Disentangling the Effects of State Ownership on Investment – Evidence From Europe

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Abstract

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JEL Classification: G32, G31, G32, G38, D92, E22
Keywords: Government policy and regulation, state ownership, corporate investment

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1. Introduction

Despite multiple privatization waves globally since the early 1980s, the state remains an influential shareholder in many of the world's largest companies. In fact, recent years have brought an increase of state involvement in the private sector (Borisova, Fotak, Holland, and Megginson, 2015; Bortoilotti, Fotak, and Megginson, 2015) that is sometimes described by the media as a revival of state intervention (The Economist, 2012).[1] Against this backdrop, a growing strand of the literature is dedicated to identifying the implications of state ownership regarding firm-specific factors, such as profitability and efficiency. Our focus is on firms' investment policies, which are essential for their future profits and firm value, and have been shown to be related with state ownership (Firth, Malatesta, Xin, and Xu, 2012; Chen, El Ghoul, Guedhami, and Wang, 2014). The core question is, if government owners have an influence on whether firms efficiently invest according to their existing investment opportunities – typically measured by Tobin's Q –, or whether they over-/underinvest conditional on other financial factors, such as internal funds (Stein, 2003). As shown by Stein (2003), the major forces that distort firms' investment policies are agency problems and financing frictions. State ownership can be associated with both issues in various ways, which makes it theoretically unclear if and, more importantly, how having government shareholders affect firms' capital allocation.

For example, owing to imperfect monitoring (Vickers and Yarrow, 1991; Laffont and Tirole, 1993; Borisova, Brockman, Salas, and Zagorchev, 2012) and various political motives, government owners may exhibit empire-building investment patterns, wherein managers overinvest available internal funds in pet projects (Jensen, 1986). On the other hand, state ownership may also give rise to managerial "quiet life" behavior characterized by investment inertia (Bertrand and Mullainathan, 2003) and political objectives to pursue firm and employee stability (Fogel, Morck, and Yeung, 2008; Boubakri, Cosset, and Saffar, 2013). This would imply that state ownership negatively affects both the level of investment and its dependence to growth opportunities. . From a financing perspective, as Ben-Nasr, Boubakri, and Cosset (2012) argue, the risk of political interference and agency problems may increase the wedge between internal and external capital costs. This additional financing friction reduces investment by firms requiring external funding. Opposite to this, the soft-budget constraint theory (Kornai, 1979, 1980) suggests that state-controlled firms face lower financing constraints because they can obtain external financing more easily

[1] For example, the French government held substantial ownership stakes in more than ten of the largest 40 companies listed in the CAC40 as of August 2015 (the list is available at http://www.economie.gouv.fr/agence-participations-etat). Additionally, Megginson and Fotak (2015) report that over the 2001-2013 period governments acquired more assets through stock purchases ($1.52 trillion) than they sold through share issue privatizations and direct sales ($1.48 trillion).

than privately controlled firms, owing to their implicit guarantee of government bailout (Borisova and Megginson, 2011; Ben-Nasr et al., 2012).

To disentangle these conflicting theoretical predictions about state ownership effects, we employ an empirical testing approach. Based on a simplified model of investment in the spirit of Stein (2003) that captures agency issues and capital constraints in an intuitive way, we derive testable predictions of the different theoretical arguments relating to state ownership. The resulting predictions focus on the influence of government ownership on the level of investment and its sensitivity to investment opportunities, measured by Tobin's Q, and to internal funds. We apply this testing scheme to a panel dataset of publicly listed firms in Europe covering the period 1997-2013. Using an algorithmic approach to combine various sources of ownership information, we are able to precisely identify government shareholdings above the 5% threshold. Our final sample includes more than 5,000 observations of 312 firms with significant state ownership in any of the years, and the same number of non-state-owned firms that are matched based on size, industry affiliation and country groups.

Our primary findings are threefold: First, our evidence shows that state ownership curtails the sensitivity of investment to Tobin's Q. This also holds true when we consider alternative measures of investment opportunities that are not directly related to the firm's stock price, or when we use advanced estimation methods to control for measurement error in Q. Second, investment-cash flow sensitivity (ICFS) increases with the level of state ownership if, and only if, firms are presumably financially constrained and external finance dependent. We also find that this relation particularly prevails countries where the government has no or low ownership of domestic bank assets. Third, our insights show that government ownership has a negative direct effect on the level of investment and on absolute annual investment changes. It also mitigates capital expenditure cuts during the recent global financial crisis. To ensure that these insights are not prone to endogeneity or measurement error, we additionally implement instrumental variables, dynamic system GMM models (Blundell, Bond, Devereux, and Schiantarelli, 1992; Blundell and Bond, 1998), and higher-order cumulant estimators developed by Erickson and Whited (2000) and Erickson, Jiang, and Whited (2014). We also rule out alternative explanations for the identified relationship between state ownership and investment. Specifically, we control for the influence of stock price informativeness (Chen et al., 2007), asset tangibility (Almeida and Campello, 2007), and uncertainty levels (Boubakri et al., 2013).

Our insights confirm the general notion that state ownership is associated with inferior investment efficiency, as evidenced by its strongly negative effect on investment-Q sensitivity. The underlying mechanism for this suggests that government shareholders promote investment policies that are best characterized as conservative and stability-seeking. State-owned firms invest less and are lethargic when it comes to adjusting capital expenditures to emerging opportunities. Government stock ownership also

seems to constitute a source of financial friction, due to state shareholders' reluctance to allow companies to execute dilutive external equity issues, which makes equity-dependent firms' investment highly reliant on available internal funds.

These novel insights contribute to the literature that speaks to the real effects of state ownership on corporate investment. The popular view that state-owned firms are inefficient because they overspend funds for non-value maximizing purposes does not hold in our data. According to this argument, we would expect a positive link between government ownership and average investment levels, as well as an unconditionally positive link between investment and cash flow.[2] Our evidence also refutes the argument that state ownership has a mitigating effect on firms' financial constraints. Instead, we find that state shareholders can be burdensome for firms that are in need of new capital. This study's findings offer important policy implications. While it is widely accepted that state ownership may not be optimal from a firm value maximization point of view, a popular argument in favor of it says that it serves common goals, such as economic growth and employment. Our findings cast some doubt on the validity of this argument, since government owners seem to reduce firm-level investment as well as employee growth. This is in line with Fogel et al. (2008), who find that aggregate corporate stability[3], which is positively correlated with the degree of state intervention, is negatively related to economic growth.

Our paper also sheds light on the general empirical investment literature, which still puzzles over why investment decisions are less sensitive to investment opportunities than the neoclassical q theory predicts. We highlight how decision makers' stability seeking and conservatism can weaken investment sensitivity. Although Kaplan and Zingales (2000) recognize that investment-cash flow sensitivities can be influenced by managerial conservatism, related studies have largely focused on the empire-building type of agency conflicts and financing frictions to explain firms' investment patterns.[4]

This article is related to the studies by Chen, Sun, Tang, and Wu (2011) and Chen et al. (2014). Both studies suggest that state ownership negatively affects the sensitivity of investment to Tobin's Q, which serves as a proxy for investment opportunities. Our work goes beyond their findings in that it employs a comprehensive testing scheme – capturing also the level of investment and its sensitivity to cash flow – that allows to disentangle the theoretical channels of state owner influence. We additionally rule out the possibility that the results are driven by varying degrees of stock price informativeness (Chen, Goldstein, and Jiang, 2007; Ben-Nasr and Cosset, 2014) or measurement issues with Tobin's Q (Erickson and Whited, 2000). In another article, Firth et al. (2012) find that government ownership causes firms to

[2] In fact, we would rather expect a positive relation between state ownership and ICFS for supposedly unconstrained firms with few investment opportunities and plenty of cash (Firth et al., 2012).

[3] The authors measure the country-specific consistency of the top ten largest firms over a 20-year period.

[4] See Stein (2003) or Bond and van Reenen (2007) for reviews of the empire-building literature.

overinvest, especially when investment opportunities are scarce and internal funds are abundant. On the other hand, Chen, Jiang, Ljungqvist, and Lu (2015) show that internal capital market allocations are more efficient in privately owned business groups in China—where capital is funneled to the best investment opportunities—than in state-owned enterprises, which do the opposite.

The rest of the article is organized as follows. The next section presents the theoretical framework, which features our applied model of investment and the different theoretical arguments related to state ownership. Section 3 describes the data and our primary empirical estimation methods. Section 4 provides and interprets our main results and presents additional robustness tests. Section 5 concludes.

2. Theoretical Framework

The fundamental assumption underlying this study is that companies operate in imperfect markets, where agency problems as well as financial frictions influence the amount of capital that firms allocate to investment projects. To illustrate the theoretical effects of state ownership on corporate investment, we first introduce a heuristic model of investment that captures agency issues and financial frictions in a general and intuitive way. In the second step, we discuss various relevant arguments associated with government ownership and hypothesize how they are related to firms' investment decisions outlined in step one. This yields a set of testable predications about the impact of state ownership on the level of investment, and its sensitivity to investment opportunities and internal funds, respectively.

2.1. Investment model

In the spirit of Stein (2003), we define the value of the firm as:

$$V = \frac{F(I) + B(I)}{1 + r} - I - C(I) - \theta C(E) \quad (1)$$

where $F(I)$ is the firm's operating profit function, r is the risk-adjusted discount rate, I is investment, and $C(I)$ represents the cost of capital adjustment that occurs at the time of investment. To capture agency problems and managerial biases, we follow Stein (2003) and Aggarwal and Samwick (2006) and augment the objective function with $B(I)$, which reflects the additional value of investment perceived by decision makers. We also include a term for the deadweight cost associated with raising funds externally, given by $C(E)$, where $C(\cdot)$ is an increasing convex function, E is the amount of external financing, and θ is the degree of financial constraints. E is defined as $I + C(I) - W$, where W reflects the amount of available internal funds.[5] The first-order condition for maximizing V with respect to investment leads to the following specification:

[5] For the sake of simplicity, we consider a two-period scenario without complex payout schedules and various forms of external financing. Writing the model as a multi-period formulation would add complexity without significantly adding intuitions relevant for addressing our research questions.

$$\frac{F_I + B_I}{1+r} = 1 + C_I(I) + \theta C_E(E)\big(1 + C_I(I)\big) = \big(1 + \theta C_E(E)\big)\big(1 + C_I(I)\big) \quad (2)$$

In the absence of agency issues and financial constraints, the left-hand side of equation (2) represents the marginal profit of investment, also defined as marginal q, and investment is chosen so that $q = 1 + C_I(I)$. According to the neoclassical model of investment, outlined by Hayashi (1982), capital expenditures closely and exclusively follow changes in q, which is the standard measure for a firm's investment opportunities.

If agency conflicts prevail and $B_I \neq 0$, firm investment deviates from the perfect-market optimum and is chosen so that $q = 1 + C_I(I) - B_I/(1+r)$. Firms either over- or underinvest, depending on the sign of B_I, implying that the investment-q relationship $\partial I/\partial q$ is distorted. The exact relationship between B_I and $\partial I/\partial q$ depends on the functional forms of $F(I)$, $B(I)$, $C(I)$, and $\partial B_I/\partial q$. We refrain from choosing explicit specifications for these functions, but follow the related literature (Jiang, Kim, and Pang, 2011; Chen et al., 2014; Asker, Farre-Mensa, and Ljungqvist, 2015) in assuming that agency issues ($B_I \neq 0$) generally lead to reduced investment-q sensitivity ($\partial I/\partial q$). The Appendix provides a simple proof based on some straightforward assumptions.

In the presence of financial frictions, the optimal investment decision is $q = \big(1 + \theta C_E(E)\big)\big(1 + C_I(I)\big)$. This implies that firms invest less than at the perfect-market optimum – equilibrium q is higher than in the frictionless setting – because the first term on the right-hand side of the equation is larger than one. Fazzari, Hubbard, and Petersen (1988) and Kaplan and Zingales (1997) show that, in this situation, investment depends on available internal funds because they ultimately determine external finance requirements, so $\partial I/\partial W > 0$. It is crucial to note, however, that positive investment-cash flow sensitivity ($\partial I/\partial W$) does not prove the existence of financial constraints *per se*. As Bond and van Reenen (2007) point out, it is in fact a "joint test of all the maintained assumptions of the model, and not simply the assumption of no financing constraints" (p. 4464).[6] Further, it is questionable whether ICFS necessarily reflects the severity of capital constraints. Theoretically, Kaplan and Zingales (1997, 2000) argue that this ultimately depends on assumptions about the firm's production function, in particular linearly decreasing returns to scale. Moyen (2004) and Hennessy and Whited (2007) support this argument and show that, in dynamic settings, less constrained firms may exhibit higher ICFS primarily because they react less

[6] For instance, Gomes (2001) shows that in dynamic settings, ICFS may be explained by imperfect measurement of investment opportunities as well as artificial correlation of investment and cash flows via underlying technology shocks. This point is also addressed by several other contributions, including Erickson and Whited (2000), Alti (2003) and Abel and Eberly (2011).

aggressively to changes in investment opportunities, which are correlated with cash flows.[7] To account for these circumstances, we design an empirical strategy (Section 3.5) that accounts for endogeneity of cash flows and imperfect measurement of q. Also, any interpretation of cash flow coefficients is carefully differentiated based on characteristics that indicate the degree of *ex-ante* external finance dependence.

If and how financial constraints affect the sensitivity of investment to q is not a trivial question. On the one hand, financial frictions distort this relation because capital-constrained firms' ability to increase investment with rising opportunities is limited. This argument is rooted in the neoclassical investment model described by Hayashi (1982) and supported by findings of Hennessy and Whited (2007) and McLean, Zhang, and Zhao (2012). On the other hand, changes in q may themselves affect the degree of financial constraints because better growth opportunities could ease existing frictions and provide an additional trigger to investment responses (Chen et al., 2007). This effect is even more pronounced when measures of investment opportunities are subject to market failures and investor sentiment (Baker, Stein, and Wurgler, 2003).

2.1. State ownership and investment: theoretical channels of influence

Theoretically, state ownership can influence firms' investment policies, formalized above, in various ways. In this section, we outline the major relevant theoretical arguments and organize them according to their association with agency aspects (reflected in B_I) and financing frictions (reflected in θ). Thereby, we are able to link the theoretical channels of government influence with the above model, and derive testable to predictions that help us to disentangle the real impact of state ownership on investment.

2.1.1. Empire-building and overinvestment

The first argument posits that state ownership is systematically related to decision makers' empire-building motives and overinvesting activities (Chen et al., 2011; Firth et al., 2012; Chen et al., 2014). This theoretical argument supposes that decision makers have a particular interest in running large firms, as opposed to solely profitable ones. This idea goes back to the agency cost of free cash flow, introduced by Jensen (1986), according to which managers spend available internal funds on investment projects to grow the firm beyond its optimal size in order to increase power and potentially compensation. Dow, Gorton, and Krishnamurthy (2005) and Albuquerque and Wang (2008) show that ownership and control characteristics determine how agency conflicts between managers and shareholders, and among shareholders, lead to investment policies that are driven by empire-building motives.

State ownership may be positively related to empire-building and overinvestment for at least two reasons. First, from a managerial perspective, state ownership is associated with weak monitoring of

[7] Nevertheless, numerous studies have followed Fazzari et al. (1988) and utilized ICFS as a measure for financial constraints, and to date, the debate about proper interpretation is still ongoing (Almeida and Campello, 2007; Chen and Chen, 2012; Agca and Mozumdar, 2014; Lewellen and Lewellen, 2014).

managers (Vickers and Yarrow, 1991; Laffont and Tirole, 1993). Related to this, Borisova et al. (2012) show that government control is negatively related to corporate governance quality. Moreover, state-owned firms are frequently less exposed to external disciplining forces, such as product market competition or takeover pressures (Chen et al., 2014). Second, from a political perspective, the state as a major shareholder may have objectives that evoke overinvestment. Boycko, Shleifer, and Vishny (1996) suggest that governments would be willing and able to subsidize inefficiently high output in order to maximize employment or achieve other socially desirable goals, such as locating production capacities in economically underdeveloped but politically important regions, providing cheap goods and services, and producing unnecessary products (Boubakri, Cosset, and Saffar, 2008). As Megginson, Nash, and van Randenborgh (1994) argue, all of this would imply that state-owned firms tend to invest relatively more than firms without state involvement. Similarly, Firth et al. (2012) contend that maximizing government owners' "objective functions may entail expanding production capacity even if profitable investment opportunities are scarce. Hence, government controlled firms would use available cash flows to expand investment even if profitability is reduced" (p. 436).

The implication is that the marginal additional value of investment is positive ($B_I > 0$), which constitutes a distortion to the investment-*q* relationship. Further, as Jensen (1986), Stulz (1990), and Stein (2003) argue, B_I strongly depends on the availability of internal funds ($\partial B_I/\partial W > 0$). In consequence, investment increases with available internal funds, as evidenced by Blanchard, Lopez-de-Silanes, and Shleifer (1994) and Andrén and Jankensgard (2015). Under the assumption that state ownership is positively associated with the described agency problems, this argument leads to following predictions:

Prediction 1a: *The investment-q sensitivity ($\partial I/\partial q$) is negatively related to state ownership.*

Prediction 1b: *The investment-cash flow sensitivity ($\partial I/\partial W$) is positively related to state ownership.*

Prediction 1c: *The level of investment (I) is positively related to state ownership.*

2.2.2. Stability and the quiet life

Contrary to the previous argument, an alternative agency problem suggests that decision makers prefer the "quiet life" and are prone to inertia when it comes to making major investment decisions. This theory goes back to a study by Bertrand and Mullainathan (2003), who examine the adoption of anti-takeover laws in US states to empirically test managerial preferences. One of the major findings is that insulation from takeovers reduces closures of old plants, but also inhibits the creation of new plants. Aggarwal and Samwick (2006) develop a theoretical model to compare the empire-building and the quiet-life variant of agency problems. If the latter prevails, managers experience a private cost of investment and capital expenses are less than at the optimum. In empirical tests, the authors find that investment and

performance increase in incentives, which supports the presence of private costs of investment and general theories of underinvestment.

From a managerial perspective, the mechanism through which state ownership can evoke quiet-life investment behavior is the same as in the previously discussed empire-building issue: state ownership implies insufficient monitoring and imperfect insider ownership. Corroborating this view, a more political perspective suggests that the state's objectives as a major shareholder are very much in line with managers' overly-conservative investment decisions. For example, Fogel et al. (2008) argue and show that government size and the degree of state intervention are strongly related to firm stability and survival. One of the major arguments is that corporate stability "is a tool for stabilizing employment and promoting egalitarian goals" (Fogel et al., 2008, p. 96). Similar to the quest for a "quiet life", this pursuit of stability implies reluctance to downsize investment and employment when economically needed, and conservatism to undertake capacious investments when opportunities are plentiful. Related to this, John, Litov, and Yeung (2008) argue that governments may discourage risky investment activities in order to maintain a constant base for rent extraction. Boubakri et al. (2013) show that, in the context of privatizations, state ownership is negatively related to risky investment decisions. The authors attribute this at least partly to the state owners' high risk aversion and the corresponding incentive structures, which impede risky investment projects. In an early study on privatization, Megginson et al. (1994) show that state-owned firms rather underinvest, partially because state control limits corporate entrepreneurship.

The corresponding model assumption related to this theoretical argument is that $B_I < 0$, meaning there is an additional perceived cost of marginal investment. Based on the findings by Bertrand and Mullainathan (2003), it is also fair to assume that decision makers dislike strong positive and negative investment adjustments and rather prefer stable levels over time. This implies that $\partial B_I / \partial |\Delta I| < 0$. Under the assumption that state ownership is positively linked to quiet-life agency problems, this theoretical argument leads to the following testable predictions:

Prediction 2a: *The investment-q sensitivity ($\partial I / \partial q$) is negatively related to state ownership.*

Prediction 2b: *The level of investment (I) is negatively related to state ownership.*

Prediction 2c: *The absolute change in investment ($|\Delta I|$) is negatively related to state ownership.*

2.2.3. Increased capital constraints

From a capital markets perspective, state ownership may influence investment policies through its increasing effect on external finance costs. First, as Ben-Nasr et al. (2012) argue, state ownership is associated with higher risks of political interference and agency problems. This negatively affects firm performance and credibility, and in consequence raises the cost of equity and debt (Borisova and Megginson, 2011; Borisova et al., 2015). Prior research shows that government ownership is also

associated with inferior reporting quality and financial transparency (Bushman, Piotroski, and Smith, 2004; Guedhami, Pittman, and Saffar, 2009). This leads to greater information asymmetries and higher costs of external finance.

Moreover, the very nature of the state as a major shareholder could create a source of financial friction for the company. Megginson et al. (1994) note that governments run their state-owned firms on a tight cash budget in order to exercise some form of control and to limit public borrowing requirements. One might expect a rent-seeking government shareholder that requires payouts to manage public budgets not to be particularly keen on injecting additional capital to fund corporate investments, even if these are profitable in the long run. This also impedes capital increases from minority shareholders if the state is eager to maintain a certain ownership stake. This point is further aggravated by the recent financial turbulences in the euro area that have put several European governments under pressure to limit their public debt burdens.

With regard to the investment model, this implies that state ownership exacerbates the degree of financial constraints θ. Hence, it can be argued that state ownership is negatively related to the level of investment and positively affects ICFS if the firm's investment activities require external financing:

Prediction 3a: *The investment-cash flow sensitivity ($\partial I/\partial W$) is positively related to state ownership if the firm's investment activities depend on external financing.*

Prediction 3b: *The level of investment (I) is negatively related to state ownership if the firm's investment activities depend on external financing.*

2.2.4. Soft-budget constraints

It is also conceivable that state ownership reduces the wedge between external and internal finance costs. Based on the soft-budget constraint theory, initiated by Kornai (1979, 1980) and summarized by Firth et al. (2012) and Megginson, Ullah, and Wei (2014), state-controlled firms are able to obtain external financing more easily than privately controlled firms. Several studies including Guariglia, Liu, and Song (2011) and Poncet, Steingress, and Vandenbussche (2010) provide empirical support for this argument by showing that state-owned firms' investment activities are rather insensitive to internally generated funds. State ownership also reduces the risk of bankruptcy because it carries an implicit guarantee of government bailout. In fact, Borisova and Megginson (2011) and Ben-Nasr et al. (2012) find evidence that, under certain conditions, state ownership can lead to reduced costs of both equity and debt.

State ownership is strongly linked to firms' political connections (Boubakri et al., 2008), which may be influential for the cost of external financing. For example, Faccio, Masulis, and McConnell (2006) show that politically connected companies are more likely to be bailed out than peers without political connections. Moreover, Claessens, Feijen, and Laeven (2008) find evidence that politically connected

firms benefit from preferential access to external finance. In consequence, investment policies of politically connected firms depend less on the availability of internal funds, as evidenced by Xu, Xu, and Yuan (2013).

These arguments imply that state ownership reduces the severity of financial constraints θ. Hence, state ownership is positively related with the level of investment and negatively affects ICFS if the firm's investment activities require external financing:

Prediction 4a: *The investment-cash flow sensitivity ($\partial I/\partial W$) is negatively related to state ownership if the firm's investment activities depend on external financing.*

Prediction 4b: *The level of investment (I) is positively related to state ownership if the firm's investment activities depend on external financing.*

****** Insert Table 1 about here ******

3. Data and methodology

3.1. Sample

In order to investigate the effect of state ownership on firms' investment patterns, we study a sample of publicly listed companies incorporated in Europe between 1997 and 2013. We only include listed firms because the required accounting, stock market, and ownership information is obtainable for those firms only. Our rationale for focusing on Europe is similar to that of Borisova and Megginson (2011) and Borisova et al. (2012). First, significant state holdings in listed firms are common in many European economies, so including several countries allows us to gain the scale that is needed to draw powerful inference from the analyses. Second, we focus on this region to limit the degree of heterogeneity across countries. Extending the dataset to include emerging economies would impede clear economic interpretation as the underlying objectives associated with state ownership may be fundamentally different in those countries. Third, data availability and, more importantly, data quality is particularly high in European countries. Our analysis demands reliable accounting data and accurate information on direct and ultimate state ownership, which is best obtained for European firms. Our panel starts in 1997 because this is the first year for which we are able to gather our key ownership data.

In a first step, we identify listed firms in Europe that are covered in Thomson Worldscope during our sample period. We exclude financial firms as well as observations for which basic accounting data – total assets, sales, capital expenditure or total equity – is missing. Following Chen and Chen (2012), we exclude firm years in which total asset growth exceeds 100% and capital, total assets and sales are below USD 1 million to mitigate the effect of outliers. Note that we require at least three consecutive years of

information to construct lags and still have at least two panel years of complete data. Eventually, we exclude countries with less than 100 observations, which leaves us with 45,553 firm years in 19 countries.[8]

Next, we match this preliminary sample with our principal ownership dataset, gathered from the Thomson Reuters Ownership database. We are able to collect useful ownership data for 40,075 observations. As described in the following section, we identify firms with significant state ownership in any of the years through an algorithmic approach, which utilizes information from various sources of ownership data.

3.2. Definition of state ownership

State ownership may broadly refer to stockholdings by any type of government-owned or controlled entity, including shareholdings of national government ministries and central banks; equity stakes held by state-owned financial and non-financial enterprises; stockholdings of local and regional governments; and portfolio investment holdings by public pension funds and sovereign wealth funds, which are frequently controlled by foreign governments (Borisova, Fotak, Holland, and Megginson, 2013). The bulk of the theoretical and empirical literature examining state ownership focuses on domestic government-controlled entities (e.g., Borisova and Megginson, 2011; Chen et al., 2014), which are also most relevant with respect to the theoretical arguments outlined above. Public pension funds and sovereign wealth funds are assumed to act rather independently and to share many features with institutional investors (Kotter and Lel, 2011; Bortolotti et al., 2015). Hence, we apply a narrow definition of state ownership that is confined to government-related entities and excludes shareholdings by sovereign wealth and public pension funds. More precisely, entities we deem government-related include central and regional governments (treasuries, ministries, states, municipalities), domestic government-controlled investment funds (such as *Caisse des Dépôts et Consignations* in France) and financial institutions (e.g., government development banks), and state-controlled non-financial enterprises. This classification logic resembles the approach taken in Borisova et al. (2013).

3.3. State ownership data

Our primary sources of state ownership data are from the Thomson Reuters Ownership & Profiles Database, and include yearly information on ownership shares by a firm's 20 largest shareholders. It also features supplementary information about shareholder type and country, which allow us to identify state owners and discriminate between government agencies, sovereign wealth funds, and public pension funds. Although data coverage and granularity are satisfactory, data quality is limited, especially when it comes to shareholder type classification. One reason for this is that the data only captures direct shareholdings,

[8] The countries are Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

which do not necessarily reflect the true ultimate ownership structure.[9] Therefore, we enrich our data with information from Bureau van Dijk's Osiris database, Thomson Reuters' SDC Platinum M&A database, the Privatization Barometer database, and public information from company filings and government institutions such as the ministry of finance. In order to identify firms in which the state holds a significant stake, we employ a three-stage algorithmic approach:

- *Step 1*: We extend our dataset by matching the firms in our sample with those in the respective databases. From Osiris, we draw information about direct and ultimate shareholdings since 2001; from SDC Platinum's deal data, we obtain information on whether the respective sample firm was involved in an acquisition by a government-owned entity or in the privatization of government assets[10]; from the Privatization Barometer, we obtain information on whether and when a sample firm was privatized. Based on this, we flag firms that are presumably state-owned in a specific year according to any of these sources.
- *Step 2*: Many governments manage their shareholdings via specific investment vehicles. Thus, we generate a list of 20 of these entities, based on press research and information provided by respective government institutions. We screen all sample firms' shareholders for any of these names and automatically change the shareholder type if necessary. Our name screen also includes basic terms related to state owners such as "Municipality" or "Ministry".
- *Step 3*: In a final step, we manually validate the ownership data of all firms, for which one of the sources indicates state ownership at the 5% level in any of the years by comparing the various sources, and by considering company filings in case of ambiguous data.

These steps yield a sample of 312 firms in which the state holds at least 5% of the shares outstanding in any of the years between 1997 and 2013. The number of firm-years with more than 5 % state ownership amounts to 1,946, which represents about 5% of the full sample of all European firm-years. Owing to the described ownership data-gathering process, our sample covers significantly more state-owned firms in Europe, compared to the datasets used by Borisova et al. (2012) and Boubakri et al. (2013), which include 113 and 134 state-owned firms, respectively.

3.4. Matching procedure

We match state-owned to non-state-owned firms to identify companies that are observably similar on dimensions likely to affect investment. We follow Mortal and Reisel (2013) and Asker et al. (2015) and focus on firm size and industry, and additionally address legal country groups. Of course, other observable

[9] Manual checks also reveal that government entities are frequently mis-classified as investment managers or corporations.

[10] The database features flag variables indicating the involvement of government-owned entities and sovereign wealth funds, as well as a privatization flag and detailed information about the involved parties on both sides of the deal.

characteristics – such as profitability, cash holdings or leverage – may significantly differ between state- and non-state-owned firms. But our aim is to keep the procedure simple so that we are able to compare both firm types across various characteristics in the course of our analysis, where we also employ instrumental variable models to control for differences between state- and non-state firms across multiple dimensions.

As can be seen from Table 2, the average firm with state ownership has total assets that are almost four times as large as those of the average firm without state ownership. Also, the industry distribution in the two groups varies significantly, with state firms being particularly over-represented in energy, telecommunication and utilities industries. Both factors, size and industry, have been shown to be influential for corporate investment activities (Asker et al., 2015).

****** Insert Table 2 about here ******

Moreover, the distribution across countries differs between state and non-state firms. Perhaps most strikingly, firms from the United Kingdom represent 31% of our entire (unmatched) sample but only 3% of all firm years with state ownership of at least 5%, doubtless because most British state enterprises had been fully privatized before our starting year 1997. Although matching within the same country would be desirable, we focus on finding similar firms within the same legal-origin (La Porta, Lopez-de Silanes, Shleifer, and Vishny, 2008) country group. First, finding an appropriate match within the same industry and country often turns out to be difficult given the available sample size, especially in smaller countries. Second, several studies – including La Porta, Lopez-de Silanes, and Shleifer (2008) and Bortolotti and Faccio (2009) – document that a country's legal origin is related to the extent to which governments hold ownership stakes in public firms, and also to the underlying objectives of such state participations. Third, a large body of research, including Wurgler (2000) and McLean et al. (2012), documents how legal origin affects firms' investment policies and efficiency.

We use a nearest-neighbor matching algorithm adapted to a panel setting. In order to uphold the panel structure, we match on the firm, not the firm year, level. This allows us to capture the time-series variation in state ownership as we do not exclude a firm from our sample once the state relinquishes its ownership stake. In effect, we match firms with at least one year of state ownership above 5% to other firms that are closest in terms of total assets (calculated as the average over the respective sample period) and that are in the same Fama and French 12-industry portfolio and of common legal country origin. [11] We distinguish between common law, French, German, and Scandinavian law origins (La Porta, Lopez-de Silanes, Shleifer, and Vishny, 1998; La Porta et al., 2008). We employ single nearest neighbor matching

[11] Our procedure also includes a criterion that ensures the observations of both matched firms cover approximately the same time period.

without replacement. If no match can be found, we look for a match in the other country groups. Our results are robust to using a procedure with replacement, specific calipers on the maximum size difference, and more granular industry classifications such as Fama and French 48 portfolios. In addition, we carefully test whether our results change when we use the unmatched sample, or allocate matches within the same country and industry (see Section 4.2.3).

The resulting matched sample includes 312 firms with state ownership in at least one of the years, representing 2,947 observations. Of those, 1,946 (66%) observations refer to firm years in which the state holds 5% or more of the shares. The sample additionally includes the same number of matched firms without any state ownership, corresponding to 2,325 observations. Table 2 summarizes the sample before and after the matching procedure. It shows that state and non-state firms are almost identically distributed across industries and country groups after matching. The large gap in firm size significantly narrows in the matched sample so that we have state and non-state firms with comparable size distributions.

3.5. Empirical specification and variables

We follow the standard approach in the literature based on Fazzari et al. (1988) and include a measure of *q* and cash flow as explanatory variables for investment. To test our theoretical predictions, we augment the model by adding a state ownership variable and its interaction with the other explanatory factors:

$$I_{i,t} = \alpha + \beta_1 Q_{i,t-1} + \beta_2 CF_{i,t} + \beta_3 Q_{i,t-1} \cdot State_{i,t-1} + \beta_4 CF_{i,t} \cdot State_{i,t-1} + \beta_5 State_{i,t-1} + X'_{i,t-1} B_6 + \varepsilon_{i,t} \quad (3)$$

where I is investment deflated by beginning-of-period capital. Our default measure for investment is capital expenditures and for capital is net property, plant and equipment. Given that our sample is not limited to manufacturing firms, we consider broader measures for I that capture R&D expenses, acquisitions, and changes in total non-current assets in robustness checks. Our default measure of q is Tobin's Q, calculated as the ratio of market value of assets to book value of assets. The market value of assets is total assets plus total market capitalization minus book equity. Book value of assets equals total assets. CF is operating cash flow scaled by beginning-of-period capital. $State$ is the ownership share held by the state. X is the set of additional control variables used in the regression. We follow Chang et al. (2014) and often include cash, leverage and a measure of firm size in our regressions. We also account for the first-order effect of uncertainty on investment, which has been recently emphasized by Panousi and Papanikolaou (2012) and Gilchrist, Sim, and Zakrajsek (2014). The exact definition and construction of all variables can be found in Appendix A. Our data contains a few severe outliers, such as observations of cash flow that are more than 30 standard deviations away from the mean. To ensure that these outliers do not contaminate our results, we winsorize all variables at the top and bottom 1%. Table 3 presents descriptive statistics for the major variables used in most regressions.

****** Insert Table 3 about here ******

Note that we estimate equation (3) in slightly different variations, as we sometimes exclude the interaction terms to investigate a direct effect of state ownership on investment and we vary the set of controls and fixed effects. Our default estimation technique is firm and year fixed effects (FE) ordinary least squares (OLS) with standard errors clustered at the firm level. This allows us to absorb individual heterogeneity as well as time-specific effects. It also increases comparability with closely related studies (Chen et al., 2011; Firth et al., 2012; Chen et al., 2014) and gives us more flexibility in slicing the data to perform specific analyses on subsamples of firms. Where relevant, we also include interactions of country and industry dummies with Q and CF to additionally control for cross-country and -industry heterogeneity in investment sensitivities.

An alternative approach is to remove all cross-sectional differences by only considering the time variation in the state ownership variable. Effectively, this implies estimating equation (3) on the subsample of firms that exhibit significant changes in state ownership over time. Because (government) ownership is typically stable over time, identifying the effect only from time-series variation within firms is not our primary approach. 52% of the 312 state firms experience changes in government control at the 5% ownership threshold, and 39% of them do so at the 10% ownership threshold. Focusing on this subgroup of state firms also poses the risk of running into sample selection problems, as these firms could systematically differ from the other state firms. Nevertheless, we apply this approach as an additional robustness check in Section 4.2.

In addition, to address the various challenges that come with the estimation of investment equations (Section 2.1), we validate our baseline results by applying a battery of complementary analyses. We discuss these robustness tests, which involve alternative estimation techniques that control for endogeneity of financial variables and measurement error in Q, in Section 4.2.1.

4. Results

4.1. State ownership and investment

This section presents results from empirical analyses aimed at identifying the channels through which state ownership affects firm investment by testing the predictions formulated in Section 2.2.

4.1.1. Sensitivity of investment to Q and cash flow

Table 4 presents results from estimating equation (3). We are particularly interested in the two interaction terms that indicate the effect of state ownership on investment-Q and -cash flow sensitivity. While the coefficient on $Q \times State$ is negative and strongly significant throughout all models, the coefficient on $CF \times State$ is positive and statistically significant only when the additional controls are included. The negative coefficient on the Q-interaction is also economically meaningful. In the average

government-owned firm, $State$ is 38%, implying a Q coefficient in model (4) of 0.013 that is 78% below the coefficient of firms without state ownership. While one standard deviation change in Q (0.7) leads to a 21% standard deviation change in I if $State$ is zero, the economic significance of Q for the average state-owned firm is below 5%.

The coefficients remain very similar when we additionally control for the interactions of country and industry dummies with Q and CF in columns 5 and 6, and when we include interaction terms between the additional control variables and state ownership. These findings strongly support Propositions 1a and 2a that $\partial I/\partial q$ is negatively related to state ownership. At this point, it is not clear whether the positive coefficient on $CF \times State$ constitutes support for the empire-building argument (Prediction 1b) or the notion that state owners are related to increased capital constraints (Prediction 3a). We differentiate between both hypotheses in the next subsection.

Note that the positive and statistically significant coefficient on $State$ cannot be interpreted standalone, because the interacting variables' mean values are different from zero. The estimates from model (1) show that, at an average Q of 1.338 for firms with at least 5% state ownership, the effect of $State$ is in fact slightly negative (0.103-0.092*1.338) and statistically insignificant. The general coefficients on Q and CF are consistent with findings in recent large-scale investment model estimations by Almeida, Campello, and Galvao (2010), Chen and Chen (2012), and Erickson and Whited (2012).[12] In fact, our coefficient on Q is rather high and the one on CF relatively low compared to studies that cover a broader time frame. This is not surprising as several studies – including Agca and Mozumdar (2008) and Chen and Chen (2012) – find that ICFS has been decreasing over recent decades. Our estimates are also similar to those obtained from advanced estimation techniques applied in studies by Almeida et al. (2010) and Agca and Mozumdar (2014). This suggests that our FE coefficients may be only marginally affected by measurement issues with Q or endogeneity. Nonetheless, we address these issues in Section 4.2.1.

****** Insert Table 4 about here ******

4.1.2. Investment sensitivities and financial constraints

As argued above, interpreting ICFS is not straightforward. It can be the result of both agency-related empire-building (Prediction 1b) and increased capital constraints (Prediction 3a). To distinguish between the theoretical arguments, we split the sample on the basis of *ex-ante* financial constraints and the level of external finance dependence. We follow standard procedures in the literature and proxy the degree of constraints with the Whited-Wu index (Whited and Wu, 2006), the payout ratio, and a size indicator. Similar to Rauh (2006), we proxy a firm's dependence on external finance by the fraction of years for

[12] When we calculate Q according to Chen and Chen (2012), our estimate on Q is 0.006 and 0.041 on CF, which closely matches their findings for the period starting in 1997.

which its capital expenditures are greater than is operating cash flow. Companies whose investment is frequently above their cash flow are more dependent of external funding. Note that in Table 5, columns 1, 3, 5, and 7 refer to the firms that are presumably more constrained and more dependent on external financing – meaning those with a high Whited-Wu index, a low payout ratio, a small size, and high external finance dependence.

The results displayed in Table 5 strongly support Prediction 3a, which implies that state ownership is associated with increased capital constraints. Irrespective of the financial constraint proxy used, the coefficient on $CF \times State$ is significantly positive (at the 1% or 5% level) if, and only if, a firm presumably has a high need for external funding. The effect is strong in economic terms – ICFS for the average state-owned firm (with 38% ownership) in the subsample of high-Whited-Wu-index firms is 0.077, which is 1.3 times higher than the corresponding value for non-state-owned firms. Further, as indicated by the p-values at the bottom of the table, the difference in the $CF \times State$ coefficient between both subsamples is always statistically significant at least at the 10% level. We compute the significance of the difference by pooling the subsamples into one regression in which every explanatory variable is interacted with an indicator for high capital constraints and external finance dependence, respectively. The coefficients do also not change when we include interactions of country and industry dummies with Q and CF as in Table 4.

****** Insert Table 5 about here ******

Our results do not support the empire-building argument. It appears that state ownership even leads to slightly reduced ICFS when firms are expected to be financially unconstrained. These findings contrast with Firth et al. (2012), who present evidence that state ownership may be related to overinvestment among publicly listed firms in China. Although methodological factors, especially the quality of stock market-based *Q*, may partially explain these diverging results, we mainly attribute the differences to the fact that the nature of state ownership may be fundamentally different in China compared to Europe.[13]

Interestingly, the relationship between state ownership and investment-Q sensitivity is negative for all firms, and is stronger if firms are more constrained. This indicates that the additional capital constraints associated with state ownership may further curb firms' ability to adjust investments according to changes in opportunities. As for the base effect of *Q*, our evidence supports Baker et al. (2003) in that the *Q* coefficients are generally higher when firms are more equity dependent. Note that we only present

[13] We check whether our results change when we follow the analysis in Firth et al. (2012) and carefully account for the U-shape in ICFS. In line with expectations, we find that the coefficient on the cash flow variable is negative for values smaller than one, yet the way in which state ownership is related to ICFS is not significantly affected.

[14] Regression results are available upon request.

results from the FE estimations for the reasons stated above. Our results are very similar when we use alternative financial constraint indexes such as the Kaplan-Zingales index.[14]

To enrich the analysis, we consider the influence of government ownership among banks. Assuming that state ownership in the domestic banking sector is positively correlated with external finance access of state-owned non-financial companies, Proposition 3a suggests that the positive relation between state ownership and capital constraints is particularly present in countries with no or limited government ownership of banks. Hence, we partition our sample into countries with a high and low fraction of government-owned bank assets and estimate equation (3) for both subsamples. The data on state-owned bank assets comes from World Bank survey data used in Barth, Caprio and Levine (2013). The corresponding results in Table 6 show that the significantly positive coefficient on $CF \times State$ only exists in firms from countries with low government ownership in banks. This finding supports Proposition 3a that state ownership is associated with increased external finance frictions. It also shows that this adverse effect seems to be mitigated when a large fraction of the banking sector is also controlled by the state.

****** Insert Table 6 about here ******

4.1.3. Direct effect of state ownership on investment

To validate the above insights, we investigate the direct effect of state ownership on the level of investment in cross-sectional analyses. Table 7 presents the results of estimating a slightly modified equation (3), in which the respective interaction terms are excluded and additional controls for dividend payments are included. We do not include firm fixed effects in these regressions to fully capture the effect of state ownership, which exhibits only a limited degree of time-variation that is captured in FE models. Instead, the regressions now include country and industry fixed effects, which were previously absorbed by the firm fixed effects.

Overall, these results paint a clear picture. In line with the stability argument outlined in Section 2.2.2, estimates show that state ownership is associated with lower investment ratios, *ceteris paribus*. The effect is statistically significant at the 1% level, or 5% level with additional controls, but is not very large in economic terms. It is also relatively unaffected by the respective level of financial constraints and external finance dependence, as the results for the subsamples indicate.

****** Insert Table 7 about here ******

State ownership also implies more investment stability, which is demonstrated by the negative coefficients in row 11, where the absolute change in investment is the dependent variable. Through probit regressions in rows 12 and following, we find that this stability manifests itself as a particularly lower likelihood of state-owned firms cutting investments. State ownership is also negatively related to strong annual increases in investment (last row).

These findings are not in line with the concept of overinvestment. In fact, our evidence is rather in line with early findings by Megginson et al. (1994), who document that divested firms increase capital investment spending after privatization, and reminds us of the quiet life behavior identified by Bertrand and Mullainathan (2003). This support for Predictions 2b and 2c suggests that, overall, the influence of state ownership on corporate investment can best be explained by the agency-related stability argument, paired with the notion of increased capital constraints.

4.1.4. Investment reductions during the financial crisis

We next analyze how state ownership is related to the investment reductions undertaken during the global financial crisis of 2008 to 2009. Consistent with evidence in the related literature (Duchin, Ozbas, and Sensoy, 2010; Kahle and Stulz, 2013), our data shows that firms make significant investment cuts during crisis years. On average, 2009 capital expenditure (capex) levels are four to five percentage points lower than before the crisis in the years 2006 and 2007. Panel A of Figure 1 presents indexed mean investment levels for firms with more and less than 5% state ownership by the end of 2007. It essentially reveals that (i) the crisis hit investment primarily in 2009; (ii) state firms apply smaller crisis-related investment cuts than non-state-owned firms; (iii) opposite to non-state-owned firms, firms with state ownership continue to decrease investment in 2010.

In the other Panels, we compare Q, cash flow and uncertainty dynamics of state- and non-state firms during years of financial crisis. The trends in Panels B and D reveal that the crisis clearly constitutes a shock to growth opportunities and uncertainty, as indicated by the strong changes in both Q and uncertainty around 2009. Interestingly, the impact is very similar for firms with and without significant state ownership. Cash flows do not exhibit a clear pattern during the crisis.

Explaining these patterns is not trivial as it is still controversial whether the crisis constitutes a shock to firms' credit supply and bank lending or to their product demand and uncertainty levels, or both (Kahle and Stulz, 2013). While we are not able to preclude any of the crisis theories, our major interpretation of the dynamics presented in Figure 1 is that state-owned firms are more reluctant and hesitant to downsize investment in light of an external demand and/or uncertainty shock.

****** Insert Figure 1 about here ******

In order to thoroughly assess the impact of *State* on investment reductions during the crisis, we estimate cross-sectional versions of equation (3), in which the dependent variable is the change in investment during the crisis. Specifically, we compare capital expenditures in each of the years 2008, 2009, and 2010 with average levels in 2006 and 2007. Besides the 2007 realization of *State*, we include previously used control variables dated at their pre-crisis levels, as well as the changes in Q, cash flow, and uncertainty.

Table 8 presents the results of these regressions. The coefficients on *State* in columns 1, 3, and 5 indicate that state ownership has a statistically significant (5% level) mitigating effect on investment reductions only in years 2009 and 2010, not in 2008. The coefficient on ΔQ is particularly high in 2008 and 2010, and Δ *Volatility* strongly explains 2009 investment changes. These findings reveal that crisis-related investment cuts, especially in 2009 and 2010, are closely linked to changes in investment opportunities and uncertainty. The link weakens with rising levels of state ownership, as indicated by the positive coefficient on $State \times \Delta Volatility$ in column 4 and the negative term on $State \times \Delta Q$ in column 6. Overall, this supports the notion that state ownership has a mitigating effect on crisis-related investment cuts, and that this effect is mainly due to state-owned firms' reluctance to quickly adjust investment levels to sudden changes in growth outlooks and uncertainty levels.

The results also reveal that investment changes in the first year of the crisis are negatively related to pre-crisis leverage ratios (column 1 and 2). This may be due to highly levered firms' impaired access to debt financing or their precautionary capital structure adoptions in times of uncertain credit supply conditions.[14]

****** Insert Table 8 about here ******

4.2. Complementary tests

In this section, we present additional evidence that validates our previous findings and enriches our understanding of state-owned firms' investment patterns.

4.2.1. Tests of endogeneity concerns

To test whether our results are substantially affected by endogeneity issues related to state ownership and the financial variables (e.g., cash flow), or by imperfect measurement of investment opportunities, we apply instrumental variables models and advanced techniques to estimate equation (3). Table 9 presents the associated regression results.

****** Insert Table 9 about here ******

In Panel A, we address the potential endogeneity of *State*. While it seems unlikely that the governments' decision to hold ownership stakes is reversely caused by the sensitivities of investment to *q* and cash flow, it is possible that state ownership is correlated with omitted factors that influence the relation between investment and *q* and cash flow (Firth et al., 2012). We address this issue by applying an instrumental variables approach. We run first-stage regressions in which we regress *State* on a set of instruments and the other explanatory variables. The corresponding predicted values for state ownership

[14] In unreported models, we apply a similar approach as Duchin et al. (2010), in which we estimate equation (3) for a restricted sample covering the years 2006 through 2010. We include firm fixed and industry-year fixed effects, a set of control variables, and crisis indicators, which are interacted with pre-crisis state ownership. This methodology yields qualitatively similar results.

are then used to replace *State* in the second-stage regression. We replicate the instrument set used by Borisova et al. (2012), which includes a privatization dummy, a political stability index, and a corruption index. The privatization dummy indicates whether a firm was ever fully government-owned, and can be generated based on our ownership data. This variable is strongly linked to the level of state ownership, but not directly related to current investment choices, making it an appropriate instrument. As shown by Boubakri, Cosset, and Guedhami (2005) and Borisova et al. (2012), political stability and corruption can influence government ownership decisions, but should not reflect current corporate investment policies. Both indexes are taken from the World Bank's Worldwide Governance Indicators. We additionally include year, country, and industry fixed effects in the first-stage regressions.

In columns 1 and 2, we investigate the direct influence of state ownership to validate the findings in Section 4.1.3. Consistent with results from Table 7, the coefficient on *State* is negative and highly significant, irrespective of whether we include a variety of additional control variables or not. We account for interactions between state ownership and Q and CF in columns 3 and 4. The corresponding estimates are similar to those reported in Table 4, except that the interaction term on cash flow does not reach statistical significance when the additional controls are included. The three instruments have strong explanatory power for *State* in the unreported first-stage regressions, with coefficient signs that are consistent with Borisova et al. (2012). Our results remain similar when we vary the number of instruments or include alternative variables, such as Hofstede's individualism score used in Chen et al. (2014), in the first-stage regression.

To account for potential endogeneity of financial variables and the dynamic nature of investment decisions, we additionally employ system GMM models in the spirit of Blundell et al. (1992) and Blundell and Bond (1998). Recent studies by Wintoki, Linck, and Netter (2012) and Flannery and Hankins (2013) compare various estimation methods for dynamic panel models and show that system GMM yields estimates that are generally more accurate (and efficient) than those by difference GMM or traditional OLS and FE estimators, when explanatory variables are endogenous.[15] FE models are particularly weak in estimating the coefficient on the lagged dependent variable (Flannery and Hankins, 2013). Almeida et al. (2010) specifically consider investment equations and show that instrumental variable approaches, such as difference and system GMM, yield robust estimates.

[15] This dynamic panel method uses past realizations of explanatory variables as instruments and estimates model coefficients based on GMM. It is particularly suitable for investment equations due to their dynamic nature (Bond and van Reenen, 2007). In fact, system GMM performs a two-equation regression, one in first differences and one in levels, with lagged variables used as instruments both in levels and differences. Taking this approach helps to overcome the weak instruments problem inherent in the traditional first difference GMM estimator (Arellano and Bover, 1995). Other studies using difference or system GMM models to estimate investment equations include Cummins, Hassett, and Oliner (2006), Carpenter and Guariglia (2008), Brown and Petersen (2009), and Agca and Mozumdar (2014).

Our implementation uses variables from $t-3$ as instruments for the equations in differences and one lag for those in levels as suggested by Blundell and Bond (1998). We also include year dummies as exogenous variables. We choose this setup for three reasons. First, in unreported regressions we find that the first two lags of I have significant explanatory power for today's investment. Hence, third and further lags provide valid instruments for today's variables. Second, we follow the advice in Blundell et al. (1992), Cummins et al. (2006) and Almeida et al. (2010) and use longer lags to account for potential endogeneity and measurement error in Q. Finally, we do not include multiple lags to limit the size of our instrument matrix and to mitigate the well-known problem of too many instruments (Roodman, 2009). Nevertheless, our results remain virtually unchanged when we include more lags as instruments.

The GMM models in columns 1 and 2 yield coefficients on the interaction terms that are closely in line with our previous findings. They also provide plausible estimators that conform with theoretical expectations. The cash flow coefficient decreases and the Q coefficient increases compared to OLS and FE estimations of the dynamic equation.[16] The coefficient on lagged investment also seems reasonable according to Blundell et al. (1992), as it lies between the coefficients from an OLS model (0.52) and from a FE model (0.26). The Hansen statistics in column 1 and 2 do not reject the hypothesis of valid instruments.

Finally, we experiment with higher-order cumulant estimators developed by Erickson et al. (2014) to explicitly address the well-known problem that average Tobin's Q is an imperfect measure of unobservable marginal q. Erickson and Whited (2000) show that in the presence of mis-measured investment opportunities, cash flow has explanatory power because it contains information about investment opportunities. The authors propose a modified GMM estimator based on higher order moment conditions, which is explicitly described in their article. Recently, Erickson et al. (2014) developed a similar yet slightly more convenient estimator based on equations that are linear in the third- and higher-order cumulants of the joint distribution of the observable variables. The cumulants are polynomial functions of the same moments that are used in Erickson and Whited (2000) and are thus asymptotically equivalent, yet the cumulant estimators exhibit superior finite-sample performance and feature a closed-form solution. This is a huge advantage as it eliminates manual selection of starting values (for the mis-measured coefficient), which strongly influence the quality of moment estimators and limit practical application. In implementing this estimator, we use cumulants up to the fourth order as this specification proves most robust in sensitivity checks. We estimate equations both in levels and differences to absorb the firm-specific heterogeneity.[17]

[16] In an unreported variation of model 1, with lagged I as a variable, the coefficient on Q is 0.039 and 0.055 on CF.

[17] We thank the authors for providing the Stata code.

The results from these estimations, presented in columns 3 and 4, strengthen our previous findings by producing highly negative estimates on $Q \times State$ and positive but insignificant estimates on $CF \times State$. As expected, the coefficients on Q and its interaction term with state ownership increase in magnitude, which "stems from the attenuation bias in the OLS estimate" (Erickson et al., 2014, p.219). The cash flow coefficient slightly decreases but remains statistically significant at the 1% level. In unreported regressions, we estimate models 5 and 6 with Q calculated as in Erickson and Whited (2012) and find a Q coefficient between 0.015 and 0.016, which is very close to those reported by Erickson and Whited (2012).

4.2.2. Tests of alternative explanations

To ensure that the findings in Table 4 are not driven by alternative explanations for the relation between state ownership and investment sensitivities, we perform supplementary tests in Table 10. First, our inference could be substantially undermined if the quality of a stock market-based measure of q is negatively related to state ownership. In a recent article, Ben-Nasr and Cosset (2014) find that state ownership is associated with lower stock price informativeness, which is relevant for the investment-Q relation (Chen et al., 2007). From a more theoretical perspective, Hayashi (1982) shows that constant returns to scale and perfect competition are necessary conditions for measured average Q to equal unobservable marginal q. Thinking about the market environment in which state-owned firms typically operate, it seems possible that state ownership is associated with higher market power, which could in turn lead to an increased wedge between marginal q and average Q.

Therefore, we test if our results change when we use alternative investment opportunity measures that are not linked to firms' stock prices (columns 1 to 3). Similar to Asker et al. (2015), we use sales growth as well as an industry-level measure of Q and a predicted Q. We calculate $Industry\ Q$ as the total assets-weighted average Q in each two-digit SIC industry and year based on the unmatched sample. $Predicted\ Q$ is estimated similarly to Campello and Graham (2013), Mortal and Reisel (2013), and Asker et al. (2015) with a regression (run on the unmatched sample) of Q on a list of fundamentals that are detailed in Appendix A. The results presented in the first three columns strongly support our previous findings and suggest that they are not driven by stock market factors. In unreported regressions, we split the sample into firms that are presumably constrained and unconstrained, and find that the positive coefficient on $CF \times State$ only refers to highly constrained firms, in line with the results from Table 5.

****** Insert Table 10 about here ******

We also follow Chen et al. (2007) and Jiang et al. (2011) and include a measure of stock price informativeness (SPI) as well as its interaction with Q in the specification presented in column 4. Despite the fact that SPI is on average lower for state- vs. non-state-owned firms (Table 3), our results are not significantly affected by this, as shown in column 3. As expected, the coefficient on the interaction term of

SPI and Q is positive. Column 5 addresses the possibility that the relation between investment sensitivities and state ownership could be driven by differences in asset tangibility, which is shown to be influential for ICFS (Almeida and Campello, 2007). The estimated equation includes a dummy variable that indicates whether a firm's tangibility, measured as the ratio of PPE over total assets (Chang et al., 2014), is above the yearly sample median, and its interaction terms with Q and CF. Although ICFS increases with asset tangibility, our coefficients of interest related to state ownership do not change significantly.

Finally, we check whether our results simply reflect different risk attitudes and uncertainty levels between state- and non-state-owned firms. This test is motivated by Boubakri et al. (2013), who show that state ownership negatively affects corporate risk taking. In column (6), we include a dummy variable that equals one if *Volatility* is above the annual sample median, and the respective interaction terms with Q and CF. Interestingly, we find evidence that investment-*q* sensitivity is higher and ICFS is lower for firms with stronger uncertainty levels. However, this does not explain the influence of state ownership on investment patterns. Note that this does not change if we use a fundamental measure of risk taking such as past earnings volatility.

4.2.3. Alternative sampling and matching approaches

Although our sample comprises a relatively homogeneous group of countries, we are aware that the implications of state ownership for corporate investment behavior might still differ between countries and regions. For example, the evidence presented in Table 6 shows that the nature of the domestic banking landscape has an impact on the relation between state ownership and external finance access. To rule out the possibility that our findings represent single country- or region-specific phenomena and not the dominant state ownership effect across European firms, we check whether our findings are robust to using alternative country sets. Specifically, we exclude observations from France, which is overrepresented in our sample (accounts for more than 20% of the observations), and from Eastern European countries, which are arguably most different in terms of economic, political, and social environment.

Panel A of Table 11 shows corresponding regression results. As the estimates in columns 1 and 2 indicate, our findings are robust to examining such alternative country samples. In unreported regressions, we find that the results are qualitatively similar for various country groups in Europe. Solely with respect to Eastern Europe, we find that the interaction terms of interest loose statistical significance. Further, the coefficients in column 3 and 4 show that the results are similar when only manufacturing firms are examined and when utility firms are excluded.

As mentioned in Section 3.4, we carefully check whether our results are robust to applying alternative matching procedures in the sampling process. Panel B of Table 11 presents the results from estimating equation (3) using four different sampling approaches. In the first column, we use the full unmatched sample of firms. The remaining columns present the results for samples in which state firms

and always private listed firms are matched by size within the same country-industry grouping, country, or industry. The coefficients in all four models are very similar to those reported in Table 4. In unreported regressions, we also find that the results of the additional analyses remain very similar when we apply no matching or the alternative approaches.

****** Insert Table 11 about here ******

4.2.4. Additional robustness checks

We apply a battery of additional robustness tests and find that our main results from Section 4.1 remain remarkably unaffected by all of these checks. These tests include the following:

1. In order to provide an additional check that endogeneity of state ownership does not undermine our inference, we employ tests in which only the time variation in the state ownership variable is considered (Firth et al., 2012). To do that, we estimate equation (3) on the subsample of firms in which the state holds more than 5% in at least one year of our investigation period; we exclude the matched non-state firms. This helps us to filter out the potential influence of time invariant omitted factors correlated with state ownership.
2. As state owners' influence could be limited when their holdings are just around 5%, we replace the continuous *State* variable with dummies indicating state ownership at the 10% or 20% level. We additionally control for ownership concentration among non-state blockholders and the corresponding interaction terms with Q and CF.
3. We alternatively compute Q according to Chen and Chen (2012) or scale all variables by gross PPE as in Erickson and Whited (2012). We also make sure that our results do not change if we apply the frequently used cash flow measure calculated as the sum of income before extraordinary items and depreciation and amortization.
4. We consider alternative investment measures, which are not limited to adjustments in fixed assets. Similar to McLean et al. (2012), Chen et al. (2014) and Asker et al. (2015), we estimate regressions in which we use the sum of capex, R&D expenses, and net assets from acquisitions, or the change in total non-current assets as the dependent variable. In this context we also use beginning-of-period non-current assets or total assets as our scaling variable.
5. In the spirit of Benmelech, Bergman, and Seru (2011) and McLean and Zhao (2014), we replace *I* in equation (3) with relative employee growth.

For the sake of brevity, we do not report these results in this article, but are happy to provide the results upon request.

5. Conclusion

We investigate the relationship between state ownership and corporate investment patterns and test the underlying theoretical channels of influence. To do so, we compare the investment behavior of state-owned and non-state-owned firms, matched primarily on size and industry. Building upon a theoretical model of investment that accounts for agency issues and financial frictions, we develop a scheme of testable predictions, which helps us disentangling the theoretical arguments related to state ownership.

Using a panel of 624 listed European companies corresponding to more than 5,000 observations, we find that state-owned firms invest considerably less and in a way that is significantly less responsive to changes in investment opportunities. This is consistent with the notion that state ownership is associated with inefficient investment. The underlying argument is that government ownership evokes investment policies that are characterized by conservatism and stability-seeking. We do not find that investment inefficiencies arise from state-owned firms' overinvestment into non-value maximizing projects. If this were the case, we would expect government ownership to increase average investment levels and generate an unconditionally positive link between investment and cash flow in state-owned firms. Our data suggests that the positive relation between state ownership and ICFS is restricted to firms that are expected to be capital constrained and external finance dependent. Thus, it seems that state ownership constitutes a source of financial frictions, rather than a mitigating factor. Our findings are remarkably robust with respect to advanced estimation methods that control for multiple sources of endogeneity as well as for measurement errors. We also show that our line of reasoning continues to hold when we consider crisis-related investment reductions and cross-checks of alternative explanations.

This paper offers a new perspective on the real implications of state ownership. It shows that the major peril of government intervention in (European) firms is not that decision makers overspend funds for political and social purposes, but that they become lethargic, excessively conservative and more affected by financial constraints.

Appendix

A. Variable description

Cash Flow: CF is operating cash flow (WS item 04860) deflated by beginning-of-period capital. Capital is defined as net property, plant and equipment. CF (adj.) is income (WS item 01751) plus depreciation and amortization (WS item 04051) minus dividends (WS item 04551), scaled by lagged total assets.

Cash holdings: *Cash* is cash and cash equivalents (WS item 02005) deflated by beginning-of-period capital. Capital is defined as net property, plant and equipment.

Corruption: *Corruption* is an index from World Bank's Worldwide Governance Indicators that refers to the perceived level of corruption in the government; higher values of the index indicate less corruption.

Dividends: *Dividends* is total cash dividends deflated by beginning-of-period capital. Capital is defined as net property, plant and equipment.

Financial constraints are estimated with three different measures. (i) The Whited-Wu index is estimated according to Whited and Wu (2006) as -0.091*(Net income + D&A)/total assets - 0.062*Dividend dummy + 0.021*LTDebt (WS item 03251)/total assets - 0.044* *Log(TA)* + 0.102*Industry sales growth - 0.035* *Sales growth*. Dividend dummy equals one if total cash dividends (WS item 04551) are positive. Industry sales growth is calculated as the average *Sales growth* estimated separately for each three-digit SIC industry and year in the unmatched sample. (ii) The payout ratio is calculated as total cash dividends divided by operating cash flow. (iii) Size refers to net sales in US$ million.

Industry Tobin's Q: *Industry Q* is average Q calculated separately for each two-digit SIC industry and year in the unmatched sample, weighted by total assets in US$ million.

Investment: I is capital expenditures (WS item 04601) deflated by beginning-of-period capital. Capital is defined as net property, plant and equipment (WS item 02501).

Leverage: *Leverage* is total debt (WS item 03255) divided by book equity. Book equity is total common equity.

Political stability: *Stability* is an index from World Bank's Worldwide Governance Indicators that measures the likelihood of political instability and/or politically-motivated violence; higher values correspond to greater political stability.

Predicted Tobin's Q: *Predicted Q* is estimated similarly to Campello and Graham (2013), Mortal and Reisel (2013) and Asker et al. (2015) as the predicted value from a regression of Q on *Sales growth*, return on assets (EBITDA divided by total assets), cash and cash equivalents normalized by total assets,

total debt (WS item 03255) normalized by total assets, and *Log.TA* including year, country, and industry fixed effects.

Privatization: *Privatization* is a dummy variable that equals one if a firm has been fully government-owned, and zero otherwise.

Sales growth: *Sales growth* is the percentage change in net sales (WS item 01001).

Size*: Log (TA)* is the natural logarithm of the book value of total assets denominated in US$ million.

State ownership: *State* is the ownership share held by a state entity. The detailed identification procedure and the associated used sources are outlined in Section 3.3.

Stock price informativeness: SPI is calculated in the spirit of Chen et al. (2007) and Jiang et al. (2011) to reflect the firm-specific component in stock return variation. Specifically, SPI is estimated in each year as 1-R^2 from following regression: $r_{i,t} = \alpha_i + \beta_{i,1} r_{m,j,t-1} + \beta_{i,2} r_{m,j,t} + \beta_{i,1} r_{m,j,t+1} + \varepsilon_{i,t}$. Here, $r_{i,t}$ is the stock return of firm *i* in week *t* and $r_{m,j,t}$ is the domestic market return in country *j* in week *t*. We allow for non-synchronous trading by including lead and lag terms for the market index returns. We exclude firm years in which the stock trades for less than 26 weeks.

Tobin's Q: Q is calculated as the ratio of market value of assets to book value of assets. Market value of assets is defined as total assets (WS item 02999) plus total market capitalization (WS item 08002) minus book equity. Book value of assets equals total assets. Book equity is total common equity (WS item 03501).

Uncertainty: *Volatility* is the yearly volatility of weekly stock price returns. We exclude firm years in which the stock trades for less than 26 weeks.

B. Agency problems and investment-q sensitivity

In this section, we show how agency conflicts lead to reduced investment-q sensitivity. In the absence of financial frictions, when θ is zero, the investment rule is:

$$\frac{F_I + B_I}{1 + r} = 1 + C_I(I) \tag{4}$$

We define fundamental investment opportunities as $q = F_I/(1 + r)$ and the additional marginal value of investment perceived by decision makers as $q^b = B_I/(1 + r)$. We follow the convention (Hayashi, 1982) and assume the following quadratic form for the adjustment cost function $C(I)$:

$$C(I, K) = \left(\frac{\alpha}{2}\right)\left(\frac{I}{K} - a - \varepsilon\right)^2 K \tag{5}$$

where a is a firm-specific parameter and ε is a technology shock. Substituting equation (5) in equation (4) yields the following investment specification:

$$\frac{I}{K} = a + b\left(q + q^b - 1\right) + \varepsilon \tag{6}$$

where $b = 1/\alpha$. The investment sensitivity to q can be written as follows:

$$\frac{\partial(I/K)}{\partial q} = b + b\frac{\partial q^b}{\partial q} \tag{7}$$

If the second term on the right-hand side is zero, investment-q sensitivity is not distorted. However, there are good reasons to assume that this term will in fact be negative. If we assume that q^b does not directly depend on q but has decreasing returns to scale, so $B_{II} < 0$, we can write equation (7) as:

$$\begin{aligned} \frac{\partial(I/K)}{\partial q} &= b + b\frac{\partial q^b}{\partial(I/K)}\frac{\partial(I/K)}{\partial q} \\ &= \frac{b}{1 - b\dfrac{\partial q^b}{\partial(I/K)}} \end{aligned} \tag{8}$$

With $\partial q^b/\partial(I/K) < 0$, the right-hand side term is smaller than b, which represents the investment-q sensitivity in the absence of agency issues. One can think of many situations in which the marginal additionally perceived value of investment is decreasing in the level of investment. First, in the context of private benefits of investment, it is common to assume that the insiders' utility of private consumption is an increasing and concave function. Second, the risk of (minority) shareholder intervention rises with increasing levels of investment, reducing the marginal additional value of investment to decision makers. Third, in the context of private costs of investment, it is fair to assume that these costs might increase exponentially. In general, it is also conceivable that there is a direct relation between q^b and q, in the sense that individually perceived marginal value of investment is higher when fundamental q is low or decreasing.

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Table 1: Theoretical channels of state ownership influence and associated predictions

This table summarizes the different theoretical arguments' predictions for the influence of state ownership on investment-q and -CF sensitivity, and the level of investment.

Theoretical argument	**Prediction**	**Expected influence of state ownership**	
		Metric	Sign
Empire building and overinvestment	1a	$\partial I/\partial q$	$-$
	1b	$\partial I/\partial W$	$+$
	1c	I	$+$
Stability / quiet life	2a	$\partial I/\partial q$	$-$
	2b	I	$-$
	2c	$\lvert\Delta I\rvert$	$-$
Increased capital constraints	3a	$\partial I/\partial W$	$+$ (if fin. constrained)
	3b	I	$-$ (if fin. constrained)
Soft-budget constraints	4a	$\partial I/\partial W$	$-$ (if fin. constrained)
	4b	I	$+$ (if fin. constrained)

Table 2: Sample overview

This table provides an overview of the full and matched sample, which includes firms with state ownership above the 5% level in at least one sample year (state firms), and other matched firms. Section 3.4 describes the matching procedure. The subsample of state firms also contains firm years in which the state holds less than 5%.

	Full sample			**Matched sample**					
	All non-state firms			State firms			Matched non-state firms		
	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
Total assets (TA) (€M)	2,719	225	13,206	12,597	2,033	35,135	11,168	1,429	32,660
Indic. (State ≥ 5%)	0.00	0.00	0.00	0.66	1.00	0.47	0.00	0.00	0.00
Observations		37,128			2,947			2,325	
Firms		5,953			312			312	
Distribution across 12 Fama-French industry groups:									
Split by:		Obs.	Firms		Obs.	Firms		Obs.	Firms
Consumer nondurables		0.13	0.11		0.05	0.05		0.05	0.05
Consumer durables		0.04	0.03		0.03	0.03		0.04	0.03
Manufacturing		0.19	0.17		0.19	0.16		0.20	0.16
Energy		0.02	0.03		0.05	0.05		0.06	0.06
Chemicals		0.03	0.03		0.03	0.04		0.03	0.04
Business equipment		0.13	0.15		0.08	0.08		0.09	0.08
Telecommunications		0.02	0.03		0.09	0.08		0.08	0.08
Utilities		0.02	0.02		0.18	0.20		0.11	0.18
Shops		0.14	0.13		0.03	0.03		0.02	0.03
Health		0.05	0.05		0.01	0.02		0.02	0.02
Other		0.23	0.25		0.24	0.27		0.28	0.27
Distribution across legal systems:									
Split by:		Obs.	Firms		Obs.	Firms		Obs.	Firms
Civil - French		0.32	0.32		0.54	0.55		0.56	0.55
Civil - German		0.21	0.20		0.28	0.28		0.23	0.28
Civil - Scandinavian		0.15	0.14		0.14	0.13		0.16	0.11
Common		0.32	0.35		0.04	0.04		0.05	0.05
Distribution across countries:									
Split by:		Obs.	Firms		Obs.	Firms		Obs.	Firms
Austria		0.01	0.01		0.05	0.04		0.02	0.02
Belgium		0.02	0.02		0.02	0.02		0.03	0.03
Czech Republic		0.00	0.01		0.04	0.07		0.00	0.01
Denmark		0.03	0.03		0.02	0.02		0.03	0.02
Finland		0.03	0.02		0.07	0.07		0.01	0.01
France		0.13	0.12		0.20	0.20		0.27	0.22
Germany		0.13	0.12		0.09	0.08		0.11	0.14
Greece		0.03	0.04		0.03	0.03		0.04	0.04
Hungary		0.00	0.01		0.03	0.02		0.01	0.01
Ireland		0.01	0.01		0.01	0.01		0.00	0.00
Italy		0.05	0.04		0.10	0.11		0.13	0.13
Netherlands		0.03	0.03		0.05	0.04		0.03	0.04
Norway		0.03	0.04		0.03	0.03		0.04	0.03
Poland		0.04	0.05		0.09	0.11		0.05	0.06
Portugal		0.01	0.01		0.04	0.04		0.02	0.02
Spain		0.02	0.02		0.02	0.03		0.03	0.05
Sweden		0.06	0.05		0.01	0.02		0.07	0.05
Switzerland		0.04	0.03		0.05	0.05		0.06	0.05
U.K.		0.31	0.34		0.03	0.03		0.05	0.05

Table 3: Summary statistics

This table provides descriptive statistics for the variables used in the empirical analyses. Panel A includes the core dependent and explanatory variables. Panel B contains measures that are used for additional tests. All variables are defined in the Appendix. The last column displays p-values of difference of mean tests with standard errors clustered by firm.

	No state ownership						**State ownership ≥ 5%**						Δ Mean
	N	Mean	SD	Min	Median	Max	N	Mean	SD	Min	Median	Max	p-value
Panel A: Core variables													
State	3326	0	0	0	0	0	1946	0.3762	0.2208	0.05	0.3562	0.9934	0.000
I	3326	0.248	0.217	0.004	0.190	1.222	1946	0.191	0.164	0.004	0.151	1.222	0.000
Q	3326	1.404	0.712	0.564	1.198	5.100	1946	1.338	0.674	0.564	1.154	5.100	0.154
CF	3326	0.576	1.063	-1.187	0.279	6.262	1946	0.323	0.689	-1.187	0.195	6.262	0.000
Leverage	3326	0.394	0.241	0.000	0.396	1.000	1946	0.378	0.232	0.000	0.383	1.000	0.350
Volatility	3232	0.054	0.026	0.018	0.047	0.155	1890	0.050	0.023	0.018	0.045	0.155	0.003
Log (TA)	3326	7.209	1.977	2.025	7.086	12.783	1946	7.836	2.056	1.851	7.856	12.894	0.000
Panel B: Additional variables													
Sales growth	3326	0.064	0.210	-0.551	0.050	0.846	1946	0.063	0.172	-0.551	0.049	0.846	0.925
Industry Q	3326	1.439	0.435	0.661	1.328	4.280	1946	1.355	0.339	0.596	1.257	3.587	0.001
Predicted Q	2841	1.395	0.431	-0.083	1.342	3.731	1705	1.327	0.410	-0.085	1.280	3.124	0.020
SPI	3232	0.739	0.193	0.090	0.782	1.000	1890	0.704	0.210	0.034	0.738	1.000	0.007
Cash	3321	1.165	2.264	0.002	0.327	13.679	1943	0.504	1.354	0.002	0.169	13.679	0.000
Dividends	3083	0.135	0.311	0.000	0.036	2.086	1826	0.075	0.213	0.000	0.029	2.086	0.001
Total assets ($M)	3326	9,327	27,900	7	1,252	356,000	1946	16,500	42,200	6	2,687	439,000	0.035
Net sales ($M)	3326	7,038	22,500	2	1,139	477,000	1946	9,977	23,000	2	2,047	271,000	0.157

Table 4: State ownership and investment sensitivity to Q and cash flow

This table provides firm fixed effects regression estimates of equation (3) in which *I* is the dependent variable. All variables are defined in the Appendix. Standard errors are robust to heteroskedasticity and clustered at the firm level. Associated t-statistics are in parentheses. The symbols ***, **, and * denote statistical significance at the l%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$Q_{t-1} \times State_{t-1}$	-0.092***		-0.104***	-0.133***	-0.130***	-0.110***	-0.126***
	(-3.01)		(-3.55)	(-4.65)	(-3.75)	(-3.21)	(-3.84)
$CF_t \times State_{t-1}$		0.054	0.070	0.100**	0.081*	0.099**	0.093**
		(1.07)	(1.45)	(2.33)	(1.69)	(2.57)	(2.08)
Q_{t-1}	0.069***	0.058***	0.069***	0.061***	0.156	0.107***	0.060***
	(6.70)	(6.08)	(6.76)	(6.33)	(1.28)	(3.35)	(6.12)
CF_t	0.051***	0.049***	0.048***	0.022**	0.062	0.012	0.023**
	(4.89)	(4.59)	(4.55)	(2.23)	(0.31)	(0.64)	(2.28)
$State_{t-1}$	0.103**	-0.046	0.096*	0.135***	0.145**	0.104*	-0.009
	(2.03)	(-1.27)	(1.80)	(2.59)	(2.26)	(1.87)	(-0.07)
$Cash_{t-1}$				0.032***	0.033***	0.032***	0.031***
				(5.67)	(6.58)	(5.93)	(5.27)
$Leverage_{t-1}$				-0.091***	-0.094***	-0.087***	-0.104***
				(-3.09)	(-3.45)	(-3.14)	(-3.24)
$Log\ (TA)_{t-1}$				-0.034***	-0.037***	-0.036***	-0.036***
				(-3.13)	(-3.42)	(-3.46)	(-3.13)
$Volatility_{t-1}$				-0.841***	-0.828***	-0.852***	-0.929***
				(-5.52)	(-5.98)	(-5.61)	(-5.11)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(Ctr. fixed effects) $\times Q_{t-1}$	No	No	No	No	Yes	No	No
(Ctr. fixed effects) $\times CF_t$	No	No	No	No	Yes	No	No
(Ind. fixed effects) $\times Q_{t-1}$	No	No	No	No	No	Yes	No
(Ind. fixed effects) $\times CF_t$	No	No	No	No	No	Yes	No
Controls $\times State_{t-1}$	No	No	No	No	No	No	Yes
Observations	5088	5088	5088	4877	4877	4877	4877
R-squared	0.121	0.119	0.123	0.190	0.217	0.204	0.191

Table 5: State ownership, investment sensitivities, and financial constraints

This table provides firm fixed effects regression estimates of equation (3) in which I is the dependent variable. The regressions are estimated separately for subsamples of firms formed on the basis of financial constraints measured at the end of the previous period. The subsamples comprise firms with financial constraint measures below and above the yearly sample median. The Whited-Wu index is calculated according to Whited and Wu (2006). Payout ratio is total dividends divided by cash flow. Size refers to net sales in US$ million. External finance dependence is measured as the percentage of observations on the firm for which investment is greater than operating cash flow. The set of control variables includes the same as in Table 4. All variables are defined in the Appendix. Standard errors are robust to heteroskedasticity and clustered at the firm level. P-values at the bottom indicate whether coefficients are significantly different between the respective subsamples. Associated t-statistics are in parentheses. The symbols ***, **, and * denote statistical significance at the l%, 5%, and 10% level, respectively.

	Whited-Wu index		Payout ratio		Size		Ext. finance dependence	
	High	Low	Low	High	Low	High	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Q_{t-1} \times State_{t-1}$	-0.129***	-0.098***	-0.191***	-0.077**	-0.105**	-0.073*	-0.156***	-0.104***
	(-2.77)	(-2.80)	(-3.86)	(-2.33)	(-2.51)	(-1.82)	(-3.10)	(-3.48)
$CF_t \times State_{t-1}$	0.132***	-0.079	0.174***	-0.069	0.146***	-0.060	0.328**	0.045
	(3.17)	(-1.06)	(3.14)	(-0.84)	(2.81)	(-0.60)	(2.32)	(0.98)
Q_{t-1}	0.054***	0.061***	0.090***	0.047***	0.057***	0.063***	0.081***	0.050***
	(4.79)	(4.29)	(6.09)	(4.19)	(4.97)	(3.84)	(4.96)	(5.03)
CF_t	0.022*	0.034	0.014	0.033**	0.023**	0.030	0.019	0.025**
	(1.90)	(1.51)	(1.17)	(2.33)	(2.16)	(1.25)	(1.17)	(2.03)
$State_{t-1}$	0.087	0.110**	0.097	0.119**	0.079	0.102*	0.123*	0.153**
	(1.08)	(1.97)	(1.18)	(2.35)	(1.06)	(1.76)	(1.65)	(2.49)
$Q_{t-1} \times State_{t-1}$: H = L		0.764		0.024		0.801		0.164
$CF_t \times State_{t-1}$: H = L		0.002		0.046		0.088		0.054
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2211	2218	2372	2365	2442	2435	2393	2484
R-squared (within)	0.215	0.187	0.238	0.199	0.204	0.186	0.207	0.205

Table 6: State ownership, investment sensitivities, and government ownership of banks

This table provides firm fixed effects regression estimates of equation (3) in which I is the dependent variable. The regressions are estimated separately for subsamples of firms formed on the basis of the country-specific share of bank assets that is owned by the government. The subsamples comprise countries with shares below and above the yearly median across all countries. The data for government-owned bank assets are from Barth, Caprio and Levine (2013), who use World Bank survey data. The set of control variables includes the same as in Table 4. All variables are defined in the Appendix. Standard errors are robust to heteroskedasticity and clustered at the firm level. P-Values at the bottom indicate whether coefficients are significantly different between the respective subsamples. Associated t-statistics are in parentheses. The symbols ***, **, and * denote statistical significance at the l%, 5%, and 10% level, respectively.

	Government ownership of bank assets			
	High		Low	
	(1)	(2)	(5)	(6)
$Q_{t-1} \times State_{t-1}$	-0.133***	-0.133***	-0.078**	-0.092*
	(-3.61)	(-3.20)	(-2.24)	(-1.79)
$CF_t \times State_{t-1}$	0.018	-0.012	0.135***	0.110***
	(0.20)	(-0.12)	(4.30)	(3.23)
Q_{t-1}	0.051***	0.143***	0.072***	-0.182
	(3.53)	(5.04)	(5.68)	(-1.49)
CF_t	0.044**	0.141	0.009	0.395***
	(2.38)	(0.56)	(0.77)	(2.78)
$State_{t-1}$	0.143***	0.144***	0.114*	-0.008
	(2.73)	(2.70)	(1.92)	(-0.05)
Control variables	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
(Country fixed effects) $\times Q_{t-1}$	No	Yes	No	Yes
(Country fixed effects) $\times CF_t$	No	Yes	No	Yes
Observations	2252	2252	2625	2625
R-squared (within)	0.187	0.216	0.210	0.239

Table 7: Direct effect of state ownership on investment

This table provides cross-sectional estimates of equation (3) without interaction terms between *State* and Q and CF. The first three columns indicate the different models' dependent variable, sample, and applied estimation method. The Whited-Wu index is calculated according to Whited and Wu (2006). Payout ratio is total dividends divided by cash flow. Size refers to net sales in US$ million. External finance dependence is measured as the percentage of observations on the firm for which investment is greater than operating cash flow. The set of control variables includes the same as in Table 4 and *Dividends*. All variables are defined in the Appendix. Industries are defined as the 12 Fama-French industry groups. R-squared refers to pseudo R-squared for the probit models. Standard errors are robust to heteroskedasticity and clustered at the firm level. Associated t-statistics are in parentheses. The symbols ***, **, and * denote statistical significance at the l%, 5%, and 10% level, respectively.

			$State_{t-1}$					
Dependent variable	Sample	Estimation	Coefficient	t-value	Controls	Fixed effects	Obs.	R-squared
I	All	OLS	-0.055***	(-3.03)	No	C, I, Y	5088	0.257
I	All	OLS	-0.044**	(-2.09)	Yes	C, I, Y	4738	0.296
I	Whited-Wu: High	OLS	-0.032	(-0.92)	Yes	C, I, Y	2155	0.344
I	Whited-Wu: Low	OLS	-0.044**	(-2.10)	Yes	C, I, Y	2161	0.298
I	Payout ratio: Low	OLS	-0.037	(-1.36)	Yes	C, I, Y	2372	0.324
I	Payout ratio: High	OLS	-0.044*	(-1.70)	Yes	C, I, Y	2365	0.321
I	Size: Low	OLS	-0.045	(-1.50)	Yes	C, I, Y	2373	0.329
I	Size: High	OLS	-0.031	(-1.16)	Yes	C, I, Y	2365	0.299
I	Ext. finance dependence: High	OLS	-0.050*	(-1.78)	Yes	C, I, Y	2335	0.266
I	Ext. finance dependence: Low	OLS	-0.051*	(-1.75)	Yes	C, I, Y	2403	0.397
$\lvert\Delta I\rvert$	All	OLS	-0.032**	(-2.50)	Yes	C, I, Y	4354	0.137
Indic. ($\Delta I <$ -10% SD)	All	Probit	-0.208**	(-2.05)	Yes	C, I, Y	4354	0.050
Indic. ($\Delta I <$ -50% SD)	All	Probit	-0.462***	(-2.98)	Yes	C, I, Y	4354	0.097
Indic. ($\Delta I >$ 10% SD)	All	Probit	0.002	(0.02)	Yes	C, I, Y	4354	0.069
Indic. ($\Delta I >$ 50% SD)	All	Probit	-0.296**	(-2.01)	Yes	C, I, Y	4293	0.138

Table 8: State ownership and investment during the global financial crisis

This table provides cross-sectional estimates of a modified equation (3) in which the dependent variable is the financial crisis related change in investment. We separately analyze investment changes in the years 2008 (columns 1 and 2), 2009 (columns 3 and 4), and 2010 (columns 5 and 6), versus average precrisis levels in 2006/07. The models control for changes in Q, CF, and $Volatility$ as well as for precrisis realizations of previously used control variables. All variables are defined in the Appendix. Industries are defined as the 12 Fama-French industry groups. Standard errors are robust to heteroskedasticity. Associated t-statistics are in parentheses. The symbols ***, **, and * denote statistical significance at the l%, 5%, and 10% level, respectively.

Difference (ΔI):	2008 vs. precrisis		2009 vs. precrisis		2010 vs. precrisis	
	(1)	(2)	(3)	(4)	(5)	(6)
$State_{t=2007}$	0.011	0.025	0.130**	-0.127	0.106**	0.017
	(0.27)	(0.59)	(2.57)	(-1.54)	(2.26)	(0.28)
$State_{t=2007} \times \Delta Q$		-0.215**		-0.144		-0.408***
		(-2.25)		(-1.38)		(-3.23)
$State_{t=2007} \times \Delta CF$		-0.543**		0.139***		0.370**
		(-2.06)		(3.22)		(2.34)
$State_{t=2007} \times \Delta Volatility$		0.800		7.600***		1.471
		(0.34)		(2.67)		(0.78)
ΔQ	0.093***	0.112***	0.027	0.035	0.163***	0.171***
	(2.66)	(2.94)	(0.65)	(0.85)	(2.88)	(3.08)
ΔCF	0.083***	0.090***	0.073***	0.058**	0.082**	0.077*
	(2.80)	(2.95)	(3.35)	(2.27)	(2.00)	(1.87)
$\Delta Volatility$	-1.592	-1.686	-2.235***	-2.854***	-0.623	-0.817
	(-1.41)	(-1.41)	(-3.35)	(-3.50)	(-1.17)	(-1.41)
$Leverage_{t=2005/06}$	-0.169***	-0.161***	-0.095*	-0.086	0.050	0.060
	(-3.20)	(-3.14)	(-1.73)	(-1.56)	(0.82)	(1.00)
$Log\ (TA)_{t=2005/06}$	0.006	0.005	0.020***	0.020***	0.013**	0.012*
	(0.99)	(0.73)	(2.88)	(3.01)	(2.04)	(1.80)
$Q_{=2005/06}$	-0.024	-0.022	-0.033	-0.024	0.053*	0.047
	(-1.16)	(-1.05)	(-0.99)	(-0.73)	(1.80)	(1.61)
$CF_{t=2006/07}$	0.019	0.022	0.031	0.029	0.064*	0.067*
	(0.74)	(0.82)	(1.19)	(1.08)	(1.67)	(1.77)
$Cash_{t=2005/06}$	-0.005	-0.005	-0.014	-0.014	-0.023	-0.022
	(-0.50)	(-0.44)	(-1.36)	(-1.37)	(-1.60)	(-1.56)
$Volatility_{t=2005/06}$	-1.689	-1.644	-0.751	-0.735	-0.851	-0.743
	(-1.12)	(-1.11)	(-0.79)	(-0.79)	(-0.81)	(-0.71)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firms	315	315	305	305	294	294
R-squared	0.229	0.247	0.284	0.315	0.335	0.356

Table 9: State ownership and investment sensitivities – controlling for endogeneity

This table provides alternative regression estimates of equation (3) in which I is the dependent variable. In Panel A, we address endogeneity of state ownership using an instrumental variable approach. In unreported first-stage equations, we regress *State* on the Political Stability index, Anti-corruption index, and a Privatization dummy, along with the other explanatory variables and year, country, and industry effects. We report second-stage OLS regressions that use the fitted values of *State*. In Panel B, we employ advanced estimation techniques to address endogeneity of financial variables and measurement error. Column headings indicate the estimation method. System GMM uses third lags of all variables as instruments for the difference equation and first lags for the levels equation, respectively. Year dummies are included as exogenous instruments. In column 2, we use fitted values of *State* as in Panel A. EW C4 refers to the higher-order cumulant estimator developed by Erickson et al. (2014), using four orders of cumulants. In column 4, we estimate the equation in differences by removing firm-specific means from observable regression variables. The set of control variables includes the same as in Table 4. All variables are defined in the Appendix. Industries are defined as the 12 Fama-French industry groups. ρ^2 is an estimate of R-squared. Standard errors are robust to heteroskedasticity, and clustered at the firm level in Panel A. Associated t-statistics are in parentheses. The symbols ***, **, and * denote statistical significance at the l%, 5%, and 10% level, respectively.

Panel A: Endogeneity of state ownership

	(1)	(2)	(3)	(4)
$Q_{t-1} \times State_{t-1}$			-0.268***	-0.333***
			(-3.92)	(-4.85)
$CF_t \times State_{t-1}$			0.063	0.133
			(0.58)	(1.18)
Q_{t-1}	0.047***	0.042***	0.075***	0.067***
	(5.29)	(4.58)	(7.06)	(6.59)
CF_t	0.055***	0.038***	0.053***	0.027***
	(6.12)	(4.55)	(7.05)	(3.36)
$State_{t-1}$	-0.235***	-0.171***	0.104	0.226**
	(-4.57)	(-2.74)	(1.02)	(2.01)
Control variables	No	Yes	No	Yes
Fixed effects	C, I, Y	C, I, Y	C, I, Y	C, I, Y
Observations	5088	4738	5088	4877
R-squared	0.262	0.297	0.271	0.313

Panel B: Endogeneity of financial variables and measurement error in *Q*

Estimation method:	System GMM	System GMM + IV	EW C4 (Levels)	EW C4 (Differences)
	(1)	(2)	(3)	(4)
$Q_{t-1} \times State_{t-1}$	-0.133***	-0.199***	-0.365***	-0.233***
	(-3.64)	(-3.05)	(-7.23)	(-4.48)
$CF_t \times State_{t-1}$	0.051	0.072	0.077	0.077
	(0.90)	(0.62)	(0.92)	(1.62)
Q_{t-1}	0.052***	0.058***	0.193***	0.164***
	(3.78)	(5.05)	(9.84)	(6.64)
CF_t	0.032**	0.039***	0.042***	0.045***
	(2.38)	(4.09)	(4.35)	(4.09)
$State_{t-1}$	0.168***	0.175*	0.390***	0.279***
	(3.13)	(1.85)	(5.56)	(3.54)
I_{t-1}	0.405***	0.369***		
	(9.97)	(9.61)		
Control variables	No	No	No	No
Year fixed effects	Yes	Yes	No	No
Observations	4344	4344	5088	5088
ρ^2			0.26	0.141
Hansen (p-value)	0.106	0.357	0.138	0.029
AR1 (p-value)	0.000	0.000		
AR2 (p-value)	0.631	0.506		

Table 60: State ownership and investment sensitivities – testing alternative explanations

This table provides firm fixed effects regression estimates of equation (3) in which *I* is the dependent variable. Columns 1 to 3 test the use of alternative measures for investment opportunities (IO), namely *Sales growth*, *Industry Q* and *Predicted Q*. In column 4, we include a proxy of stock price informativeness (*SPI*) and its interaction with *Q*. Column 5 includes a dummy variable (*Tang. high*) that indicates whether the ratio of PPE to total assets is above the yearly sample median. Column 6 includes a dummy variable (*Uncert. high*) that indicates whether *Volatility* is above the annual sample median. The set of control variables includes the same as in Table 4. All variables are defined in Appendix A. Standard errors are robust to heteroskedasticity and clustered at the firm level. Associated t-statistics are in parentheses. The symbols ***, **, and * denote statistical significance at the l%, 5%, and 10% level, respectively.

Test:	Alternative measures of IO			SPI	Tangibility	Uncertainty
IO measure:	*Sales growth*	*Industry Q*	*Predicted Q*	*Q*	*Q*	*Q*
	(1)	(2)	(3)	(4)	(5)	(6)
$IO_{t-1} \times State_{t-1}$	-0.180***	-0.180***	-0.170***	-0.133***	-0.104***	-0.124***
	(-2.67)	(-3.18)	(-4.54)	(-4.56)	(-3.66)	(-4.64)
$CF_t \times State_{t-1}$	0.092**	0.095**	0.113***	0.098**	0.086**	0.091**
	(2.06)	(2.30)	(3.03)	(2.28)	(2.08)	(2.14)
Q_{t-1}	0.105***	0.053***	0.095***	0.038	0.063***	0.039***
	(4.97)	(2.96)	(5.48)	(1.45)	(5.71)	(3.69)
CF_t	0.021**	0.024**	0.027**	0.023**	0.018*	0.035***
	(2.06)	(2.42)	(2.58)	(2.28)	(1.86)	(2.97)
$State_{t-1}$	-0.037	0.208**	0.168***	0.136**	0.108**	0.125**
	(-1.09)	(2.35)	(3.00)	(2.58)	(2.10)	(2.51)
$IO_{t-1} \times SPI_{t-1}$				0.029		
				(0.94)		
SPI_{t-1}				-0.076*		
				(-1.70)		
$IO_{t-1} \times Tang.\ high_{t-1}$					-0.023*	
					(-1.72)	
$CF_t \times Tang.\ high_{t-1}$					0.061*	
					(1.90)	
$Tang.\ high_{t-1}$					-0.071***	
					(-2.74)	
$IO_{t-1} \times Uncert.\ high_{t-1}$						0.030***
						(2.64)
$CF_t \times Uncert.\ high_{t-1}$						-0.022**
						(-2.13)
$Uncert.\ high_{t-1}$						-0.032**
						(-2.34)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4877	4877	4467	4877	4877	4877
R-squared (within)	0.179	0.176	0.194	0.191	0.210	0.195

Table 11: State ownership and investment sensitivities – alternative samples and matching procedures

This table provides firm fixed effects regression estimates of equation (3) in which I is the dependent variable, based on alternative samples (Panel A) and matching approaches (Panel B) as indicated in the column heads. The set of control variables includes the same as in Table 4. All variables are defined in the Appendix. Industries are defined as the 12 Fama-French industry groups. Standard errors are robust to heteroskedasticity and clustered at the firm level. Associated t-statistics are in parentheses. The symbols ***, **, and * denote statistical significance at the l%, 5%, and 10% level, respectively.

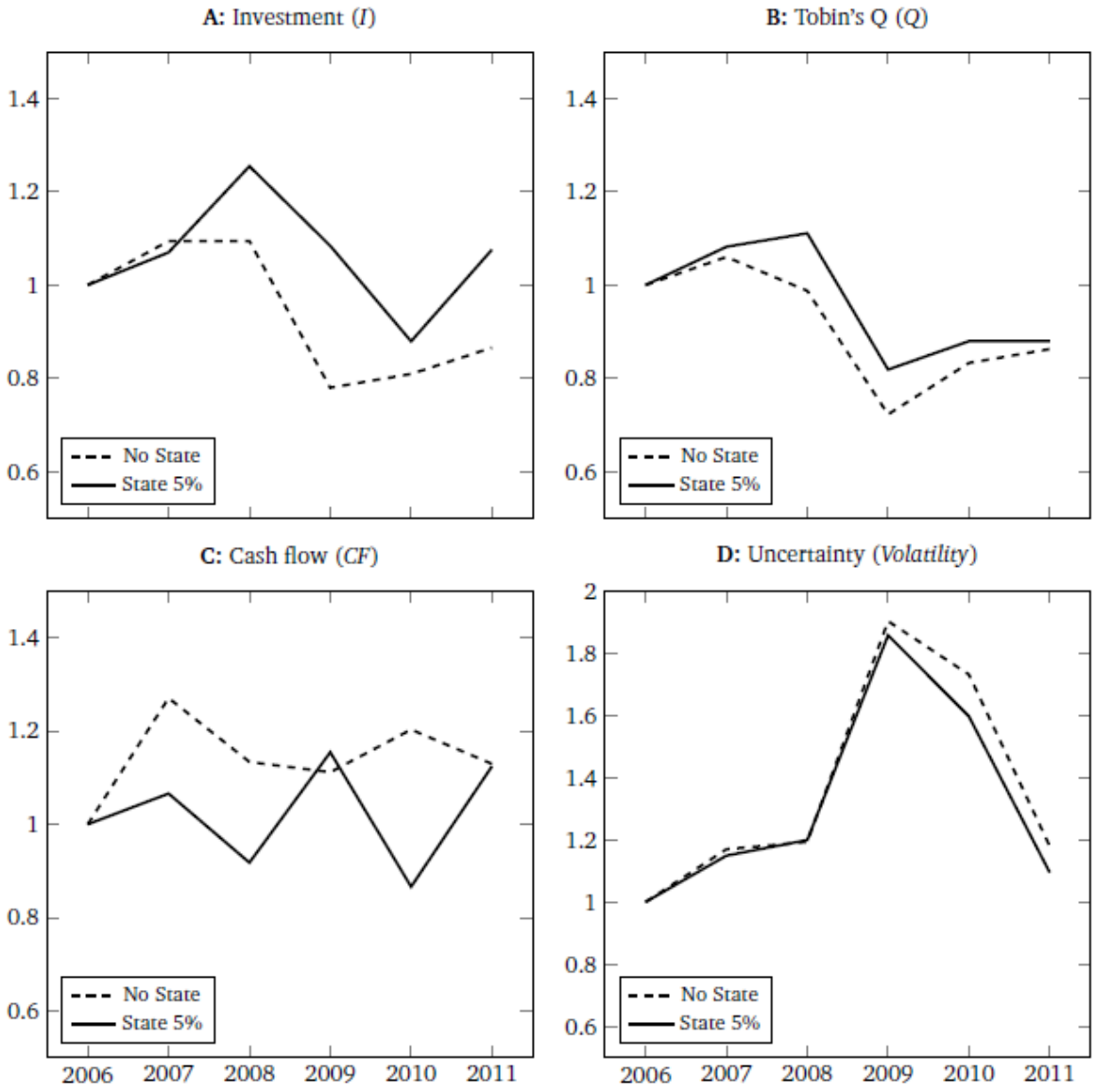
Panel A: Alternative samples

	Alternative country sets		Alternative industries	
	Without France	Without East Europe	Only Manufacturing	Without utility firms
	(1)	(2)	(3)	(4)
$Q_{t-1} \times State_{t-1}$	-0.104***	-0.152***	-0.214***	-0.153***
	(-3.18)	(-5.05)	(-3.62)	(-4.42)
$CF_t \times State_{t-1}$	0.109	0.102**	0.043	0.082**
	(1.05)	(2.40)	(0.66)	(2.12)
Q_{t-1}	0.048***	0.065***	0.071***	0.061***
	(4.39)	(6.56)	(5.41)	(6.26)
CF_t	0.024**	0.020**	0.021	0.023**
	(2.30)	(2.04)	(1.50)	(2.31)
$State_{t-1}$	0.114**	0.151***	0.171**	0.172***
	(2.19)	(2.63)	(2.54)	(2.94)
Control variables	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	3708	4364	1995	4175
R-squared (within)	0.167	0.190	0.246	0.206

Panel B: Alternative matching procedures

	No matching	Matching within industry and country	Matching within country	Matching within industry
	(1)	(2)	(3)	(4)
$Q_{t-1} \times State_{t-1}$	-0.151***	-0.177***	-0.115***	-0.116***
	(-5.06)	(-4.88)	(-3.56)	(-3.81)
$CF_t \times State_{t-1}$	0.089**	0.085*	0.086*	0.074**
	(2.47)	(1.80)	(1.74)	(2.32)
Q_{t-1}	0.059***	0.067***	0.053***	0.058***
	(16.37)	(5.43)	(4.91)	(5.66)
CF_t	0.025***	0.046***	0.040***	0.026***
	(9.64)	(3.74)	(3.51)	(2.66)
$State_{t-1}$	0.143***	0.190***	0.126**	0.114**
	(2.73)	(3.04)	(2.13)	(2.09)
Control variables	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	35767	3898	4388	4551
R-squared (within)	0.146	0.174	0.183	0.176

Figure 1: Dynamics during the financial crisis



Notes: This figure depicts indexed mean levels of I (Panel A), Q (Panel B), CF (Panel C), and *Volatility* (Panel D) during the years 2006 to 2011, differentiated between firms with and without state ownership at the 5% level prior to the crisis (end of 2007).