	11	Extraction of crude petroleum and natural gas
C	12	Mining of uranium and thorium ores
C	13	Mining of metal ores
C	14	Other mining and quarrying
D		**Manufacturing**
DA	15	Manufacture of food products and beverages
DA	16	Manufacture of tobacco products
DB	17	Manufacture of textiles
DB	18	Manufacture of wearing apparel; dressing and dyeing of fur
DC	19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear
DD	20	Manufacture of wood and products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
DE	21	Manufacture of pulp, paper and paper products
DE	22	Publishing, printing and reproduction of recorded media
DF	23	Manufacture of coke, refined petroleum products and nuclear fuel
DG	24	Manufacture of chemicals and chemical products
DH	25	Manufacture of rubber and plastic products
DI	26	Manufacture of other non-metallic mineral products
DJ	27	Manufacture of basic metals
DJ	28	Manufacture of fabricated metal products, exc. machinery/equipment
DK	29	Manufacture of machinery and equipment n.e.c.
DL	30	Manufacture of office machinery and computers
DL	31	Manufacture of electrical machinery and apparatus n.e.c.
DL	32	Manufacture of radio/television/communication equipment/apparatus
DL	33	Manufacture of medical/precision/optical instruments, watches/clocks
DM	34	Manufacture of motor vehicles, trailers and semi-trailers
DM	35	Manufacture of other transport equipment
DN	36	Manufacture of furniture; manufacturing n.e.c.
DN	37	Recycling

Table continued on the next page

Table A.2b: List of the NACE 2-digit industries included in the data (Continued).

Broad category	NACE 2-digit	Description
E		**Electricity, gas and water supply**
E	40	Electricity, gas, steam and hot water supply
E	41	Collection, purification and distribution of water
F		**Construction**
F	45	Construction
G		**Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods**
G	50	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel
G	51	Wholesale trade and commission trade, except of motor vehicles and motorcycles
G	52	Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods.
H		**Hotels and restaurants**
H	55	Hotels and restaurants
I		**Transport, storage and communication**
I	60	Land transport; transport via pipelines
I	61	Water transport
I	62	Air transport
I	63	Supporting and auxiliary transport activities; activities of travel agencies
I	64	Post and telecommunications
K		**Real estate, renting and business activities**
K	70	Real estate activities
K	71	Renting of machinery and equipment without operator and of personal and household goods
K	72	Computer and related activities
K	73	Research and development
K	74	Other business activities

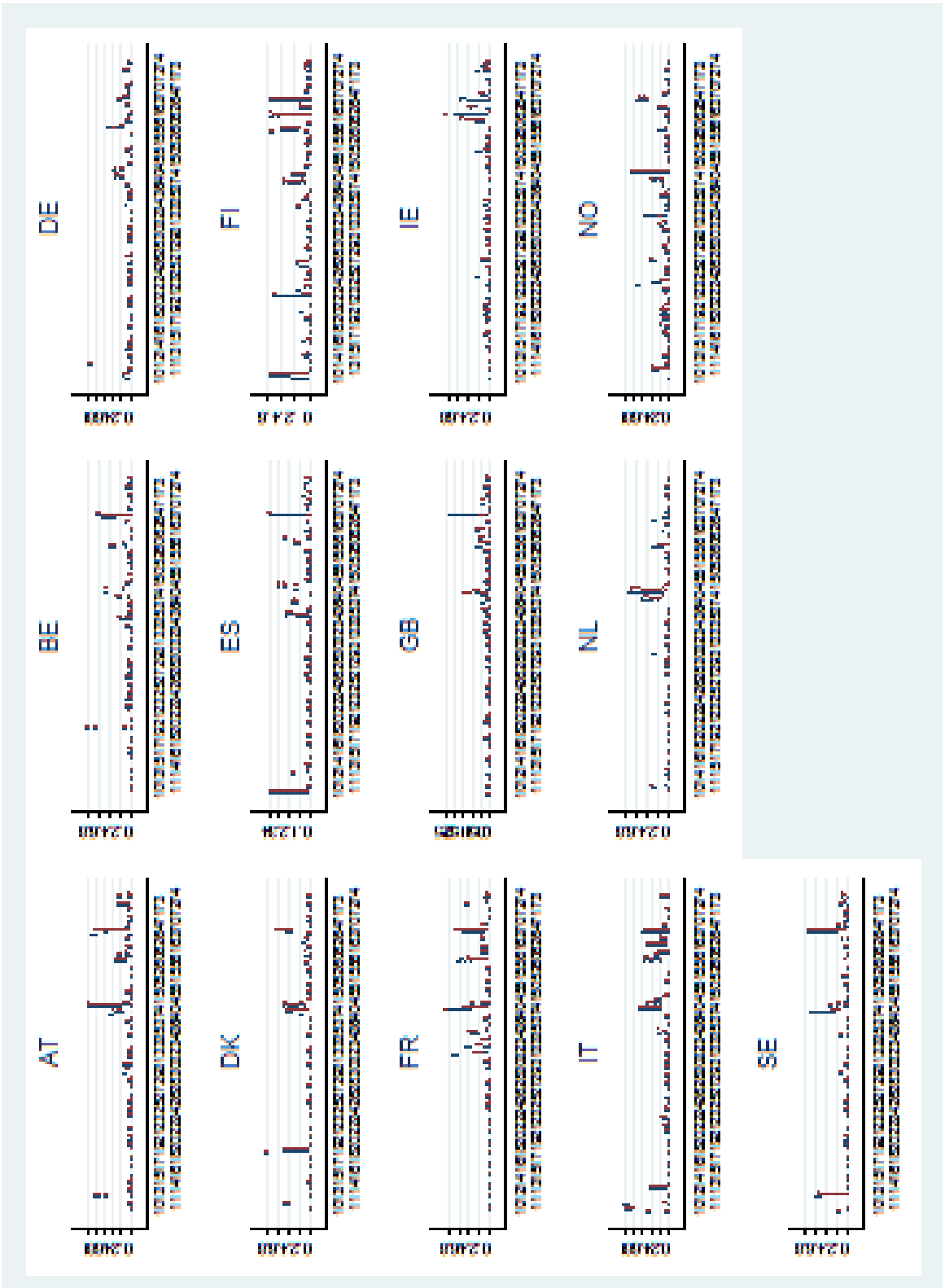


Figure 15: Share of state firms across countries

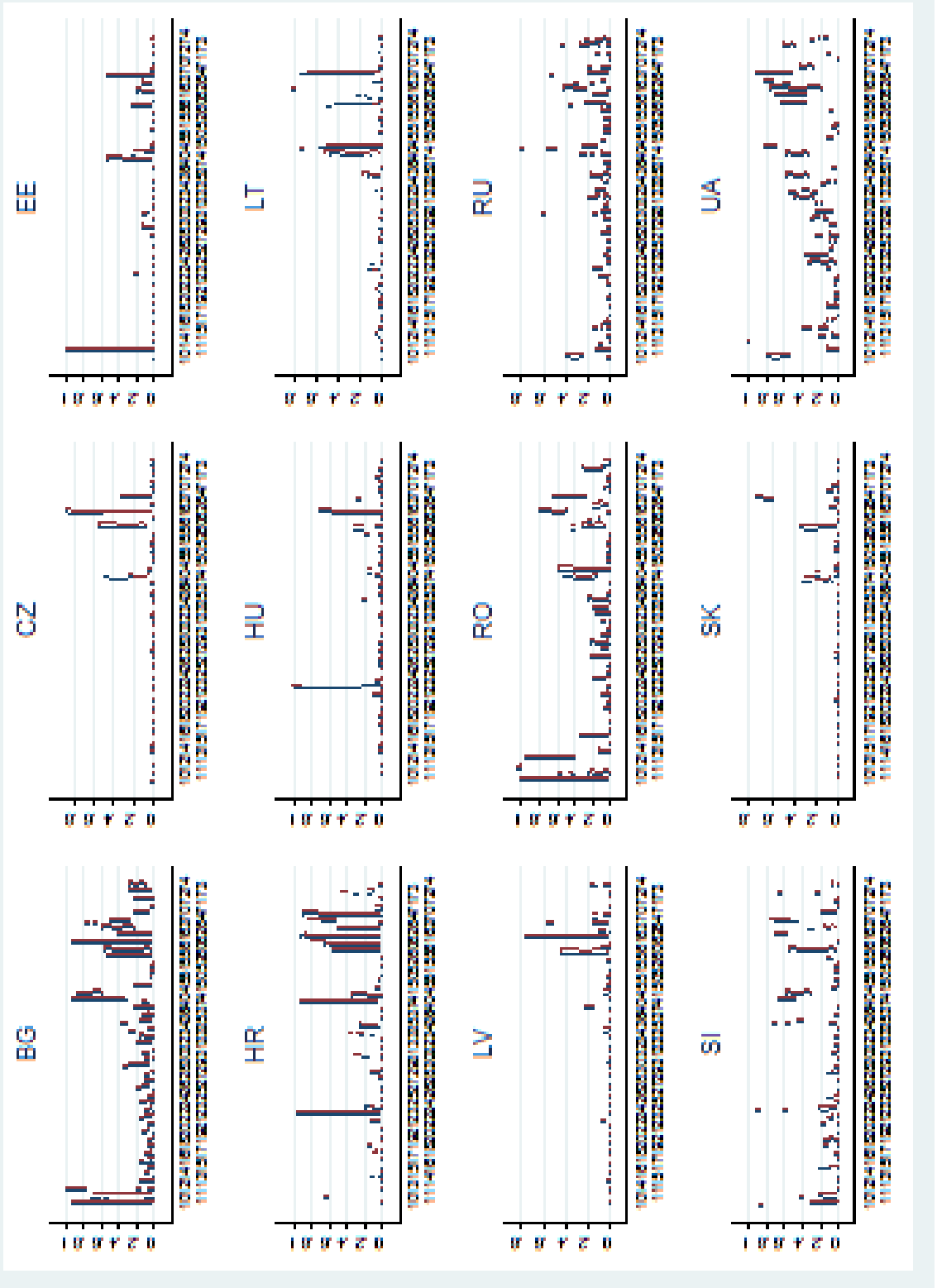


Figure 16: Share of state firms across countries

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