The Financial Premium and Real Cost of Bureaucrats in Businesses*

Ana Cusolito[a], Roberto N. Fattal-Jaef[a], Fausto Patiño Peña[a], Akshat V. Singh[b]

[a] *World Bank, Washington, D.C., US*
[b] *Oxford University, Oxford, UK*

Abstract

This paper studies the financial premium (or tax) and aggregate productivity losses (or gains) of having bureaucrats in businesses. It does so, using a novel firm-level database that contains information about the ownership structure of firms operating in 24 European countries during the period 2010-2016. The paper shows that firms with public authorities as direct shareholders (SOEs) get, on average, subsidized access to financial resources (e.g., debt and equity) compared to private-owned enterprises (POEs). A 1 p.p increase in government direct shareholding reduces the average cost of production through the financial channel by 0.02 percent. The largest subsidies appear in sectors that are the great facilitators of the economy. The latter includes finance, energy, water, transport, as well as agriculture. Back-of-the-envelop calculations show that the fiscal burden of the SOE financial subsidy ranges from 0.001% to 0.955% of GDP for the year 2016. Counterfactual analyses conducted to quantify the aggregate productivity gains from removing state-ownership distortions show that productivity gains are maximized when the reform involves an initial targeted approach that focuses on dismantling unproductive SOEs coupled with a subsequent complementary reform that eliminates the remaining distortions in financial markets before reallocating the released resources towards more productive firms. Under this counterfactual scenario, governments can increase aggregate productivity at least from 19.1% to 83.7%. Last but not least, the paper shows that an untargeted reform that dismantles indiscriminately all government-run firms and subsequently reallocates the freed-up financial resources toward their private-sector peers can generate productivity losses (of up to 22%) when financial markets remain highly distorted.

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**acusolito@worldbank.org Corresponding author.
rfattaljaef@worldbank.org
fpatinopena@worldbank.org
akshat.singh@economics.ox.ac.uk

1. Introduction

Despite decades of retrenchment, the footprint of the entrepreneurial state is still notable in the economies of many countries. While government intervention in providing certain key services and goods has been justified on the grounds of market failures, coordination problems, and increasing returns to scale, the reality is that 70% of government-owned enterprises operate in competitive industries, such as food, construction, and hospitality, typically dominated by the private sector firms and where these considerations are arguable less prevalent.[1] What is the outcome of the interaction between state and privately owned firms? Are SOEs interfering in any way with the behavior of private firms? If so, what are these interference channels, and what are their macroeconomic effects?

In this paper, we study one particular source of interference from government-owned enterprises: the competition with private firms for external financing in capital markets. There are several well-understood mechanisms through which inefficient firms with a large government stake could access external financing more favorably than private counterparts, thereby distorting finance, innovation, investment, and resource allocation. These range from lower debt issuance costs due to the federal government's backing of corporate debt to direct budget support from the government in the form of internal equity. While the mechanisms are well acknowledged, there is a less clear understanding of their quantitative significance. Do capital markets favor SOEs with relatively lower debt and equity financing costs? If so, how large is their financial premium, and what is their effect on aggregate productivity?

To study these questions, we appeal to Whited and Zhao (2021)'s methodology for inferring financial distortions from firms' balance sheet data and apply it to a global sample of 24 European countries during the period 2010 and 2016. Mirroring the real misallocation literature (Hsieh and Klenow, 2009), the methodology delivers

[1]In 2019, SOEs' revenues account, on average, for 17% of GDP and 5% of formal jobs across 91 countries. Europe and Central Asia (ECA) is the region with the largest proportion of sectors (more than 50% of 2-digit NACE sectors) with SOEs' presence (World Bank, 2023).

a distribution of firm-specific financial wedges resulting from deviations in the rates of marginal revenue products of debt and equity across firms, the properties of which we characterize across state- and private-owned firms. We find that firms with public authorities as direct shareholders (SOEs) get, on average, subsidized access to debt and equity compared to private-owned enterprises (POEs). A 1 p.p. increase in government stake reduces the implicit average finance cost by 0.01 percent. We then leverage the theoretical structure to quantify the macroeconomic effects of removing state-owned firms and reallocating their financial resources toward the private sector. We find that despite being, on average, subsidized, shutting down SOEs may lead to aggregate productivity losses due to their superior technical efficiency. Targeted reforms that only close down poor-performing SOEs lead to aggregate TFP gains in every country, reaching up to 15

We find that firms with public authorities as direct shareholders (SOEs) get, on average, subsidized access to debt and equity compared to private-owned enterprises (POEs). A 1 p.p. increase in government stake reduces the implicit average finance cost of production by 0.02 percent. Given the model-based nature of the inference of financial frictions, we conduct several counterfactuals to assess the macroeconomic significance of SOE-based finance misallocation. We find that the effects of an indiscriminate shutdown of SOEs on aggregate total factor productivity (TFP) depend on the extent of persistent distortions in capital markets and the relative performance between state-owned and private-owned firms. We also show that constraining the shutdown of SOEs to those at the bottom of the productivity distribution, even when maintaining financial frictions, yields TFP gains of more than 5%

As said, our approach for measuring financial frictions follows closely the work of Whited and Zhao (2021). The methodology postulates a production function, mapping financial resources (debt and equity) into value-added. The underlying assumption is that firms primarily raise costly external financing to acquire physical capital, hire workers, and purchase intermediate inputs. In the spirit of the real resource misallocation literature (Hsieh and Klenow, 2009), the efficient allocation of financial resources prescribes that finance should be allocated to equalize the distribution of marginal returns across enterprises. Thus, more productive firms get a larger proportion of the financial resources available for a sector.

Firm-specific financial frictions, then, can be read off the data as wedges that rationalize the observed dispersion in the marginal returns to debt and equity. Unlike such literature, however, we consider degrees of substitutability between debt and equity that differ from Cobb-Douglas complementarity. The purpose is to flexibly accommodate sector-wide financial frictions that rationalize deviations from the Modigliani-Miller benchmark of irrelevance of the financial composition of the firm. A CES structure generates well-defined debt-to-equity ratios. Once the sector-wide financial frictions are captured through the elasticity of substitutions, we are interested in gauging the firm-specific wedges that rationalize the dispersion in these ratios across firms within narrow industries.

We implement the methodology by leveraging Cusolito and Vranic (2020), which recreates the ownership trees of all firms in the ORBIS database, endowing us with the firm-level financial and ownership information required for our investigation. We focus on direct ownership links, as this is the most prevalent public-related link for the sample of European countries under study (75.4% on average). Our SOE variable measures the total amount of shares owned by all the public authorities that belong to the country in which the firm operates.

Equipped with a distribution of firm-specific financing wedges, we use fixed-effect regressions to assess the role of state ownership in the cost of finance. Controlling for firm size, age, physical productivity, firm, sector-time, and country fixed effects, we regress the idiosyncratic cost of finance (i.e., the wedge) against the fraction of state ownership in a firm. We find that a one percentage point increase in government shareholding reduces the cost of finance by 0.02%. While our main specification implemented across firms in the whole economy controls for sector fixed effects, we also conduct estimations at the sector level. We find that sectors that are the greatest facilitators of the economy, such as financial services, electricity, water, and transport, exhibit a higher elasticity of the financial subsidy to state ownership.

We then turn to assess the economic significance of our empirical findings. As a first step, we quantify the extent to which aggregate productivity would increase or decrease if we shut down all SOEs and reallocate finance toward the private sector. Since these firms also face distortions, in our first exercise, we reallocate the financial resources towards private-owned firms, preserving their distortions.[2] We find that many countries would see their TFP fall and others increase, between -20% and 10%. There are two forces behind the results. Firstly, even if private-run firms were more productive than government-run ones, the severity of persisting financial distortions could be so extreme that further reallocating finance towards POEs is productivity-reducing. Secondly, it may be that SOEs are, on average, more productive than their private counterparts, so despite their subsidy, it is productivity-reducing to shut them down. We find that the latter channel is the dominant force driving the predicted declines in TFP in response to SOE shutdown. For instance, in Bosnia and Herzegovina, where TFP would decrease by 20% under such a reform, the average TFPQ among state-owned firms is more than three times higher the average TFPQ of private firms. We then consider a performance-dependent reform where only the SOEs below the median of the distribution of financial liabilities in their respective industries are shut down. In this scenario, the resulting changes in TFP are still affected by persisting distortions interfering with the reallocation of financing toward the surviving enterprises.

Arguments have been leveraged to support the persistence of bureaucrats in business, ranging from social development goals, network externalities, coordination problems, and increasing returns to scale. The reality, however, is that SOEs are prevalent in sectors and areas of economic activity, where there is not a rationale for it. What are the macroeconomic implications of the pervasive participation of government-

[2]Under a CES aggregator of individual varieties, there is mechanical variety channel through which productivity would fall if the number of varieties is reduced, which is what would occur under a shutdown of SOEs. To abstract for this channel, we normalize TFP by the number of firms.

owned enterprises in the economy? What are the channels through which bureaucrats in business distort economic activity? We confront these questions amidst growing support for government intervention in various spheres of the economy.

Advocates of government intervention support an entrepreneurial state based on fixing market failures in particular industries, ranging from bounding market power for private firms to economies of scale and under-provision of public goods.[3][4] The latter, coupled with the notorious return of industrial policy[5]–government interventions to support technological upgrading and innovation in specific sectors—as part of the policy toolbox to boost private-sector-led growth has recently reignited the historic debate about the rationale for and potential distortionary effect of state intervention in the market-based economy.

To overcome the above-mentioned concerns, this paper explores the potential distortionary effect of state ownership on productivity and finance (mis)allocation using a mirror approach. Theoretically, we rely on Whited and Zhao (2021), which is the financial mirror of the model by Hsieh and Klenow (2009) to analyze if SOEs get preferential treatment in financial markets compared to private-owned ones (POEs), and its implied effects on productivity and economy. To deal with the above-mentioned measurement concerns, we focus the analysis on the liabilities (e.g., debt and equity) that back firms' purchases of inputs and factors of production to produce a unit of a

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[4] Ehrlich et al. (1994b); Karpoff (2001), Dollar and Wei (2007), Hsieh and Klenow (2009), Song et al. (2011), Bai et al. (2016), Boeing et al. (2016); Wei et al. (2017), Cong et al. (2019), Harrison et al. (2019), and Huang et al. (2020).

[5] In the U.S., the recent congressional approval of large stimulus packages–USD 80 billion in place-based industrial policy programs–aimed at supporting the American industry–the American Rescue Plan Act (ARP), Infrastructure Investment and Jobs Act (IIJA), CHIPS and Science Act, and the Inflation Reduction Act (IRA)—mark a notorious shift in the national strategy geared to boost private-sector-led growth from non-intervening in the economy to heavily supporting the development of the modern American industry (Muro, 2023). In the EU, the recent approval of the European Chips Act, which will mobilize more than € 43 billion of public and private investments aimed at supporting large-scale technological capacity building and innovation in the chip sector, is indicative of the relevant place industrial policy is occupying in the current agenda of policymakers (European Comission, 2023).

good.

Since several reasons can theoretically rationalize both the existence of a state-ownership premium, as well as a state-ownership tax, exploring the (un)distortionary effects of state ownership on the cost of finance is ultimately an empirical question. Theories in favor of a state-ownership premium often rely on the benefits of having a market regulator as a shareholder of a firm, the advantages of having the state as a lender of last resort, and favored access to subsidized inputs. Those supporting a state-ownership tax frequently rely on the poor performance of SOEs compared to POEs, as well as sovereign default risk concerns. It is, therefore, the objective of this paper to explore empirically this issue and to shed light on the potential consequences of the (un)preferential financial treatment of government-run firms for the whole economy.

Empirically, we construct a novel firm-level and dynamic database to estimate the effect of state-ownership distortions on the cost of production through the financial channel. The new database builds on the work done by Cusolito and Vranic (2020)–who developed a methodology and SQL code to recreate the ownership trees of all the firms in the Orbis database–and provides a full characterization of the ownership structure of all the firms operating in 24 European countries during the period 2010-2016.

Our analysis focuses on direct ownership, as this is the most relevant public-related ownership link for European firms. In the new database, an SOE is defined as a firm with government entities as direct shareholders. We use the government's total direct ownership stake–which accounts for span-of-control issues related to delegation of authority–as our main explanatory variable. We selected the Eurozone for analysis as there were a lot of government interventions to rescue private-run firms following the global financial crisis of 2008/9. This allows us to exploit a lot of data variation to identify the main effect. Importantly, the nature of our database allows us to control for firm-, industry-time-, and country-fixed effects and thus tease out the effect of potential confounded factors embedded in the distortion measures such as risk, markups, factor prices, technological and quality differences across firms to mention a few.

To shed light on the policy debate, we leverage the theoretical underpinnings of our analysis and we conduct back-on-the-envelop calculations to pin down the fiscal burden (in GDP terms) of having bureaucrats in businesses. We also conduct three counterfactual exercises to calculate the aggregate productivity gains (or losses) from different types of SOEs-related structural reforms. In the first scenario, we indiscriminately dismantle all SOEs and reallocate the released resources toward POEs. In the second one, we follow a targeted approach, where we shut down underperforming SOEs and then reallocate the resources toward the rest of the firms. In the last scenario, we follow the previous targeted approach and we fix markets—reduce distortion dispersion—before reallocating the released resources towards the most productive firms.

The paper shows that in the absence of distortions, the debt-to-equity ratio is the same for all firms operating in the same sector. However, more productive firms get better access to finance and produce more units of a good. By contrast, distortions affect the efficient allocation of debt and equity across firms through two different channels: finance levels and finance mix. Empirically, the paper shows that government-run firms get subsidized access to financial resources. A 1 percentage point increase in government shareholding reduces the cost of finance by 0.02%. However, there are no significant differences between publicly listed and non-publicly listed SOEs. Sectors that are the greatest facilitators of the economy are the most subsidized. This includes financial services (0.37%), agriculture (0.09%), electricity (0.07%), water (0.06%), and transport (0.05%). Back-of-the-envelope calculations show that the total annual fiscal burden of having bureaucrats in businesses ranges from 0.001% of the GDP to 0.955% for the year 2016.

Moreover, countries may gain or lose from an indiscriminate dismantlement of SOEs, depending on the relative performance of SOEs compared to POEs, as well as the extent of financial market distortions that persist in the economy after the SOE reform. When distortions are severe, the resources freed up by the SOEs will be inefficiently allocated to POEs, potentially leading to lower aggregate productivity and output (up to 22.2% losses). Further, if SOEs were over-performing private firms, the productivity losses would be magnified. Thus, our paper shows that targeted interventions that dismantle underperforming SOEs maximize the number of countries that exhibit productivity gains from the reform and increase those gains (up to 7.4%), compared to a non-targeted reform scenario. In addition, productivity gains at the aggregate level will increase if the target reform is followed by complementary structural reforms that remove reminding distortions before reallocating the freed resources towards more productive firms. Our counterfactual analysis reveals productivity gains that range from 19.1% to 83.7% under this scenario.

To conclude, our paper shows that one size does not fit all and we need firm-level evidence to inform policymakers before they embark on a specific type of SOEs reform. Further, the results show that it is not only about SOEs reforms. Governments need to make financial markets more competitive and less distorted to maximize the productivity gains from these reforms. While the small estimated (SOE-related) coefficients may suggest the relevance of the extensive margin (dismantling) as the mechanism to maximize the productivity gains from SOEs reforms, changes in the intensive margin (reducing the subsidy), often associated with corporate governance reforms, may be prominent if government-run firms are, as these days, highly indebted. In the end, answering this type of policy question highlights the relevance of firm-level evidence to inform the current policy debate.

The remainder of the paper is organized as follows. Section 2 presents the literature review. Section 3 describes the data. Section 4 presents the model. Section 5 describes the identification strategy. Section 6 discusses the empirical results. The final section concludes.

2. Literature Review

Our paper relates to two main strands of literature. First, we contribute to work studying the relevance of state ownership for misallocation of finance. Much of this literature has focused on the Chinese context given the importance of state-owned enterprises in its economy and availability of firm-level data. Research by Bai et al. (2016), Cong et al. (2019), and Huang et al. (2020) empirically analyses the efficiency of credit allocation in China after the massive fiscal stimulus package introduced in response to the financial crisis in 2008. Bai et al. (2016) find that this intervention was associated with a reallocation of credit away from POEs towards SOEs, as the former were perceived to have higher levels of default risk due to their lack of government guarantees. Huang et al. (2020) correspondingly find evidence in favor of crowding-out effects, with private investments shrinking relatively more in locations with higher growth rates of public debt. Song et al. (2011) show that POEs increased their reliance on internal sources of finance as a result of these financial distortions, thus deviating further away from the optimal debt-to-equity mix. In more recent work, Geng and Pan (2023) document that SOEs in China face lower credit costs than POEs, consistent with previous evidence. Moreover, they find that the introduction of a new regulatory framework in 2018 which tightened credit conditions further increased credit misallocation in favor of SOEs on account of their government guarantees. These papers establish the important role of state ownership in China for the allocation of credit. However, because of the unique role of state-owned enterprises in the Chinese economy, it is not clear whether these findings would be applicable to other economies around the world. In this paper, we seek to contribute in this direction by offering evidence on finance misallocation induced by state ownership across a wide range of countries and industries. Importantly, we find that indiscriminate interventions removing SOEs may not be optimal for all economies since government-run enterprises outperform private-sector peers in some contexts.

Second, our work contributes to highly influential studies on the impact of misallocation of financial or real inputs on aggregate total factor productivity. Seminal work by Hsieh and Klenow (2009) establishes a framework based on firm-level data to estimate aggregate productivity losses due to misallocation of real inputs in production. Whited and Zhao (2021) extend this framework to derive aggregate implications of misallocation of financial inputs. Due to data considerations, their findings are limited to a narrow range of countries, with Hsieh and Klenow (2009) focusing on US and India and Whited and Zhao (2021) focusing on US and China. Buera et al. (2011) examine the channel through which financial frictions may lead to real losses. They propose that financial frictions distort capital and entrepreneurial talent allocation across production units, thereby decreasing aggregate productivity. In related work, Midrigan and Xu (2014) find that financial frictions cause sizable productivity losses from inefficiently low entry levels and technological upgrading. Gopinath et al. (2017) study the interaction of capital adjustment costs and size-dependent financial frictions in determining productivity losses from capital misallocation in Europe. The authors show that the decline in real interest rates attributed to the euro convergence process led to important real losses as capital inflows were allocated to unproductive firms. We contribute to work in this field by building a dataset with granular firm-level information about state-ownership and capital structure for a wide range of countries. By combining data on state-ownership with the framework of Hsieh and Klenow (2009) and Whited and Zhao (2021), which allows us to identify financial misallocation without requiring detailed information about the financial inputs of a firm, we are able to closely analyze the relevance of state-ownership for allocation of finance in varied contexts. The next section presents the model we employ to analyze this issue.

3. Model

This section presents the theoretical framework that we use to guide the empirical analysis. In doing so, we follow the model developed by Whited and Zhao (2021), which builds on the framework developed by Hsieh and Klenow (2009).

The economy consists of S sectors. Total value added, Y, is the aggregate output value of all the sectors in the economy. Parameter θ_s measures the relative importance of Y_s in Y. Thus, the economy's production function is as follows:

$$Y = \prod_{s=1}^{S} Y_s^{\theta_s}, \text{ where} \sum_{s=1}^{S} \theta_s = 1. \tag{1}$$

Value added in sector s, Y_s, is produced with M_s differentiated varieties. The market for each variety has a monopolistic competition market structure with σ as the elasticity of substitution between varieties. Sector s's production function is as follows:

$$Y_s = \left(\sum_{i=1}^{M_s} Y_{is}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}. \tag{2}$$

Firm i, which operates in sector s, uses two different types of liabilities, debt (D_{is}) and equity (E_{is}), to produce value added, Y_{is}. The production function has a CES functional form, with elasticity of substitution between liabilities γ_s. A_{is} stands for total factor productivity and parameter α_s represents the relative importance of debt to equity in producing one unit of the good. Firm i's production function is as follows:

$$Y_{is} = A_{is} \left(\alpha_s D_{is}^{\frac{\gamma_s-1}{\gamma_s}} + (1-\alpha_s) E_{is}^{\frac{\gamma_s-1}{\gamma_s}} \right)^{\frac{\gamma_s}{\gamma_s-1}}. \tag{3}$$

Firm i maximizes profits by choosing the optimal price (P_{is}) at which to sell output Y_{is}, as well as the debt (D_{is}) and equity (E_{is}) levels, taking as given the demand for its good and firm-specific distortions (τ_{Dis}, τ_{Eis}), which alter the cost of finance, relative to the sectorial values, R_s and λ_s, respectively. A negative (positive) value of τ_{Jis} means that firm i has preferential (disadvantageous) treatment when accessing to financial resource J, with $J = D, E$. Thus, firm i's profit maximization problem is as follows:

$$\{P_{is}, D_{is}, E_{is}\} \operatorname{argmax} \Pi_{is} = P_{is} \left(\frac{P_s^{\sigma} Y_s}{P_{is}^{\sigma}} \right) - (1+\tau_{Dis}) R_s D_{is} - (1+\tau_{Eis}) \lambda_s E_{is} \tag{4}$$

The profit maximization problem yields first-order conditions (FOCs) (5) and (6), from which the firm derives the optimal debt and equity demand. At the optimum, the level of debt and equity is such that the marginal revenue of one extra unit of the financial liability equals its marginal cost. Three factors determine the relative demand of debt to equity as shown in equation (7): the relative liability prices, distortions ratio, and the relative importance of debt to equity in the production process. By substituting equation (7) in the FOCs (5) and (6), one can derive the final expression for firm i's optimal demand of debt and equity as shown in equations (8) and (9).

$$\{D_{is}\} \quad : \quad \frac{\sigma-1}{\sigma}\alpha_s \cdot \frac{P_{is}Y_{is}}{\left(\alpha_s D_{is}^{\frac{\gamma_s-1}{\gamma_s}} + (1-\alpha_s)\, E_{is}^{\frac{\gamma_s-1}{\gamma_s}}\right) D_{is}^{\frac{1}{\gamma_s}}} = (1+\tau_{Dis})\, R_s, \tag{5}$$

$$\{E_{is}\} \quad : \quad \frac{\sigma-1}{\sigma}(1-\alpha_s) \cdot \frac{P_{is}Y_{is}}{\left(\alpha_s D_{is}^{\frac{\gamma_s-1}{\gamma_s}} + (1-\alpha_s)\, E_{is}^{\frac{\gamma_s-1}{\gamma_s}}\right) E_{is}^{\frac{1}{\gamma_s}}} = (1+\tau_{Eis})\, \lambda_s, \tag{6}$$

$$Z_{si} \equiv \frac{D_{is}}{E_{is}} = \left[\frac{\alpha_s}{(1-\alpha_s)} \frac{(1+\tau_{Eis})\,\lambda_s}{(1+\tau_{Dis})\,R_s}\right]^{\gamma_s}, \tag{7}$$

$$D_{is} = \frac{\frac{P_{is}^{1-\sigma}}{\left[\alpha_s + (1-\alpha_s) Z_{is}^{-\frac{\gamma_s-1}{\gamma_s}}\right](1+\tau_{Dis})}}{\sum_{j=1}^{M_s} \frac{P_{js}^{1-\sigma}}{\left[\alpha_s + (1-\alpha_s) Z_{js}^{-\frac{\gamma_s-1}{\gamma_s}}\right]\left(1+\tau_{Djs}\right)}} \times D_s, \tag{8}$$

$$E_{is} = \frac{\frac{P_{is}^{1-\sigma}}{\left[\alpha_s Z_{si}^{\frac{\gamma_s-1}{\gamma_s}} + (1-\alpha_s)\right](1+\tau_{Eis})}}{\sum_{j=1}^{M_s} \frac{P_{js}^{1-\sigma}}{\left[\alpha_s Z_{js}^{\frac{\gamma_s-1}{\gamma_s}} + (1-\alpha_s)\right]\left(1+\tau_{Ejs}\right)}} \times E_s. \tag{9}$$

Firm i's optimal price, P_{is}, is a markup, $\frac{\sigma}{\sigma-1}$, over the marginal cost of producing one unit of value-added. The marginal cost is, in turn, a function of two components. The first one is the inverse of firm i's total factor productivity, A_{is}. The second component, $\tilde{M}gCost_{is}$, is the marginal cost of finance associated with producing one unit of value added. The latter is a weighted average of the unit cost of debt and equity. Thus, P_{is} and $Mg\tilde{C}ost_{is}$ can be written as follows:

$$P_{is} = \left(\frac{\sigma}{\sigma - 1}\right)\left(\frac{1}{A_{is}}\right)\tilde{M}gCost_{is}(\tau_{Dis}, \tau_{Eis}, R_s, \lambda_s, \gamma_s, \alpha_s), \tag{10}$$

where

$$Mg\tilde{C}ost_{is} = \left[Mg\tilde{C}ost_{Dis} + Mg\tilde{C}ost_{Eis}\right] \tag{11}$$

$$Mg\tilde{C}ost_{Dis} = \left[(1 + \tau_{Dis})\, R_s \left(\alpha_s + (1 + \alpha_s)\, Z_{is}^{-\frac{\gamma_s - 1}{\gamma_s}}\right)^{-\frac{\gamma_s}{\gamma_s - 1}}\right] \tag{12}$$

$$Mg\tilde{C}ost_{Eis} = \left[(1 + \tau_{Eis})\, \lambda_s \left(\alpha_s Z_{is}^{\frac{\gamma_s - 1}{\gamma_s}} + (1 + \alpha_s)\right)^{-\frac{\gamma_s}{\gamma_s - 1}}\right] \tag{13}$$

The following section describes the firm-level and dynamic database we constructed to empirically identify the effect of state ownership on the marginal cost of production through the financial channel.[6]

4. Data

We work with Orbis firm-level financial and ownership raw files to construct an unbalanced panel with information for 24 European countries during the period 2010-2016.[7] We build on the work of Kalemli-Ozcan et al. (2015), Cusolito and Didier

[6] Appendix D includes a discussion on model mis-specificiation and the empirical section explicitly explains how we address related concerns.

[7] Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Finland, France, Germany, Hungary, Italy, Luxembourg, Montenegro, North Macedonia, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Serbia and Ukraine.

(2020) and Kalemli-Ozcan et al. (2023) to construct the financial module.

Orbis presents financial information in two different formats: consolidated and/or unconsolidated format. The first one presents aggregated information on the parent and subsidiary companies, while the second one presents information for each type of firm, separately. We use unconsolidated information as it reflects the activity of a firm in the country in which it operates. Appendix B presents details of the procedure for constructing the financial module and Appendix C presents the representativeness analysis.

To construct the ownership module, we build on the work by Cusolito and Vranic (2020), who develop a methodology and SQL code to recreate the ownership trees of all the firms in the Orbis database. Our main explanatory variable, SOE, measures the percentage of direct shares owned by all the public authorities (PAs) that govern the country in which a firm operates. To create this variable, we work with Orbis Links historical files (often known as vintage disks) and the Entities files. A Links file is a matrix. Each row of the matrix contains information about the ownership structure of a firm at the first layer of the ownership tree. This includes the firm identifier, shareholders' names, each shareholder's ownership percentage, source of information, and date the ownership information was validated. The Entities file contains additional information for each firm, such as the firm identifier, entity type, entity name, and whether the firm is a subsidiary or a parent company.

To build the SOE variable, we first clean the raw Links files and eliminate branches. Appendix A presents a detailed description of all the steps we implemented to clean the raw files. Then, we merge the Links and Entities files to identify which of the shareholders are public authorities (PAs). We do so, by using the entity category S,--public authorities, states or governments--which includes governmental agencies, departments, and local authorities. Then, we identify all the shareholders who, at the first layer of the ownership tree, are PAs and belong to the same country in which the firm operates. We do so by comparing the ISO country code embedded in the firm identifier with that of the shareholder.

Due to span-of-control issues, governments tend to spread their ownership stakes in a company across several PAs or ministries. Therefore, our SOE variable captures all the shares belonging to all the PAs in which a firm operates. In the end, the latter belongs to only one shareholder, which is the state. Figure 1 presents an example of a company's ownership tree. The red dots stand for public shareholders, while the blue ones to private investors. As can be observed, the state's ownership stake is widely spread across several firms. We found plenty of cases like this one in our database. Further, because on average, 75.4% of the public ownership stake in Europe is concentrated at the first layer of the ownership tree, our analysis only focuses on direct ownership. Thus, we focus on the strongest channel of state influence in a firm. Last, we do not take into account sovereign wealth funds and institutional investors as public shareholders because these types of investors often capture indirect influence links.

Figure 1: Example of a Firm's Ownership Tree

Note: red circles represent public shareholders while blue circles represent private investors.

Table 1 presents summary statistics for our main SOE variable. Three conclusions can be drawn from it. First, the state footprint in the economy–the proportion of SOEs in the economy and the average government shareholding–displays an inverted

U-shaped pattern with increasing state participation since 2012. Second, assuming a standard class of shares (e.g., 1 share grants 1 voting right), on average, the state controls the firms where it invests, as direct government shareholding accounts for two-thirds, approximately, of the total ownership of a firm. Third, although the proportion of SOEs in a market is small relative to that of POEs, the total number of SOEs in the economy is not trivial.

In order to understand the drivers behind the main ownership-related trends, Table 2 unpacks the sources of SOE variation. As Table 2 shows, ownership changes (type and stake) occur both at the extensive and inventive margins, as well as in both directions. That is, our database reflects situations where the state bailed out or bought POEs and vice versa. In addition, data show that state ownership stakes have increased and decreased, depending on the country and year. Finally, Table 3 shows that, on average, SOEs have better access to finance, as they have higher debt and equity levels than POEs.

Table 1: Summary Statistics - Ownership Variables

Variables	2010	2011	2012	2013	2014	2015	2016	Average
Proportion of SOE Firms	1.9%	1.9%	0.9%	1.0%	1.1%	1.9%	2.0%	1.5%
Average Govt. Shareholdings	72.5%	71.7%	72.8%	75.0%	76.9%	78.4%	80.3%	75.4%
Total Number of Frims	611,289	799,699	807,411	898,277	920,795	973,742	887,367	824,654
Total Number of SOEs	4,907	5,625	3,519	4,718	4,871	6,852	6,249	5,249

Note: The number of observations between 2010-2016 is 5,898,580. To obtain the values in this table, we calculate the statistic at the country level and then take the mean of the country statistic for each year. The statistic of the first row corresponds to the proportion of SOE firms in total firms. The statistic of the second row corresponds to the average level of government shareholdings in SOEs.

Table 2: Summary Statistics - Variation in State Ownership

Period	Extensive Margin				Intensive Margin				
	POEs →SOEs	POEs →SOEs (as a % of total POEs)	SOEs →POEs	SOEs →POEs (as a % of total SOEs)	Share of SOEs with Change in State Ownership %	% of SOEs with Positive Change relative to all SOEs with change	Average Positive Change in State Ownership %	% of SOEs with Negative Change relative to all SOEs with change	Average Negative Change in State Ownership %
2010 - 2011	685	0.1%	924	18.5%	6.4%	59.2%	6.2%	40.8%	-12.5%
2011 - 2012	732	0.1%	877	14.8%	4.3%	62.7%	9.9%	37.3%	-14.2%
2012 - 2013	1,337	0.2%	505	13.4%	6.8%	54.8%	13.3%	45.2%	-10.4%
2013 - 2014	494	0.1%	446	9.0%	6.2%	41.8%	12.7%	58.2%	-11.2%
2014 - 2015	1,988	0.2%	442	8.8%	6.7%	33.8%	13.4%	66.2%	-7.8%
2015 - 2016	448	0.1%	791	11.2%	5.4%	65.8%	6.7%	34.2%	-18.5%

Note: The number of observations between 2010-2016 is 5,898,580. Column 2 reports the number of POEs that became SOEs in the two-year period. Column 3 is the ratio (in percentages) of the number of POEs that became SOEs in the two-year period relative to the total number of SOEs in the first year of the two-year period. Column 4 reports the number of SOEs that became POEs in the two-year period. Column 5 is the ratio (in percentages) of the number of SOEs that became POEs in the two-year period relative to the total number of SOEs in the first year of the two-year period. Column 6 is the share of SOEs that changed state ownership shareholding percentage, but remained as SOEs, in the two-year period relative to the total number of SOEs in the first year of the two-year period. Column 7 is the share of SOEs that reported a positive change in state ownership shareholding percentage relative to all SOEs that reported a change in state ownership shareholding percentage. Column 8 reports the average positive change in state-related shareholding percentage for SOEs that reported a change in shareholding percentage over the two-year period. Column 9 is the share of SOEs that reported a positive change in state ownership shareholding percentage relative to all SOEs that reported a change in state ownership shareholding percentage. Column 10 reports the average negative change in state ownership shareholding percentage for SOEs that reported a change in shareholding percentage over the two-year period.

Table 3: Summary Statistics - Financial Variables: SOEs vs. POEs

Variable	State-Owned Enterprise	Private-Owned Enterprise	p-value (t-test)
Debt	14.141	12.877	0.00000
Cost of Debt	0.653	0.644	0.00003
Equity	14.215	12.232	0.00000
Cost of Equity	0.513	0.585	0.00000
Number of Observations	36,741	5,861,839	5,898,580

Note: The number of observations between 2010-2016 is 5,898,580. The descriptive statistics for debt and equity are in natural logarithm. Our measure of debt for firm i that operates in sector s, D_{is}, is equal to the sum of short-term and long-term debt. The latter includes creditors, loans, other current liabilities, long-term debt, and other non-current liabilities. Our measure of equity, E_{is}, is equal to total shareholders' funds. This includes shareholders' capital and other shareholders' funds. The descriptive statistics for the cost of debt and cost of equity are expressed as the natural logarithms of the firm-level cost normalized by the weighted average industry cost. Monetary values are in USD 2005. To obtain the values in this table, we calculate the average of each variable across countries and years. The third column shows the p-values for the t-test comparing means across state-owned enterprises and private-owned enterprises.

5. Empirical Strategy

To study the effect of state ownership on the cost of production through the financial channel, $Mg\tilde{C}ost$, we estimate the following equation:

$$\ln\left(Mg\tilde{C}ost_{isct}\right) = \alpha + \beta \text{SOE}_{isct-1} + \gamma \text{Publicly Listed}_{isct-1} \times \text{SOE}_{icst-1}$$

$$+ \kappa X_{isct-1} + \lambda_i + \lambda_{st} + \lambda_c + u_{isct}, \tag{14}$$

where $Mg\tilde{C}ost_{isct}$ measures the cost of finance for firm i, which operates in sector s, and it is located in country c, at time t. Variable SOE captures total direct shares owned by all the public authorities of the country in which the firm operates. Publicly Listed is a dichotomous variable that takes value 1 if the firm is publicly listed and 0 otherwise.[8] Vector X includes control variables that may affect the cost of capital Cusolito and Didier (2020). This includes firm size (ln assets), age, and productivity (ln TFPQ).

To calculate $Mg\tilde{C}ost_{isct}$, we calibrate the model. We measure nominal value-added, $P_{is}Y_{is}$, as the difference between sales and intermediate inputs. We calibrate debt and equity prices, as well as the elasticity of substitution between varieties following Hsieh and Klenow (2009) and Whited and Zhao (2021) ($R_s = 0.1$, $\lambda_s = 0.1$, and $\sigma = 1.77$). We estimate γ_s at the country-sector (2-digit NACE) level following the methodology developed by Kmenta (1967) and applied by Whited and Zhao (2021).[9] Further, using equations (5) and (6), we calibrate firm wedges $(1 + \tau_{Dis})$ and $(1 + \tau_{Eis})$ with our measures of $P_{is}Y_{is}$, D_{is}, E_{is}, prices of financial resources, and calibrated parameters. Last, we use equation (15) to calculate firm-level total factor productivity (TFPQ) as follows:

$$A_{is} = \frac{(P_{is}Y_{is})^{\frac{\sigma}{\sigma-1}}}{\left(\alpha_s D_{is}^{\frac{\gamma_s-1}{\gamma_s}} + (1-\alpha_s) E_{is}^{\frac{\gamma_s-1}{\gamma_s}}\right)}. \tag{15}$$

There are important identification concerns associated with eliciting the effect of state ownership on the cost of capital. One of the virtues of the pioneering work by Hsieh and Klenow (2009) and Whited and Zhao (2021) is the tractability of the frameworks they proposed. However, the latter comes at the expense of relying on very restrictive assumptions,[10] which have left several economists a bit uncertain as to what the distortion measures really capture when the data do not validate them. This includes variations across firms in

[8]To identify publicly listed firms, we use the variable "Listed" from Orbis, classifies firms into three categories: Listed, Delisted, Non-listed. We consider a firm listed if it is labeled as "Listed".

[9]Thus, γ_{sc} is estimated using a non-linear specification of value-added on equity and debt controlling for firm fixed effects

[10]This includes monopolistic competition and a producer's price elasticity of -1 with respect to its TFPQ level.

risk (Doraszelski and Jaumandreu, 2013), factor prices (De Loecker et al., 2016), markups (Haltiwanger et al., 2018), quality (Krishna et al., 2020), technology (Kasahara et al., 2017), adjustment costs (Asker et al., 2014), and informational asymmetries (David et al., 2021).

One particular characteristic of those potential confounded factors is that they are often structural, in the sense that they are related to firms' fundamentals. Thus, it takes time for the firm to change them. Therefore, given that our database covers a short period of time, 2010-2016, our identification strategy is to estimate a saturated econometric specification that controls for firm fixed effects. We also include sector-time fixed effects to control for industry trends that may affect the cost of finance (e.g., trade, technological change), as well as governments' ownership stakes. Since the period of analysis began in 2010, a year in which substantial government intervention was still in place in Europe to recover from the financial crisis of 2008/9, these fixed effects allow us to control for sector-specific bailouts. Our econometric specification also includes country-fixed effects to control for the quality of financial institutions and sovereign risk. Last but not least, we lagged all the explanatory variables (except age) to control for endogeneity issues, as variations in the marginal cost of capital may affect governments' decisions about their ownership stake in a firm, as well as firm size and firm productivity (TFPQ).

6. Empirical Results

This section presents the main empirical findings. We start by describing the results from estimating our core specification for the entire sample. Then, we explore heterogeneous effects across sectors. We conclude by presenting back-of-the-envelope calculations to pin down the total government cost of granting preferential financial treatment to SOEs.

Table 4 presents the results from estimating equation (14). Columns (1) to (5) display the results from running OLS regressions with contemporaneous regressors, while column (6) controls for endogeneity. On average, SOEs get subsidized access to financial resources. A 1 p.p increase in government shareholding reduces SOEs' cost of finance by 0.02 percent. The subsidy is the same for publicly listed and non-publicly listed SOEs.[11]

[11] In line with previous empirical evidence for Europe (Cusolito and Didier, 2020), large and mature firms face a lower cost of finance than small and young ones. However, high-productivity firms have, unexpectedly, a higher financial cost than low-productivity enterprises.

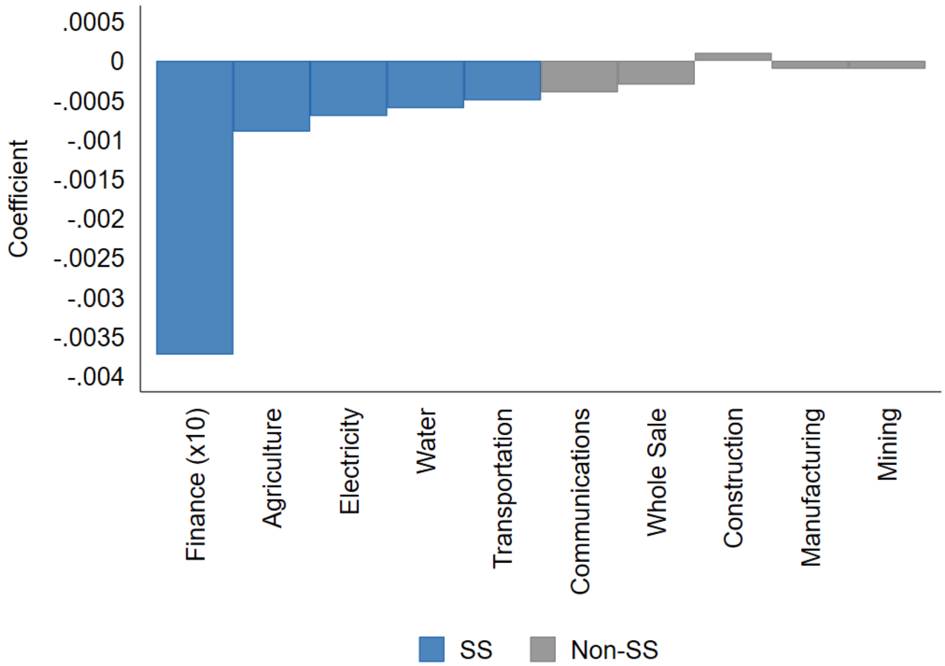
Table 4: Financial Premium (Tax) of Bureaucrats in Business

	(1)	(2)	(3)	(4)	(5)	(6)
	(OLS)	(OLS)	(OLS)	(OLS)	(OLS)	(IV)
State Ownership	-0.0001	-0.0001	-0.0001	-0.0002***	-0.0008***	-0.0002***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0000)	(0.0001)
Publicly Listed=1 X State Ownership		-0.0006	-0.0006	-0.0004	-0.0009**	0.0002
		(0.0006)	(0.0006)	(0.0006)	(0.0004)	(0.0007)
Age			-0.0345***	-0.0559***	0.0134***	-0.0181*
			(0.0090)	(0.0099)	(0.0034)	(0.0094)
Log(Total Assets)				-0.3301***	-0.5425***	-0.1623***
				(0.0009)	(0.0003)	(0.0011)
Log(TFPQ)					0.4055***	0.0666***
					(0.0001)	(0.0004)
Observations	5898580	5898580	5898580	5898580	5898580	4090426
Country fixed effects	Y	Y	Y	Y	Y	Y
Firm fixed effects	Y	Y	Y	Y	Y	Y
Industry-time fixed effects	Y	Y	Y	Y	Y	Y

Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

To explore heterogeneous effects across sectors, we split the sample and estimate equation (14) for each 1-digit NACE sector, separately. Figure 2 displays blue bars (grey) with the value of the estimated coefficients for the sectors where the SOE variable is (not) statistically significant at the 5% or lower percentage level. As Figure 2 shows, the largest state-ownership subsidies appear in sectors that are the greatest facilitators of the economy. This includes finance, electricity, water, transport, as well as agriculture. The average financial premium varies between 0.05 p.p for a sector like transport and up to 3.73 p.p for a sector like finance.

Figure 2: Heterogeneous SOE Financial Premium (across sectors)



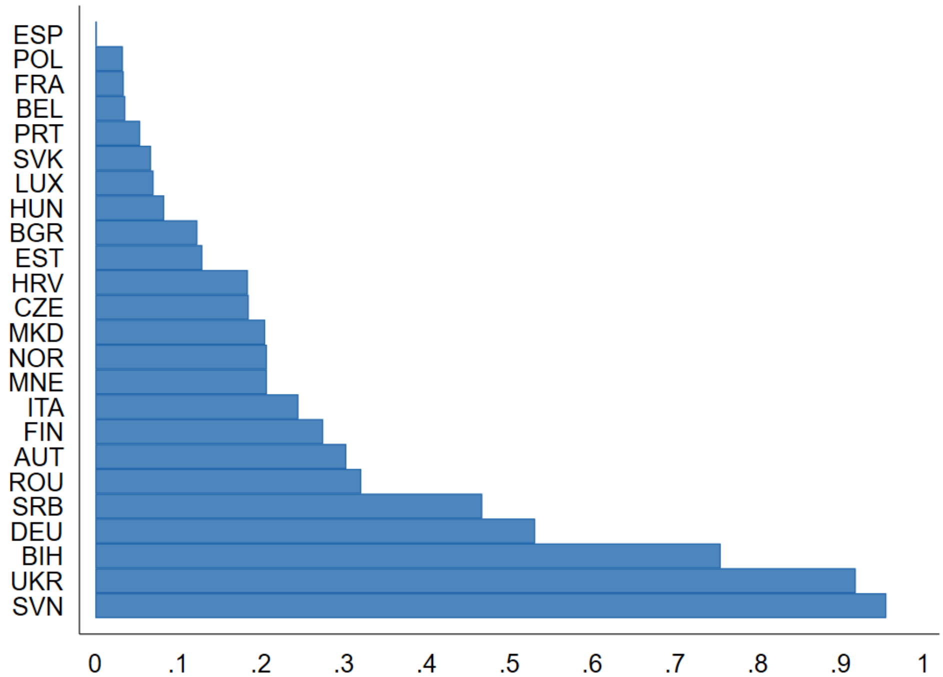
Note: This figure plots the financial premiums (taxes) of SOEs differentiated by aggregate industry. Premiums are estimated using equation (14) separately for each 1-digit NACE sector. SS stands for statistically significant at the 5% level or lower.

Then, with the main estimated coefficient handily and the information on state ownership, the marginal cost of production, and value-added for each firm in a country during the year 2016, we conduct back-of-the-envelope (BoE) calculations to determine the cost for the government (in GDP% terms) from subsidizing SOEs. Equation (16) specifies the BoE calculation we performed and Figure 3 portrays the costs for each country.[12] As Figure 3, the total SOE subsidy ranges from a low of 0.001% of GDP for Spain up to 0.955% of GDP for Slovenia.

$$\frac{\text{Total SOE Subsidy}_{ct}}{GDP_{ct}} = \frac{\sum_{i \in \Omega_{ct}} \hat{\beta} \times SOE_{isct} \times Mg\tilde{C}ost_{isct} \times Y_{isct}}{Y_{ct}} \tag{16}$$

[12] Ω_{ct} in equation (16) represents the set of SOEs in country c at time t.

Figure 3: Total SOE Subsidy (% of GDP)



Note: The total cost of subsidizing SOEs relative to GDP is calculated using equation (16) and 2016 data.

In order to shed light on the policy debate, the next section calculates the economic gains that countries can obtain from implementing other types of SOE reforms than eliminating the financial premium of having bureaucrats in businesses.

7. Efficient Allocation and Counterfactual Analysis

This section presents the theoretical foundations for conducting the counterfactual analysis and calculating the productivity gains a country can obtain from pursuing SOE reforms. We start by solving the planner's problem and then we explain how we conduct the counterfactual study and calculate the gains from a reform.

Using the theoretical framework presented in Section 3, we solve the social planner's problem in a frictionless economy. Equations (17) and (18) show that in an efficient economy, the debt-to-equity ratio is the same for all the firms operating in the same sector. However, the planner allocates resources across firms within a sector based on their contribution to the productivity of the sector. Thus, the most productive firms receive a larger proportion of the total optimal level of debt and equity available for each sector. Then, aggregate output gains from eliminating distortions and reallocating financial resources towards the most productive firms can be written as in equation (19). These gains are equivalent to aggregate productivity (TFP) gains as sector-level debt and equity remains invariant.[13]

$$\hat{D}_{is} = \frac{A_{is}^{\sigma-1}}{\sum_{j=1}^{M_s} A_{js}^{\sigma-1}} \times D_s. \tag{17}$$

$$\hat{E}_{is} = \frac{A_{is}^{\sigma-1}}{\sum_{j=1}^{M_s} A_{js}^{\sigma-1}} \times E_s. \tag{18}$$

$$\text{Aggregate Output (TFP) gains} = \left(\frac{\hat{Y}}{Y} - 1\right) \times 100. \tag{19}$$

While equation (19) allows us to calculate the total gains an economy can obtain from eliminating the distortions and reallocating resources towards the most productive firms, a similar expression, together with equations (8) and (9), can be used to calculate the counterfactual real gains from pursuing different types of SOEs-related structural reforms.

We are particularly interested in three counterfactual scenarios. The first one involves the indiscriminate dismantling of all SOEs. The second scenario follows a targeted approach, where underperforming SOEs (compared to the median of the sector) are dismantled and the released resources are reallocated toward the rest of the firms. The last one, adds to the targeted scenario, a reform that fixes markets before reallocating the freed-up resources toward the rest of the firms. As in Hsieh and Klenow (2009), fixing markets means equalizing distortions to the average of the market, which is defined at the country-4-digit sector level. Thus, our output (productivity) gains from a reform are just a lower bound of the real gains, as countries can further increase output (productivity) by pursuing reforms that lower the median market distortion to that of an advanced economy like the U.S.

[13] Aggregate output, Y, can be expressed as a function of sector-level debt, D_s, sector-level equity, E_s, and sector-level productivity, TFP_s: $Y = \prod_{s=1}^{S} \left[TFP_s \left(\alpha_s D_s^{\frac{\gamma_s - 1}{\gamma_s}} + (1 - \alpha_s) E_s^{\frac{\gamma_s - 1}{\gamma_s}} \right)^{\frac{\gamma_s}{\gamma_s - 1}} \right]^{\theta_s}$. This is derived by combining the expressions for the sector-level demand of debt, sector-level demand of equity, sector-level price, P_s, and aggregate output price, P. As sector-level debt and equity remain constant between the efficient economy and the economy with distortions, aggregate output gains in equation (19) are equivalent to aggregate productivity gains.

8. Productivity Gains from SOE Structural Reforms

Our empirical analysis allows us to conduct BoE calculations to determine the fiscal savings a government can obtain by implementing policy reforms that eliminate the state-ownership financial subsidy. We complement the regression-based analysis by proposing a series of policy counterfactuals aimed at quantifying the aggregate productivity gains or losses countries can get from pursuing these reforms. More concretely, we consider alternative equilibrium stationary allocations where all or subsets of SOEs are shut down and their financial resources are reallocated back into the private sector or remaining firms, respectively. The last scenario introduces a complementary reform that fixes financial markets–eliminates heterogeneous policy treatment and equalizes firms' distortions to the median of the market–before reallocating the freed-up resources from the dismantled SOEs.

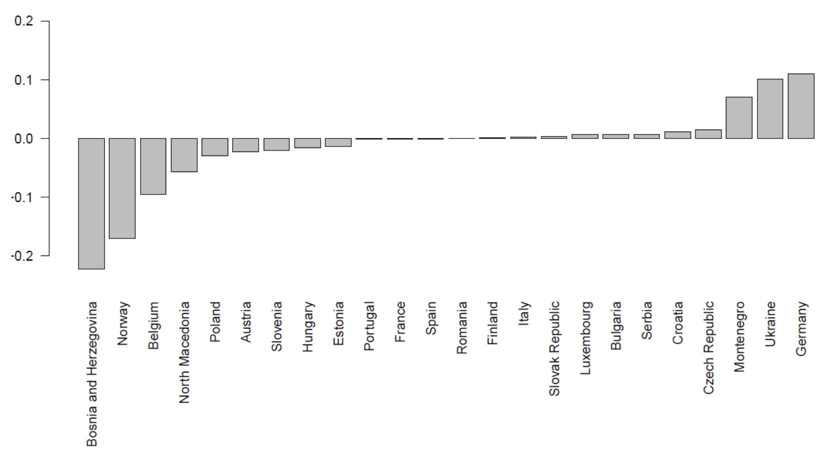
Thus, our quantitative analysis provides lower-bound (upper-bound) calculations about the productivity gains (losses) from the proposed counterfactual reform. Ideally, we would have preferred to quantify the productivity impact of a less extreme policy scenario than dismantling SOEs, like privatizing them. However, beyond the fact that this would require introducing a feasible extension to the model,[14] the most challenging aspect of doing so is to assume a particular fixed cost of entry at the country-sector level to be able to quantify the effect of the policy reform. Therefore, our dismantling scenario offers a lower bound (upper bound) of the potential TFP gains (losses) from the reform. Given the love for variety inherent to a CES demand system, any policy that reduces the number of firms exerts a negative contribution to TFP. In our counterfactuals, we shut down the variety channel by aggregating productivity only across the firms that remain active in the baseline and the counterfactual allocations. Moreover, given that our definition of fixing financial markets does not reduce to zero the distortions but it does so with their dispersion, countries can further advance in their reform agenda by reducing the median market distortion to the level of an advanced economy like the U.S. and therefore increase (reduce) the gains (losses) from the policy reform. The following subsections present the counterfactual analyses.

[14] This would require assuming a fixed cost of entry and imposing a free entry condition to pin down the equilibrium number of firms in each market after the privatization occurs.

8.1. Productivity Gains: Dismantling all SOEs and Distorted Capital Markets

Our first counterfactual characterizes an extreme scenario, where all SOEs are shut down, while the private sector remains active but subject to its intrinsic financial distortions. By closing firms with the state as a shareholder, additional financing can be channeled toward private-run firms. However, because of persisting financial frictions, such reallocation will still be inefficient. While unrealistic, this counterfactual is instructive to emphasize the importance of complementarities in the implementation of structural reforms. The cross-country distribution of TFP changes arising from the first counterfactual is illustrated in Figure 4. A revealing pattern in the Figure is that the experiment of eliminating all SOEs and reallocating financial resources towards POEs subject to their financial frictions leads to moderate gains in some economies but moderate losses in many others. The range of TFP changes varies from -22.2% for Bosnia and Herzegovina to 11% for Germany.

Figure 4: TFP Gains or Losses: Dismantling SOEs with Distorted Capital Markets



Note: This figure portrays the TFP gains or losses countries experience from shutting down all SOEs and reallocating the resources towards POEs when financial markets are distorted.

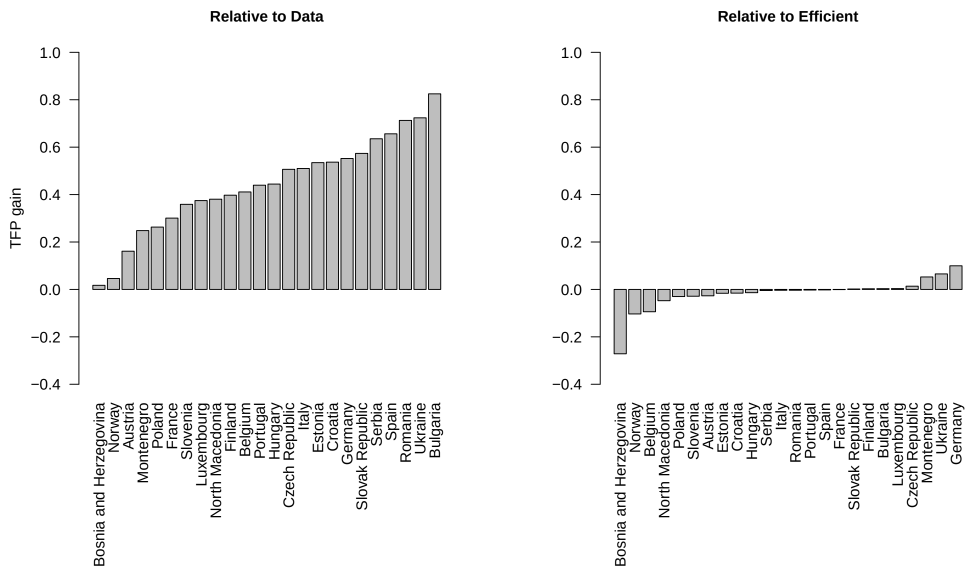
Given the prior that on average POEs outperform government-run firms, it may seem counter-intuitive that countries lose by removing all SOEs. Two forces are behind the results. Firstly, even if private-run firms were more productive than government-run ones, the severity of financial distortions in the private sector could be so extreme that further reallocating finance towards POEs is productivity-reducing. Secondly, it may be that the prior is not valid and, in fact, SOEs are on average more productive than their private counterparts. The next counterfactuals are aimed at disentangling these forces.

To this end, consider next a scenario where SOEs are closed down at the same time financial markets are reformed. Therefore, debt and equity are efficiently allocated across firms. Because two features of the economy are changing simultaneously, we compare the gains (or losses) from these reforms against two alternative benchmarks: a) the observed allocation in the data, which exhibits SOEs and financial frictions and b) the efficient allocation without financial frictions, but with active SOEs. The former normalization portrays the combined productivity gains from the two reforms (shutting down SOEs and fixing markets), while the latter isolates the gains from keeping active SOEs, while financial markets are not distorted.

Figure 5 illustrates the TFP gains resulting from the proposed counterfactual. In the left panel, we observe sizable productivity gains arising from reforming financial markets, closing SOEs, and letting the private sector absorb the resulting funds, relative to the allocation of resources in the data, where financial frictions and SOEs interact. To decompose these large gains into those stemming from the SOE elimination and those implied by the financial liberalization only, the panel to the right illustrates the gains relative to an economy with no financial frictions, but with active SOEs. That is, the benchmark allocation underlying the right panel is one where there are SOEs but no financial misallocation, while in the left panel, a reform is implemented that closes down SOEs.

The figure to the right shows that, while some countries would still experience an increase in aggregate productivity, many others would suffer a TFP loss. However, for the majority of the countries, the effect would be negligible. Since all that changed was that SOEs were closed, countries whose TFP fell in the counterfactual must be economies where SOEs outperform POEs. An important message that emerges from this scenario is that an indiscriminate shutdown of government-run businesses could be counterproductive.

Figure 5: TFP Gains or Losses with Undistorted Capital Markets

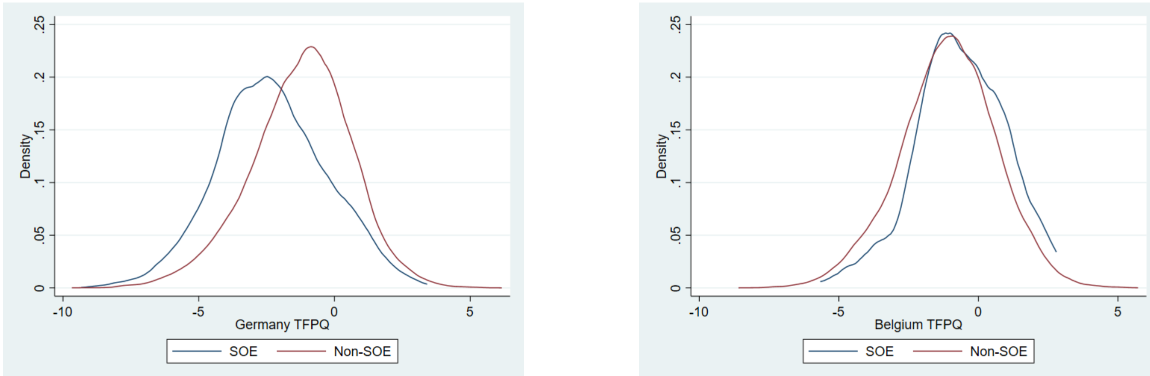


Note: The left panel illustrates the TFP gains in the counterfactual economy relative to the one observed in the data, which exhibits SOEs and distorted financial markets. The right panel illustrates the TFP changes of the counterfactual scenario of analysis relative to another hypothetical economy, which exhibits SOEs and undistorted financial markets. The numbers reported in the histograms correspond to the average for each country across all years in our sample

To validate the claim that SOEs outperform POEs in cases where shutting down SOEs led to productivity losses, Figure 6 plots kernel densities for physical productivity, TFPQ, for both types of firms in Belgium and Germany.[15] More specifically, we illustrate the distributions of $log\left(\frac{A_{si}}{\overline{A}_s}\right)$, as defined in equation (15), for private and government-run firms. As readily seen in the figure, SOEs are widely outperformed by their private sector counterparts in Germany, whereas the converse is true in Belgium. Thus, rationalizing that the former country gains from a policy reform that withdraws SOEs from the market, while the latter loses from doing so.

[15]While the point being made is most eloquently portrayed in Germany and Belgium, the same rationalization of the patterns described in Figure 5 could be obtained by inspecting the distribution of productivities in any other country in the sample.

Figure 6: TFPQ Distribution: SOEs vs. POEs



Note: The figures illustrate the distributions of $log\left(\frac{A_{si}}{A_s}\right)$ as defined in equation (15) for private and government-run firms in Germany (left panel) and Belgium (right panel).

The conclusion from this counterfactual scenario–the indiscriminate dismantling of all SOEs–motivates us to consider targeted interventions, where SOEs are shut down based on their performance, TFPR, relative to the median of their private-sector peers. The following subsection presents this analysis.

8.2. Productivity Gains: Targeted SOE Reform and Distorted Capital Markets

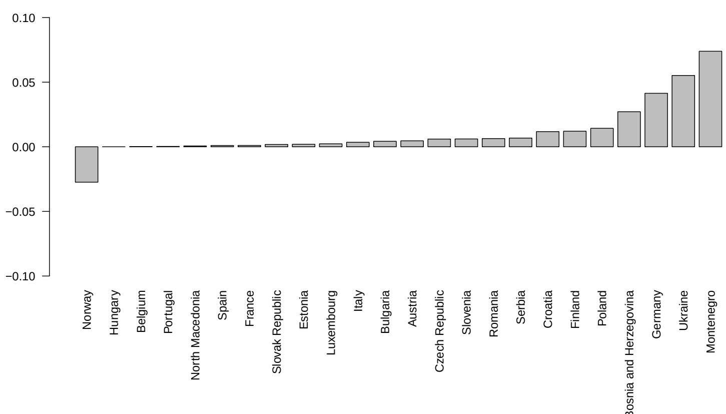
In the distorted economy, the one we observe in the data, a firm's relative performance is given by its debt and equity demands, which are a function of the physical productivity of the firm and the idiosyncratic distortions. Therefore, we design the targeted intervention to close down the SOEs, whose debt and equity demands are below the median demand among their POEs market counterparts. We define a market at the country-industry-year level. The should be noted that the targeting strategy may result in no SOEs being shut down.

The results illustrated in Figure 7 dictate that once the interventions are targeted at under-performing SOEs, all countries except Norway[16] experience a moderate increase in

[16] During the analyzed period, Norway had a distortive tax regime on financial liabilities, where debt and equity were treated differently, since the costs of debt financing (interests) were deductible, whereas the costs of equity financing were not (Ministry of Finance of Norway, 2015). The productivity losses associated with the reform in Norway may be, partly, explained by the fact that POEs were more exposed to or benefit less from the distortive tax regime on financial liabilities than SOEs. Indeed, while the average SOE and POE relied relatively more on debt than equity for producing a

aggregate productivity in response to the policy reform. The gains are moderate because despite reallocating resources away from poorly performing firms, the reallocation takes place in distorted financial markets. Indeed, the highest TFPR gains are 7.4% for Montenegro. If financial distortions among the private sector and surviving SOEs are relatively more severe, aggregate productivity declines in response to the intervention. Overall, however, the targeted intervention proves to be more effective at raising aggregate productivity than an indiscriminate elimination of government-run firms. The next section explores the effect of fixing markets before reallocating resources to make the SOE reform more effective.

Figure 7: TFP Gains: Targeted SOE Reform with Distorted Capital Markets



Note: The figure illustrates the TFP aggregate changes from a targeted removal of the SOEs with debt and equity levels below the median level among private sector enterprises in the same industry and country. The TFP gains in the counterfactual economy are measured relative to the distorted allocation we observe in the data, with both SOEs and financial distortions. The numbers reported in the histogram correspond to the average for each country across all years in our sample.

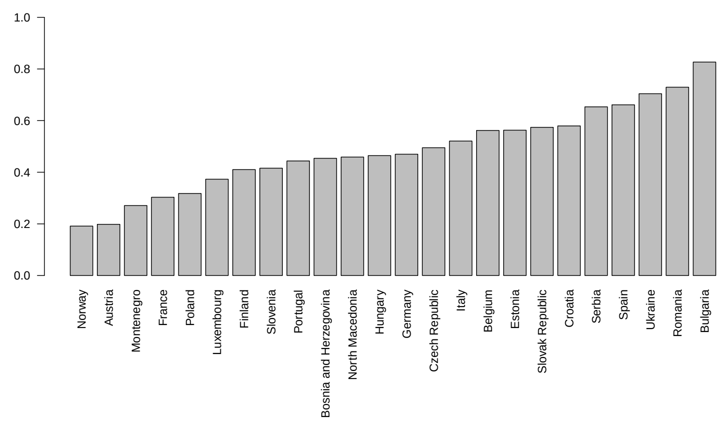
8.3. Productivity Gains: Targeted SOE Reform and Fixed Capital Markets

In our final counterfactual, we consider a scenario where the targeted SOE intervention is implemented alongside a reform that withdraws the dispersion in distortions from financial markets. In this case, the reallocation of the financing absorbed by the underperforming SOEs is conducted efficiently. Figure 8 shows that targeted SOE interventions combined

unit of the good in the year 2016, the debt-to-equity ratio of the average SOE was 2.28, while that of POEs was 1.78.

with financial reforms aimed at making markets more efficient lead to gains in every country. The latter ranges from 19.1% for a country like Norway up to 83.7% for Bulgari.

Figure 8: TFP Gains: Targeted SOE Reform with Undistorted Capital Markets



Note: This figure illustrates TFP gains from a targeted removal of SOEs with debt and equity levels below the median among private sector enterprises in the same industry and country. The TFP gains in the counterfactual economy are measured relative to the economy as implied by the data. The numbers reported in the histogram correspond to the average for each country across all years in our sample.

9. Conclusion

For more than a century, economists and policymakers have debated about the rationale for and potential effects of state participation in the economy. Despite the latest privatization waves and further structural reforms that broadly mirrored the global consensus about the need to shrink a bossy business government, the footprint of the state in the local and global economy remains indelible. The debate has recently regained momentum amid the notorious return of industrial policy as the cornerstone of the policy toolbox to promote private-sector-led growth despite the past pitfalls of its own.

Evidence about the distortionary effect of state ownership in the economy is surprisingly thin and mainly China-centric. However, while China offers the typical case for studying the economic implications of state participation in the market-based economy, the specificities of the Chinese case impede establishing a broader cross-country and cross-sectoral characterization that helps understand and, more importantly, quantify the fiscal cost and productivity effect of having the state heavily involved in the economy as a market player. This paper comes to fill this gap.

Our paper shows that firms with public authorities as direct shareholders (SOEs) get, on average, subsidized access to finance compared to private-owned enterprises (POEs). A 1 p.p increase in government direct shareholding reduces the average cost of finance (e.g., debt and equity) by 0.02 percent. The total SOE subsidy has an annual fiscal cost of up to 1% of GDP for a country like Slovenia during the year 2016. The largest subsidies appear in sectors that are the greatest facilitators of the economy. This includes finance, electricity, water, transport, as well as agriculture.[17]

Moreover, the paper shows that one size does not fit all. Our counterfactual analysis reveals that indiscriminate interventions aimed at dismantling SOEs may backfire in economies where government-run enterprises outperform private-sector peers and where severe financial distortions affecting POEs remain in place. Leveraging the theoretical underpinnings of our analysis, we constructed counterfactual allocations where SOEs were shut down under alternative assumptions about distortions in capital markets. We found that in many economies, SOEs perform relatively well compared to POEs. Hence, their dismantlement would not translate into aggregate productivity gains.

Targeting SOEs reforms to dismantle those government-run firms with relatively poor performance increases the number of countries benefiting from the reforms. However, while necessary, the latter is not enough to maximize the economic gains from SOEs reforms. Nonetheless, as expected, all interventions will translate into larger productivity gains if governments make financial markets less distorted. That is, if the SOEs policies are accompanied by financial market reforms that improve the allocation of capital across all types of firms.

We want to conclude our paper with some reflections about the relative importance of intensive (reducing the subsidy) versus extensive (dismantling) SOEs reforms to improve economic outcomes. It may be fair to argue that, the small value of the estimated coefficient that measures the average effect of state-ownership on the cost of finance, suggests that reforms at the extensive margin seem to be the most effective mechanism to maximize the economic gains from SOEs reforms. However, changes in the intensive margin, often

[17] We replicate the analysis for factor markets and we found that distortions in factor markets are larger than in financial ones, probably as they accumulate the upstream distortions related to getting access to finance. The results are available upon request (Cusolito et al., 2023).

implemented through corporate governance reforms, may be prominent if SOEs are, as these days, highly indebted. In the end, answering this type of policy question highlights the relevance of firm-level evidence to inform the current policy debate.

Appendix A. Historical Ownership Data Cleaning Procedure

To develop the historical ownership module we apply the following sequence of cleaning steps, following the methodology and SQL code developed by Cusolito and Vranic (2020).

1. *Merge all Links files*: create a unique file that compiles the individual annual Links files.

2. *Remove duplicates and keep the most updated information*: eliminate duplicate observations and keep the most updated information.

3. *Harmonize the time frame of the information*: use the information-date variable to identify the latest month where the ownership data was collected. If the latest month is June or after, then assign to the firm the Links file of the same year. Otherwise, assign the Links file of the previous year. We apply this rule to keep consistency with the timing rule applied when cleaning the financial information.

4. *Replace BvD ownership codes with numeric values*: in some specific cases, BvD has missing information about the ownership stakes of a particular shareholder. However, using secondary sources of information, BvD collects imprecise, though valuable, information that can be used to fill the data gaps. The following table presents the codes that BvD uses, their meaning, and the numeric value the company assigns to each link (Bureau van Dijk, 2018).

Table A.5: BvD Ownership Codes

BvD code	Meaning	Definition	Numeric Value Assigned
WO	Wholly Owned	The shareholder has at least 98% of the company	98%
MO	Majority Owned	The shareholder has at least 50.01% of the company	50.01%
JO	Jointly Owned	The shareholder has 50% of the company	50%
CQP1	General Partner	The shareholder has 50% of the company plus 1 share	50.01%
NG	Negligible	The shareholder has 0.01% of the shares or less than that	.

Appendix B. Historical Financial Data Cleaning Procedure

Following Bureau van Dijk (2011), Kalemli-Ozcan et al. (2015), Cusolito and Didier (2020), and Kalemli-Ozcan et al. (2023), we document the steps we apply to clean the financial information.

1. *Fill time-invariant data gaps*: for a given BvD.ID-year combination, with BvD.ID standing for firm unique identifier, replace missing highly-likely time-invariant information with information available for previous years (e.g., US SIC code, NAICS, NACE, NACE main sector, company name, city, region, postal code, legal form, incorporation date, thicker, isin). To perform this step, the team first worked with auxiliary raw tables, which collect legal and sectoral information of the firm, and collapsed the time-invariant variables at the BvD.ID level.

2. *Harmonize timeframe*: convert variable closedate from string to numeric format. Then create a new variable, name it year, and assign a year to the observation according to the following rule. If closing month corresponding to the observation is June or any other month after June, then make Year take the year reported in closedate. Otherwise, make Year the year reported in closedate minus 1.

3. *Drop duplicates*: the raw database presents a large number of duplicates at the BvD.ID-year level. The team noticed that the information was the same, except in the SIC primary code variable. Thus, we collapsed all the SIC primary codes reported by the same BvD.ID-year in one variable, using semicolons to list all the SIC primary codes, and eliminated duplicates.

4. *Drop firms with missing relevant information*: drop all the firms with no information for the following set of variables: US SIC code, NAICS, NACE core code, NACE main sector.

5. *Drop observations with missing information for the currency code*: eliminate observations with missing information for the currency code.

6. *Drop observations with missing information for variable closedate*: eliminate observations with missing information for the close date of the financial statement.

7. *Drop observations with relevant missing information* eliminate observations that at the BvD.ID-year level have missing information in all the following variables: operating revenue (turnover), sales, employment, total assets.

8. *Drop duplicates and keep most updated information*: keep observations with the most recent closing date if there are duplicates at the BvD.ID-year-first letter of consolidation code (e.g., C, U) level.

9. *Drop duplicates and keep information from annual reports*: keep observations with annual report in *Use FillingType* variable if there are still duplicates and keep the standardized information. Using annual reports (IFRS preferred, instead of local reports) guarantees standardization of reporting protocol at international level.

10. *Eliminate firms with noisy data*: drop all the observations corresponding to a specific BvD.ID if any of the following variables has a negative value in a specific year – total fixed assets, tangible fixed assets, intangible fixed assets, other fixed assets, current assets, sales, and employment.

11. *Deflate values*: use country GDP deflators from the World Bank database to deflate nominal variables and set year 2005 as the base year.[18]

12. *Harmonize currencies*: convert values in local currency to USD dollars, using the average of the monthly exchange rate for year 2005.

[18] https://data.worldbank.org/indicator/NY.GDP.DEFL.ZS.

Appendix C. Validation of Final Database

We validate the representatives of the final database by calculating the ratio of the sum of employment and gross output in the database to their corresponding aggregates, in the same manner as Gopinath et al. (2017). Aggregates for employment and gross output are obtained from Eurostat's Structural Business Statistics Database (SBS). Table C.6 compares the coverage of our final database to that of Gopinath et al. (2017) for the Spanish manufacturing sector. Our coverage is smaller than theirs because not all firms have the appropriate information in the historical ownership module to determine their linkage to the state or not, resulting in additional attrition in our sample. Tables C.7 and C.8 show the coverage of our sample by country, separately for manufacturing and non-manufacturing sectors.

Table C.6: Coverage of Final Database Relative to Gopinath et. al. (2017) - Spain Manufacturing

Year	Employment		Gross Output	
	Final Database	Gopinath et. al.	Final Database	Gopinath et. al.
2010	41.9%	68.0%	37.3%	74.0%
2011	43.5%	69.0%	35.6%	75.0%
2012	39.8%	65.0%	31.5%	72.0%

Note: This table only compares the years for which our database overlaps that of Gopinath et al. (2017), 2010 - 2012.

Table C.7: Coverage of Final Database Relative to Eurostat (SBS) - Manufacturing

Country	2010		2011		2012		2013		2014		2015		2016	
	Employment	Gross Output	Employment	Gross Output	Employment	Gross Output	Employment	Gross Output	Employment	Gross Output	Employment	Gross Output	Employment	Gross Output
Austria	7.1%	5.6%	13.4%	10.3%	27.2%	28.7%	39.3%	47.7%	39.5%	48.9%	42.6%	54.1%	43.9%	55.1%
Belgium	54.0%	69.5%	56.2%	66.4%	57.8%	71.4%	58.7%	71.3%	61.6%	69.9%	61.9%	73.8%	61.2%	71.2%
Bosnia and Herzegovina			45.6%	41.9%	34.7%	37.2%	52.2%	49.6%	50.7%	49.6%	52.0%	53.9%	47.7%	48.1%
Bulgaria	35.0%	26.4%	42.5%	27.6%	48.4%	27.3%	66.3%	38.2%	67.4%	40.5%	71.1%	43.6%	68.0%	43.8%
Croatia	34.2%	41.2%	34.8%	44.4%	46.6%	55.5%	46.1%	57.1%	49.7%	58.2%	52.0%	55.6%	51.3%	53.1%
Czech Republic	61.7%	42.2%	60.1%	43.6%	61.6%	43.1%	65.8%	46.8%	69.1%	48.7%	70.2%	53.7%	69.0%	56.9%
Estonia	35.5%	30.5%	38.5%	30.2%	37.0%	29.4%	40.0%	32.3%	38.8%	32.5%	39.4%	33.2%	40.7%	35.1%
Finland	27.2%	19.0%	29.9%	20.1%	31.2%	21.3%	29.6%	18.1%	34.6%	23.1%	35.4%	25.7%	33.7%	26.4%
France	17.9%	15.5%	17.4%	14.9%	15.2%	12.7%	18.9%	16.9%	23.3%	22.3%	25.3%	25.0%	25.2%	24.5%
Germany	24.7%	33.9%	26.8%	36.2%	27.9%	37.1%	26.5%	33.2%	27.0%	34.3%	27.8%	36.8%	25.0%	31.5%
Hungary	48.1%	67.5%	52.1%	69.4%	53.1%	70.5%	58.1%	78.5%	54.5%	82.1%	58.8%	85.6%	55.9%	85.8%
Italy	39.6%	42.8%	54.9%	53.4%	55.8%	51.5%	57.6%	54.5%	58.4%	54.7%	61.3%	55.8%	60.4%	57.1%
Luxembourg	49.3%	71.6%	64.5%	98.6%	49.6%	84.5%	59.3%	75.6%	56.9%	72.2%	52.5%	63.9%	44.1%	57.0%
North Macedonia					57.3%	39.0%	53.4%	42.2%	39.3%	29.3%	33.4%	25.7%	53.2%	
Norway	3.0%	1.8%	4.0%	2.5%	3.0%	2.6%	1.6%	0.9%	2.6%	1.9%	52.9%	44.1%	55.4%	48.3%
Poland	20.5%	25.8%	17.5%	21.9%	13.3%	17.8%	8.4%	10.4%	6.3%	9.0%	5.5%	8.1%	13.5%	19.7%
Portugal	41.6%	33.6%	58.7%	46.2%	41.7%	30.7%	62.7%	47.9%	63.7%	48.6%	64.4%	51.2%	64.3%	51.8%
Romania	44.7%	40.5%	49.8%	45.5%	51.3%	49.3%	56.2%	52.7%	56.5%	52.3%	58.9%	54.1%	57.6%	53.9%
Serbia													59.5%	78.5%
Slovak Republic	46.0%	33.1%	44.4%	37.8%	49.1%	48.0%	58.3%	55.8%	57.1%	46.6%	52.9%	40.3%	49.8%	40.3%
Slovenia	46.2%	46.1%	48.6%	48.3%	51.8%	52.3%	50.2%	49.3%	52.5%	50.6%	50.5%	50.4%	53.4%	52.7%
Spain	41.9%	37.3%	43.5%	35.6%	39.8%	31.5%	47.6%	40.2%	48.7%	38.4%	49.0%	40.4%	34.4%	28.7%

Note: Blanks correspond to country-year pairs for which the Eurostat's SBS Database does not report information. Montenegro and Ukraine are excluded from this table as the SBS Database does not include information for any of the years in our sample.

Table C.8: Coverage of Final Database Relative to Eurostat (SBS) - Non-Manufacturing

Country	2010		2011		2012		2013		2014		2015		2016	
	Employment	Gross Output	Employment	Gross Output	Employment	Gross Output	Employment	Gross Output	Employment	Gross Output	Employment	Gross Output	Employment	Gross Output
Austria	9.8%	9.2%	10.1%	9.4%	17.5%	21.4%	21.6%	27.4%	19.4%	26.9%	24.6%	30.9%	20.3%	27.9%
Belgium	33.9%	43.1%	32.9%	43.2%	35.5%	43.4%	36.3%	44.5%	36.0%	45.4%	36.3%	44.7%	35.3%	44.2%
Bosnia and Herzegovina			49.7%	54.6%	27.9%	33.7%	49.1%	54.3%	50.7%	53.2%	43.4%	50.8%	49.0%	51.5%
Bulgaria	30.5%	31.2%	36.7%	35.5%	42.6%	36.3%	61.2%	51.5%	64.3%	52.9%	68.4%	54.2%	64.0%	53.4%
Croatia	24.3%	33.9%	26.9%	38.0%	42.0%	52.4%	42.9%	53.3%	45.6%	56.7%	44.6%	56.2%	45.1%	56.4%
Czech Republic	51.5%	36.4%	51.5%	32.4%	52.0%	33.7%	56.6%	37.3%	58.0%	41.1%	59.2%	43.6%	56.9%	43.7%
Estonia	33.7%	30.1%	36.4%	31.4%	35.3%	33.7%	37.9%	33.7%	37.2%	34.1%	37.5%	34.5%	40.0%	37.0%
Finland	30.1%	39.3%	30.1%	44.0%	31.5%	41.6%	28.9%	44.3%	32.3%	45.2%	32.8%	48.7%	30.9%	45.1%
France	14.1%	18.2%	13.7%	17.5%	12.3%	15.4%	15.6%	20.5%	17.0%	23.1%	17.7%	23.0%	15.2%	22.3%
Germany	23.0%	39.6%	24.3%	41.8%	25.7%	41.9%	25.1%	41.7%	25.9%	41.8%	25.3%	38.1%	23.6%	37.5%
Hungary	30.1%	49.6%	31.9%	53.5%	31.6%	56.8%	32.7%	60.4%	33.6%	62.3%	32.3%	60.6%	29.8%	59.0%
Italy	31.5%	34.1%	45.8%	45.1%	46.7%	42.6%	45.1%	41.4%	47.3%	42.7%	49.8%	45.2%	48.1%	46.5%
Luxembourg	19.8%	46.4%	24.1%	57.8%	20.7%	48.6%	32.0%	63.0%	36.9%	65.2%	55.4%	80.1%	41.4%	76.0%
North Macedonia					46.5%	61.5%	53.7%	69.7%	37.9%	50.3%	36.1%	49.3%	59.0%	68.5%
Norway	1.0%	1.4%	4.3%	4.1%	1.0%	1.1%	3.4%	3.0%	1.7%	1.9%	65.1%	52.7%	65.4%	57.7%
Poland	13.1%	16.2%	12.7%	14.9%	8.5%	9.9%	4.9%	5.5%	4.6%	5.8%	3.1%	4.4%	8.9%	11.0%
Portugal	27.2%	31.9%	36.7%	41.7%	27.6%	31.6%	39.1%	43.8%	40.4%	46.4%	40.6%	47.4%	39.7%	46.6%
Romania	35.2%	42.6%	42.3%	51.4%	43.4%	52.8%	46.8%	57.8%	48.8%	59.6%	53.7%	67.6%	53.2%	68.2%
Serbia													44.8%	78.3%
Slovak Republic	35.7%	37.5%	36.6%	39.3%	38.6%	39.2%	51.8%	51.2%	55.3%	53.5%	51.2%	53.4%	48.7%	48.0%
Slovenia	35.3%	45.0%	40.1%	48.2%	40.0%	47.7%	41.7%	46.0%	40.9%	48.0%	39.0%	46.3%	42.5%	46.8%
Spain	31.5%	38.0%	32.6%	37.9%	30.0%	35.0%	34.8%	41.2%	34.8%	40.2%	35.0%	41.5%	25.3%	30.2%

Note: Blanks correspond to country-year pairs for which the Eurostat's SBS Database does not report information. Montenegro and Ukraine are excluded from this table as the SBS Database does not include information for any of the years in our sample.

Appendix D. Misallocation and Model Mis-specification

The framework proposed in Whited and Zhao (2021), which we adopt to conduct our empirical and quantitative analysis, inherits all of the limitations of any model-driven approach to elicit distortions from the data. Part of it is an actual distortion, and another part is the forces unaccounted for in the model. In the context of real-resource misallocation, unaccounted forces, such as adjustment costs to labor and capital accumulation, heterogeneity of markups across firms, technological differences across firms, and informational frictions, were all shown to account for some fraction of the overall misallocation inferred without consideration for these channels. However, substantial residual dispersion of marginal returns across firms remained, suggesting that misallocation is effectively a rooted feature of the data in less developed countries.

In the context of our assessment of the role of SOEs in misallocating financial resources, further limitations should be acknowledged. For instance, the theoretical framework does not endow state enterprises with any role in fixing market failures or contributing to a country's welfare function other than through allocative efficiency. All we are characterizing in our model is the amount and type of financing received compared with their private marginal returns. If, in reality, SOEs brought non-marketable returns that merited a larger size, the methodology would incorrectly treat it as a distortion.

We acknowledge this as a possibility and offer a few caveats that attenuate the concern. Firstly, we estimate the relationship between financial distortions and state ownership separately across broad economic sectors. So, if we found robust patterns across sectors, and if the non-private role of SOEs was more notable in some sectors and not in others, then we'd be reassured that, indeed, there is distorted access to finance from SOEs. As we will see, this is what we report later. Secondly, even in the economy-wide econometric specifications, we control for sector, time, and firm fixed effects, providing another layer of attenuation to the concerns. And lastly, we do not endow private firms with any social role either. It is conceivable that some private firms bring externalities to the rest of the economy through knowledge spillovers or other channels. In this way, we are also misattributing excessive finance to a private firm when indeed it is warranted by their externalities.

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