CFR Working Paper No. 15-13

Government Ownership, Informed Trading and Private Information

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Government ownership, informed trading, and private information

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Forthcoming Journal of Corporate Finance

Abstract

We investigate the nature and extent of information asymmetry among traders in companies with government ownership. Consistent with a less transparent information environment, we find relatively less informed trading in the shares of firms with government presence, and specifically, fewer informed trades related to the skilled analysis of public information. At the same time, we also find that firms with government presence have a significantly higher proportion of informed trading that arises from explicitly private information, consistent with the literature on the self-serving influence of government stakeholders not necessarily committed to maximizing firm value.

Keywords: Government ownership, Privatization, Information asymmetry, Informed trading, Private information

JEL classification: G32, D82, L33

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1. Introduction

The government's participation in industry often involves holding shares of publicly-traded firms. Between gradually divesting firms through privatization, and acquiring (or bailing out) companies, state ownership creates scenarios where shareholder value maximization has to contend with potentially conflicting motivations of government stakeholders. Consequently, trading shares in firms with government ownership involves dealing with unique information environments where less transparency can obscure undercurrents of private knowledge and trading on private information (Shleifer and Vishny, 1994; Gul et al., 2010).

There is an extensive literature on publicly-listed companies and government ownership, including those firms previously controlled but now completely divested by the state (fully privatized firms) and those where the government holds a partial ownership stake, selling only a fraction of the company's shares (partially privatized firms).[1] However, we know relatively little specifically about information asymmetry and explicitly private information in the market for the securities of government-owned companies.[2] Our paper addresses this gap. Since the potential of profitably trading on private information motivates the investment in generating such information, we measure information asymmetry directly by the extent of informed or private-information trading reflected in "market-maker" bid-ask spreads – the profits of potentially informed traders at the expense of the liquidity supplying traders in the market. Furthermore, we note that an informational advantage in trading can arise in two ways: first, through skilled analysis of duly disclosed or publicly available information as in Kim and Verrecchia

[1] Megginson and Netter (2001) provide an excellent survey of the empirical studies on privatization, and the literature continues to grow. Recent research provides evidence on important issues relating to differences between full and partial privatizations, such as their effects on the cost of equity (Ben-Nasr et al., 2012) and the cost of debt (Borisova and Megginson, 2011).

[2] Gul et al. (2010) show that "synchronicity" is significantly higher for companies with the government as a shareholder. They measure synchronicity based on the extent to which the variation in individual stock returns is explained by overall market and industry common factors, and interpret such synchronicity as an inverse proxy for the firm-specific information in stock prices incorporated through trading. Ben-Nasr and Cosset (2014) also use a similar measure and come to a similar conclusion. Besides being dependent on other factors, synchronicity is a measure of overall firm-specific information content, whether public or private, not a measure of firm-specific information asymmetry or private information *per se*. On the other hand, this paper specifically investigates information asymmetry and private information, and does so directly through the profits of informed traders at the expense of liquidity suppliers (i.e., market-makers).

(1994, 1997); and second, through inherently private information not available in the public domain.[3] These different sources of informed trading become particularly relevant in partially state-owned firms, where an opaque information environment can limit the informed trades available to skilled information processors of public information, while the considerable resources and potentially non-economic objectives of government stakeholders can facilitate informed trading based on private knowledge. This paper therefore investigates the nature and extent of informed trading in companies with government ownership relative to other companies, examines how the nature of this informed trading changes in information-intensive periods like earnings announcements, and specifically analyzes the components of informed trading attributable to skilled processors of public information and to inherently private information.

To perform the analysis, we use high-frequency order and transaction data from all partially privatized firms traded on the Euronext stock exchanges (i.e., Amsterdam, Brussels, Lisbon, and Paris). The government shareholdings in these firms are stakes remaining after partial divestitures of these former fully state-owned entities, rather than recent government investments driven by firm-level factors. In this way, the residual state ownership in partially privatized firms provides a direct measure of government influence that is free from reverse causality concerns. For comparative testing, we also collect trading data for all fully privatized firms on Euronext and for a matching sample of publicly-traded firms that are not (and have never been) owned by the government (i.e., "*de novo* private firms").[4] Subsamples of partially and fully privatized firms allow us to test the impact of state ownership while controlling for the unique, shared characteristics of privatized firms (e.g., their large size). Similar *de novo* private firms further enable the analysis to compare different nuances of government presence in privatized firms to a subsample of companies without state connections. The sample companies are based

[3] In this paper, the term "private information" signifies information that is not public or based just on analysis of public information. Specifically, it would include information one would normally associate with insiders, or those with privileged access to inside knowledge or information in some form.

[4] We use the term "*de novo* private" to describe publicly-traded firms that have never been controlled by the government. There are no fully state-owned or non-publicly-traded companies in our sample.

in the European Union (EU), which provides a fertile setting for our tests due to its widespread mixture of government and public ownership, the existence of fully developed capital markets, and the availability of high-frequency trading data that facilitate computation of our measures of informed trading. The data are drawn from early 2007, the latest available period prior to the onset of the 2008 financial crisis. This timeframe allows testing to be free from anomalous readings likely to accompany the crisis yet yields results that could be relevant to the mixed enterprises formed by subsequent state interventions.[5] Our proxy for informed trading is the adverse selection component of the bid-ask spread (hereafter "AS"), a direct measure of information asymmetry that reflects the average gross profits made by (potentially informed) traders (at the expense of liquidity suppliers) due to prices moving in the direction of their trading. The AS measure is estimated for the 7.5 million trades in our sample and can be aggregated for any horizon or group of trades on any criterion.

We find that firms in which the government retains an ownership stake (i.e., partially privatized firms) exhibit significantly lower overall levels of informed trading relative to firms that are not owned by the government (i.e., fully- and *de novo private* firms). Higher government ownership stakes are also associated with significantly lower informed trading. That said, using an event study based on informed trading of different groups of firms around earnings announcements, we find that only the government-owned group of firms displays a significant spike in informed trading *prior* to the announcement, consistent with private information leakage; whereas firms without state ownership exhibit their highest informed trading levels in the *post*-event period, consistent with skilled investors processing and trading on the information release. Similarly, when we decompose informed trading into components arising from (1) the skilled analysis of public information and (2) explicitly private information, we find that government-owned companies – despite having lower overall informed trading – display a significantly higher proportion of the latter.

[5] Given that our sample consists of privatized firms rather than private firms rescued by the government, our results represent what is applicable to the former group. However, by controlling for firm characteristics and using a matching sample, we attempt to isolate the effects of state ownership from firm-specific traits.

In sum, our results indicate that the state indirectly lowers the overall informed trading in a company through its residual presence and the accompanying opaque information environment. However, higher government involvement is also associated with a greater proportion of inherently private information and knowledge in the informed trading surrounding a firm's stock. We interpret this result as not necessarily being a sign of corruption or mala fide intent. Instead, it is also possible that the presence and influence of government agents as non-managing owners and directors with access to a wide base of firm, political, and macro-level knowledge can leave opportunities for informed trading.

Informed trading is economically important in the context of this study for at least two reasons. First, it directly affects the cost of trading since liquidity suppliers demand a higher premium for providing liquidity to stocks with more informed trading (Copeland and Galai, 1983; Glosten and Milgrom, 1985). For example, our finding of a 19.16 basis points difference in the AS of government-owned and firms never owned by the government translates into an annual difference in information asymmetry trading costs of almost 100 million euros, given a total turnover for each group of about 50 billion euros during our period. Second, information asymmetry has been shown to impact the cost of capital, and this effect arguably has a considerably greater cost to shareholders in the long term than trading costs.[6] Even though the empirical conclusions to this effect documented by Easley et al. (2002) and based on probability of informed trading (PIN) calculations have been disputed by Duarte and Young (2009) and Mohanram and Rajgopal (2009), recent AS-based evidence on informed trading in Chan et al. (2008) shows that AS is priced in international markets and has a much stronger link with asset prices than PIN. Bardong et al. (2009) find significant pricing relevance of AS for U.S. stocks, and also show that it is the risk from inherently private information that is priced rather than the advantage generated by skilled information processors from public information. Further, Botosan et al. (2004) show that the cost

[6] From a theoretical perspective, Easley and O'Hara (2004) show that firms with more private information exposure have higher required returns because uninformed investors are compensated for the risk of systematically losing out to privately informed investors. Hughes et al. (2007) argue that while such a pricing effect disappears in a large enough economy due to diversification, factor risk premiums do increase as information asymmetry about systematic factors increases.

of capital decreases with the precision of public information associated with a firm and, even more so, increases with the strength of private information in its information environment.

Previous research has shown the broad stock market liquidity fostered by privatization (Bortolotti et al., 2007) and explored the relation between state involvement and firms' trading environments using share prices, particularly in China (e.g., Bailey et al., 2004; Gul et al., 2010). The focus of this paper, however, is on firm-level information asymmetry, in contradistinction to that of Gul et al. (2010) and Ben-Nasr and Cosset (2014), which is on the overall firm-specific information content (whether public or private) that is incremental to market-wide factors. This paper also focuses on the study of a region where lines between state and private control are arguably more clearly drawn. That said, our finding of a lower level of informed trading in firms with state ownership is consistent with the lower firm-specific information content of stock returns of firms with government shareholders shown by Gul et al. (2010) and Ben-Nasr and Cosset (2014). Other ownership types and characteristics have also been found to affect stock price informativeness (or lack of synchronicity) in recent studies, such as block ownership (Brockman and Yan, 2009), the presence of large foreign owners (He et al., 2013), and the difference in control and ownership rights of controlling shareholders (Boubaker et al., 2014). Our results are consistent with the findings in these studies, in as much as we also find a positive association between block ownership and informed trading, but also highlight a key difference in these ownership effects and those of state ownership, which is linked to lower informed trading.

In addition to studying aspects of government intervention and an unexplored question in the privatization literature, our research fits in with other recent studies linking spreads and informed trading to investor behavior, such as the response to advertising (Grullon et al., 2004) and to the use of lending-relationship underwriters (Duarte-Silva, 2010). Furthermore, we also explore the direct impact of government involvement through corporate governance elements, such as ownership structure and board

composition.[7] By investigating the effects of government ownership on the observed level of informed trading, we address questions of interest to academics, market participants, and regulators that are likely to grow in relevance considering the abundance of bailouts, government investments, and privatizations.

The rest of the paper proceeds as follows: Section 2 motivates the study and lists the hypotheses to be tested. Section 3 describes the data and the variables. Section 4 presents an empirical examination of overall informed trading. Section 5 analyzes informed trading around earnings announcements. Section 6 decomposes the informed trading into components representing skilled analysis of public information and explicitly private information. Section 7 concludes.

2. Hypotheses

Informed trading can be very different for firms with government ownership relative to other firms for several reasons. On the one hand, companies with current or former government ownership can have less firm-specific information impounded into their stock prices due to their more opaque information environments (Ben-Nasr and Cosset, 2014; Gul et al., 2010). For instance, Ben-Nasr et al. (2015) link state ownership to a lower quality of reported accounting information. Leuz and Oberholzer-Gee (2006) suggest that firms more closely connected to a ruling government seek to avoid higher levels of transparency and scrutiny that could expose politically-motivated (and potentially illegal) transactions. Bushman et al. (2004) find the prevalence of state-owned enterprises in a nation to be negatively related to financial transparency, while Piotroski et al. (2010) discuss how government owners can suppress negative information to avoid the associated political costs. While ownership by blockholders can encourage better disclosure and governance (He et al., 2013), the decreased information flow surrounding state-owned firms should result in a lower level of public information reflected in the traded stock price of the company, thereby offering fewer advantages to skilled investors and lowering the information

[7] Denis and McConnell (2003) point out the relative lack of corporate governance research on privatized firms, which has more recently been countered by work such as Fan et al. (2007) on Chinese firms and by Borisova et al. (2012) on European firms.

asymmetry faced by uninformed traders (Kim and Verrecchia, 1994). This reasoning leads to our first hypothesis, hereafter *Hypothesis* H_1: firms with a stronger government presence have less informed trading related to skilled analysis of public information.

On the other hand, state ownership would arguably not reduce informed trading due to the informational advantages generated by the presence and influence of self-serving stakeholders driven by non-economic factors, and specifically, government stakeholders not primarily motivated by shareholder value maximization. Bureaucrats, politicians, and leaders of relevant interest groups could obtain *private* informational advantages based on a network of strong relationships with company directors and officers, and enforcement of insider trading regulation could be compromised. Boubakri et al. (2008) highlight anecdotal evidence that the government often resorts to appointing politicians and bureaucrats to key positions to maintain control over partially government-owned firms. These authors find empirically that political connections in such firms are a function of the proportion of government ownership. Su (2003) and Ziobrowski et al. (2004) also specifically imply that state officials trade using their informational advantages, while Shleifer and Vishny (1994) stress the essential role of government corruption in modeling the behavior of the state's relationship with firms they control. Based on these findings, our second hypothesis, hereafter *Hypothesis* H_2, is that firms with a stronger government presence have a greater proportion of information asymmetry arising from explicitly private information.

Because we consider two distinct sources of informed trading – skilled analyses of public information and explicitly private information – our hypotheses are not, on the whole, mutually exclusive. A couple of additional channels suggest how firms with government ownership could engender a more opaque environment for most investors while still allowing for informed trading based on private knowledge. First, the state can have significant control over the media and prevent certain private information from being disseminated. For instance, Djankov et al. (2003) report that the government owns 45% of the five largest TV stations in our sample countries, on average. Second, and more generally, governments have a much wider base of private information available to them (compared to other insiders) that can affect trading in a firm's shares. Beyond just firm-specific information, such as

future privatization plans or potential subsidies, the state would be privy to other macro-level events that impact the firm's outlook, including regulatory changes and other privatizations in the same industry. Information of this nature does not typically fall into regular channels of disclosure, allowing for crucial or sensitive private information to be withheld from otherwise accurate company reports.

Our hypotheses reflect that transactions based on the private knowledge of government stakeholders could exist alongside the reduced informed trading of skilled public-information processors. However, one of these contrasting effects may be more prevalent in the overall balance of informed trading, and we therefore leave the comparison of the total trade-based information asymmetry of firms with and without state ownership as an important empirical question.

3. Data and variables

3.1 Samples

One important feature that differentiates privatized firms is whether the controlling government decides to completely divest its interests in the firm (i.e., full privatization) or maintain an ownership stake while selling some portion of the company (i.e., partial privatization). Often the state will gradually privatize the firm over several years, slowly decreasing its holdings through asset sales or share offerings to investors (Perotti and Guney, 1993). Nevertheless, even after full privatization, Bortolotti and Faccio (2009) discuss how governments can employ various methods, such as golden shares, to maintain a certain amount of control in the divested firm. Distinguishing between informed trading in partially and fully privatized firms, therefore, can reveal if different levels of information asymmetry are linked to the state ownership present in partially privatized companies or instead to the firm characteristics and government connections shared across all privatized firms. Additionally, the government's role as a residual owner in partially privatized firms, rather than an active investor choosing its shareholdings based on firm traits, can alleviate reverse causality concerns that the state's selection of a target firm will affect our results.

We include all 54 privatized firms contained in the Privatization Barometer database[8] that are traded on Euronext, which consists of companies from Belgium (4), France (34), the Netherlands (6), and Portugal (10). Subsamples based on whether the state has completely divested (*Fully privatized*, 29 firms) or retained a portion of the firm's ownership (*Partially privatized*, 25 firms) are central to our analyses. Unique matching *de novo* private firms are also used for comparison, and they are paired with the privatized companies in the sample based on country, industry, and market capitalization.[9] All *de novo* private companies that match on the first two criteria are ranked based on market capitalization, and the one that most closely matches the privatized firm in question is selected as a part of the sample. Our control group of *de novo* private firms includes 45 companies, yielding a sample of 99 firms whose home exchange is Euronext and who are the largest in their respective national exchanges in terms of market capitalization.[10] All ten industries comprising the Industry Classification Benchmark (ICB) structure are represented in our sample, with Financials (28%) and Industrials (23%) being the most common. Throughout the analysis, we often group fully- and *de novo* private firms together to comprise firms without government ownership and compare this group to firms with government ownership (i.e., partially privatized firms) to determine the effect of direct shareholdings by the state.

3.2 Adverse selection measure

Our main proxy for information asymmetry is AS, the adverse selection measure, equivalent to the (permanent) "price impact" in Bessembinder and Kaufman (1997, p. 303) or the "position margin" in Hansch et al. (1999, p. 1826). AS represents asymmetry from the standpoint of relatively short-lived

[8] www.privatizationbarometer.net

[9] Based on the free float of a company's shares to facilitate the matching process. We thank Bill Megginson for this suggestion. Using the total market capitalization, rather than the free float market capitalization, of the partially privatized firms yields very similar matches, with only three differences in the sample of matched *de novo* private firms.

[10] Finding appropriate matches for privatized firms can be difficult, stemming from the fact that privatized companies are very distinctive and sometimes monopolistic. Very often they are the sole telecommunications, utilities, or airline company of a country. Choi et al. (2010, p. 165, footnote 5) comment that "this problem bedevils all privatization empirical studies that try to match divested firms with comparable domestic (or even international) companies." Thus, nine out of 54 privatized companies in the sample remain unmatched. Our results are very similar if only matched pairs are used.

information and is the component of spread-related revenue that liquidity suppliers lose on average to traders with private information, who demand immediacy to profit from this information. It is defined as the signed difference between the mid-quote in effect of the trade and the mid-quote 15 minutes into the future multiplied by the trade direction, expressed as a percentage of the mid-quote in effect of the trade. The direction of the trade takes a value of 1 for customer buys and a value of -1 for customer sells. Calculating the measure for limit order book markets by signing it in this way defines it from the frame of reference of liquidity demanders. Given that informed traders in limit order book markets can also choose to supply liquidity by posting limit orders based on knowledge of the stock's true value (Bloomfield et al., 2005; Rindi, 2008), we also calculate the AS measure using the absolute difference between the mid-quote in effect of the trade and the mid-quote 15 minutes into the future, expressed as a percentage of the mid-quote in effect of the trade. Both variants of the AS measure yield similar results. AS is calculated on an intraday basis using data from Euronext trades and orders files as detailed below.

Euronext is a purely order-driven market. It has a central electronic order book per location (Euronext, 2008) and a single trading platform and clearing house (Euronext, 2002). The trading day starts with a call auction price at 9:00 AM based on orders that are entered into the book from 7:15 AM to 9:00 AM, without any trading activity occurring during this time. Continuous trading takes place from 9:01 AM to 5:25 PM based on electronic order matching using the price/time priority rule. Data before 10:00 AM and after 4:30 PM are not used in the calculation of the AS due to many order cancellations occurring at the beginning and ending of the day.

Using high-frequency order and trade data from Euronext, the best bid and offer (BBO) is calculated for every second of the relevant trading day using data over the period of January 20th to April 5th of 2007. This is accomplished by cumulating all limit orders that remain in the book at any particular time and taking the highest bid price as the best buy and the lowest ask as the best sell. Every time there is a change in the order book, the BBO is revised to reflect the new market conditions. If there is not a change from the previous second, the last available BBO is carried forward. The changes that affect the status of the order book could be the execution of an existing order, the placement of a new order, the

modification of an existing order, or the cancellation of an existing order. The database provides an indicator variable that denotes the limit orders as a buy (A) or a sell (V). Some orders are only valid for the day and expire at the end of the trading day if not executed. Other orders are associated with a future validity date. These latter orders are carried forward to the next trading day and used in the pool of orders determining the BBO. Overall, our BBO calculations consist of 41.5 million order requests occurring for the sample firms over the period.

Determining the direction of the trade is based on which order was placed later. In other words, if a trade took place because the buy order entered the book after the sell order it matched with, then the trade is buyer-initiated. This identification is possible since Euronext provides a unique time-sequence based buy-order ID and sell-order ID for each transaction. Therefore, even if both orders are recorded at the same time, the order with the higher order number is recognized as the initiator of the trade.

The adverse selection component of the bid-ask spread is accordingly calculated for each of the 7.5 million trades of our sample firms' stocks. We aggregate this informed trading measure on an hourly, daily, or full-period basis for each firm, depending on the analysis performed. Collapsing the dependent variable over the entire period allows it to correspond with the retained percentage of government ownership and a majority of the control variables, which are collected annually. Higher frequencies of observations are used for a more time-specific investigation of the AS around earnings announcements.

3.3 Explanatory and control variables

The main explanatory variables of interest are government-ownership related measures, such as the percentage of government ownership, and binary variables for partially privatized, fully privatized, and *de novo* private (i.e., never owned by the government) firms. Retained government share ownership (*% gov. ownership*) as of the start of 2007, another of the main explanatory variables of interest, is collected from Privatization Barometer and used to classify privatized firms as fully (*% gov. ownership* = 0) or partially privatized (*% gov. ownership* > 0). On average, the state owns 26.2% of stock in our partially privatized firms. A count of government representatives who serve on the boards of privatized

firms is also employed in the analysis and is hand-collected from the companies' financial statements provided by Global Access WorldScope or from their websites.[11] For our sample, government officials are only appointed to the boards of partially privatized firms, where the state retains some ownership stake. At least one state official sits on the board in 52% of our partially privatized firms, and the mean number of government board members in these companies is two. These various measures allow us to isolate government ownership and determine the impact of different forms of state presence.

Market control variables based on Heflin and Shaw (2000), namely blockholder ownership and returns volatility (calculated as the standard deviation of daily returns) are used in the analysis. Greater ownership by blockholders (i.e., entities owning at least 5% of a company's stock) should increase informed trading based on the valuable private knowledge often provided to these monitoring owners (Heflin and Shaw, 2000; Brockman and Yan, 2009). Volatility also has a positive expected impact due to its association with news related to firms' earnings. We also include two indicators of trading activity that are averaged over the number of transactions in the period being tested: turnover, which represents the value in euros being traded, and volume, which is simply the number of shares traded.

Firm size, profitability, capital expenditures, and dividend payments are also used to control for the determinants of informed trading. Size typically exhibits a negative relation with informed trading since bigger companies should attract more attention and coverage and thus experience lower levels of asymmetry. An inverse relation between profitability and informed trading is expected based on Ben-Nasr and Cosset (2014), who find profitability to have a negative association with price informativeness. We further include a dummy variable taking a value of one if the company pays dividends, as previous research posits that dividend payments reduce asymmetry levels (Khang and King, 2006). Firm-specific data are taken from Thomson ONE Banker for the beginning of 2007 and, whenever missing, hand-

[11] For example, the 2007 annual report for Gaz de France specifies the following text: "The State appointed six representatives to the Company's Board of Directors by decree on November 20, 2004, and the shareholders' meeting elected six directors on October 7, 2005. Thus, the Board of Directors is composed of six representatives of the State, six members elected by the shareholders' meeting and six employee representatives."

collected from the companies' websites. Table 1 provides a description of the variables used, and Table 2 lists related summary statistics.

***** Insert Tables 1 & 2 about here *****

4. Empirical analyses of overall informed trading

4.1 Descriptive analysis

Table 3 presents the average levels of informed trading for different groups of firms, and results of formal tests for differences in these averages. Privatized firms as a whole have significantly lower levels of informed trading than *de novo* private firms as measured by the adverse selection measure of the spread. Privatized companies have AS that is 16.6 basis points lower than *de novo* private firms (p-value 0.028). More specifically, AS for government-owned firms (i.e., partially privatized firms) is 24.2 basis points lower than that of companies that have never had the government as their shareholder, and this difference is significant (p-value 0.013). This last result shows that the lower AS of privatized firms is driven by the partially privatized firms still under direct government influence via retained shareholdings. Further, the informed trading in partially privatized companies is significantly less (difference in AS of 14.2 basis points (p-value 0.046)) than that in fully privatized firms without residual government ownership. Informed trading is not significantly different between fully privatized and *de novo* private firms (difference in AS of 10.0 basis points (p-value 0.318)). These results suggest that the residual government ownership stake in a firm, as opposed to the completion of the privatization process or firm-level traits shared amongst privatized firms, has a strong association with lower informed trading. As in *Hypothesis* H_1, potential advantages available to skilled informed traders who benefit from processing firm information could be decreased by the poor disclosure tied to government presence.[12]

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

[12] Our results are not driven by auditor choice, as all sampled firms are using Big Four auditors during the period.

Figure 1 provides a comparison of daily-average AS between firms with and without government ownership. At all times in our sample period, partially privatized firms have lower, and seemingly less-volatile, spreads than fully privatized and *de novo* private firms. These initial results show that the presence of the government is associated with lower informed trading.

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

Measures of blockholder ownership, firm profitability, and capital expenditures are similar across the firm groups.[13] Importantly, all firm and market components show no significant difference between partially and fully privatized firm groups in the last column of Table 3, indicating informed trading comparisons between them are inherently well-controlled. Differences in firm size and market variables between privatized and *de novo* private firms reflect the previously mentioned difficulty of finding proximate *de novo* private matches for distinctive privatized firms.[14] Therefore, all compared traits are included as controls in the multiple regression analyses to follow. Nevertheless, in an unreported mean difference test, we find no significant difference between stock prices of privatized and *de novo* private firms.

4.2 Regression analysis

We next undertake a multiple regression analysis of the impact of retained government ownership and control on measures of informed trading. Our full period estimations include country and industry (based on ICB classification) fixed effects, as well as robust standard errors, to account for the influence of unobservable nationwide and industry-related factors. The results are presented in Table 4.

[13] The firms in our sample have a significant amount of total blockholder ownership, with a mean value of 42.5%. This value is higher than the annual averages reported by Brockman and Yan (2009), which are around 23% for a sample of large firms primarily traded on the NYSE/NASDAQ/AMEX exchanges. However, our mean value almost exactly matches that of He et al. (2013), who report a mean total block ownership of 42% for a sample of firms from 40 markets and list countrywide means of 51%, 51%, 35%, and 57% for the nations in our sample (Belgium, France, the Netherlands, and Portugal, respectively).

[14] Bessembinder and Kaufman (1997) and Huang and Stoll (1996) also base their spread comparisons on matched samples with substantially different trading volumes. Their differences emerge from market heterogeneity between the NYSE and NASDAQ, whereas ours result from the distinctive characteristics of privatized firms.

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

The absolute value of the AS measure serves as the dependent variable in all models. Unlike in the descriptive analysis, privatized firms as a whole do not have significantly less informed trading than *de novo* private firms in Model 1. However, Model 2 shows that partially-privatized firms (i.e., firms with residual government ownership) exhibit significantly less informed trading than firms that have never been government owned (i.e., *de novo* private firms). These firms have a lower adverse selection component by 19.16 basis points. On the other hand, the informed trading of fully-privatized firms is again not significantly different from that of *de novo* private firms. Following complete state divestiture, these fully-privatized firms become more similar in their information environments to firms that have never been in government ownership, despite having firm and market characteristics more akin to those of partially privatized companies.

Model 3 of Table 4 includes the percentage of retained government ownership to further investigate the effects of government ownership and control. In support of the overall effect of residual government ownership, the larger the retained stake by the state, the lower the information asymmetry in the enterprise's trading environment. In particular, a one-percentage point increase in government ownership is linked to a significantly smaller (by 0.643 basis points, *p*-value 0.012) adverse selection component. Similarly, Model 4 shows each additional government board member is linked to a lower AS by 5.832 basis points. Results for government variables in these last two models suggest that greater government control in firms corresponds to lower informed trading.

The coefficients on the size and profitability variables are generally negative and significant as expected. In contrast to the lower informed trading linked to larger state ownership, block ownership emerges as positive and significant, in line with Heflin and Shaw (2000) and Brockman and Yan (2009). Regarding market liquidity, the average volume often has a positive association with information

asymmetry, consistent with the findings in Gul et al. (2010) that more active trading is associated with firm-specific information being impounded into stock prices.[15]

Findings in this section indicate that government-owned firms have less informed trading. If we think of informational advantages as arising from either the skilled analysis of public information as in Kim and Verrechia (1994, 1997) or from explicitly private information, then these results, while not necessarily inconsistent with *Hypothesis* H_2, are clearly consistent with *Hypothesis* H_1. In other words, informed trading is less in government-owned firms as it becomes more costly for skilled information processors to extract private knowledge from these firms' information environments. We shed further light on the topic of informed trading based on public or private information in Sections 5 and 6.

5. Informed trading in information-intensive periods around earnings announcements

Given that the information environment changes around earnings announcements (Lee et al., 1993; Krinsky and Lee, 1996), we use an event study approach to examine the impact of such information releases on informed trading in the sample firms. Informational advantages generated from the skilled analysis of public information should be observable primarily in periods coinciding with and following earnings releases (Kim and Verrecchia, 1994, 1997; Barron et al., 2002), while any informed trading in pre-announcement period should ordinarily be attributable only to informed traders with explicitly private information (Finnerty, 1976). Although these investors could engage in trading following the announcement as well, we expect that informed traders with explicitly private information seek to realize their advantage in the pre-release period to the maximum extent that is feasible. Korczak et al. (2010) show that insider trading before announcements can be mitigated by the threat of regulatory action. Since state agencies themselves are typically responsible for regulatory enforcement, we expect pre-release

[15] In order to ensure that our results are not influenced by the overall liquidity of the stock, we calculate and compare the effective spreads of fully, partially, and *de novo* private firms (in untabulated results), where the effective spread is calculated as twice the difference between the transaction price and the quotation mid-point. We find that there are no significant differences in averages across any of these groups, indicating that our results are not being driven by stock liquidity.

trading by government-connected informed traders to be relatively undeterred by this risk. Shleifer (2005) discusses how regulatory officials pursuing their own interests (or interests of a connected group) can subvert public regulation.[16]

To test for informed trading around the release of information, we collect the exact dates of the earnings announcements from I/B/E/S and verify these dates in the European Wall Street Journal. The information intensive period is taken to be 5 days on either side of the event date (i.e., the day of a firm's earnings announcement): the before-event period, being the five days before the event date, and the after-event period, being the five days after the event date.[17] All other days in the sample period are labeled as 'Non-event days' and constitute the estimation period of normal trading days. For these tests, measures of state ownership and privatization are investigated using AS aggregated on a daily basis. To avoid repeating values for which we only have one reading per firm over the period, we only include control variables that can also be aggregated for each day.[18] As our models introduce a time-varying element within firm observations, standard errors are clustered by trading date to account for cross-sectional dependence.

Model 1 in Table 5 examines the effect of the retained government ownership on informed trading around the earnings announcement date. Results from Model 1 show that, when considering the full sample, there is significantly higher informed trading on the event day and in the after event period, consistent with existing literature (e.g., Kim and Verrecchia, 1994, Krinsky and Lee, 1996). However, interestingly, while there is no "leakage" of private information before the event for the sample as a whole, the interaction variable between the government ownership stake and a dummy variable taking a

[16] Bris (2005) also comments on the link between political connections and insider trading, citing the Triangle scandal in France that involved an assistant to the nation's finance minister and a friend of the president. It was suggested by some editorials in the press at the time that this trading scandal would have been covered up by the government had it not been for the involvement of a foreign regulatory agency, the SEC (Greenhouse, 1989).

[17] Krinsky and Lee (1996) choose two days around the event, but they use earnings announcements time-stamped to the minute. The announcements for the current study are daily, so we choose to use a wider period of time around the day of the event.

[18] Our main conclusions are unchanged if we include all controls from Table 4 in the remaining models of the analysis.

value of one for all five days before the event (Before event × %) has a statistically significant and positive coefficient (0.160). This result indicates that partially privatized firms with a larger proportion of government ownership have significantly higher levels of informed trading *before* the event compared to normal trading days, suggesting a greater susceptibility to (explicitly) private-information trading in the pre-event period.

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

Model 2 of Table 5 contrasts informed trading across event periods within the subsample of government-owned (i.e., partially privatized) firms, while Model 3 does the same for firms without current state ownership (i.e., fully privatized, and *de novo* private firms).[19] Non-event days serve as the omitted base group in the models. The positive and significant coefficients on all three groups in Model 2 illustrate that normal trading days yield the lowest level of informed trading for government-owned firms. We further note that the magnitude on informed trading prior to the earning release (5.332) is roughly double that after the release (2.658), linking government-owned firms to a greater proportion of pre-event informed trading likely attributable to explicitly private information and providing evidence in support of *Hypothesis* H_2. From the opposite perspective, and consistent with *Hypothesis* H_1, the relative lack of accurate public information surrounding government-owned firms generates a more opaque information environment, precluding skilled processors from achieving the same benefits over uninformed traders for firms with state presence. Contrastingly, the increased magnitude of the *Event* and *After event* coefficients in Model 3 (around eight basis points each) are consistent with sophisticated traders of non-government-owned firms gaining their greatest advantage from skilled information processing in the days following an earnings announcement by processing the newly-released information into value-enhancing trades.

Somewhat surprisingly, the results in Model 3 of Table 5 indicate that the five days before the release of information exhibit significantly lower asymmetry levels than normal trading days for firms

[19] Since our analysis indicates that the most significant differences in informed trading levels exist between firms with and without current government ownership, rather than between privatized and *de novo* private firms, we focus on this comparison here and in the remainder of our testing.

without state ownership. This is consistent with a scenario in which fully privatized companies, having previously gained the public exposure brought by privatization and now stably operating as companies free from the government, offer few surprises by their release of earnings. This predictability could partially explain the lack of higher informed trading around the announcement date, as in Affleck-Graves et al. (2002). Further, Korczak et al. (2010) find few examples of insider trading before earnings announcements, reflecting investor caution during this period due to trading regulations, and this result could explain the negative relation between non-government-owned firms and pre-event informed trading. We expect this disciplinary effect to be mitigated for the subsample of firms in Model 2 with stronger government connections due to direct state ownership.

Table 6, Panel A presents the event study results using full hourly-aggregated observations of AS and standard errors clustered by the date and hour of observed trading. These high-frequency results also show a significant increase in the levels of informed trading on the day of the earnings release (D_0 = 9.441) and on most of the five days following the event for the full sample. As opposed to the rest of the event period, the day just prior to the event shows a significant difference as the government's stake increases (% x D_{-1} = 0.299), yielding more of a spike in AS. This finding is consistent with the results from Model 1 in Table 5, showing that partially privatized firms with more government ownership are significantly more susceptible to trading on explicitly private information just prior to an earnings announcement. Since no such increase in informed trading emerges in companies free from government ownership – in fact, the coefficient on D_{-1} is negative (-4.521) – this effect is attributable to firms with government ownership and control, and consistent with *Hypothesis* H_2.[20]

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

Panel B of Table 6 provides a comparison of informed trading in firms with government ownership (partially privatized firms) and those without (fully and *de novo* private firms). Firms with

[20] Models equivalent to Model 1 in Tables 5 and 6 are performed substituting *% gov. ownership* with *Gov. board members* as the main regressor of interest in untabulated analysis. The results are very similar as each additional government director is linked to a higher AS only in the before-event period and on the day before an earnings announcement for Tables 5 and 6, respectively.

government ownership have lower average AS on every day throughout the event period (and significantly lower on most of those days), *except* for the day just prior to the earnings announcement (33.9 basis points) on which the level of informed trading in government-owned companies is actually slightly higher than that in non-government companies. These results are consistent with earlier findings and *Hypothesis* H_1, while not excluding *Hypothesis* H_2. The insignificant yet higher AS on the day prior to the announcement suggests that government-owned firms make it feasible for private information to be potentially exploited by associated officials through pre-event trading, counterbalancing the comparatively lower AS found on all other event period days. Otherwise, these partially privatized companies have significantly lower informed trading, especially in the days following the information release.[21] The informed trading in firms free from government ownership climbs on the day of the event and remains high during the after-event period as sophisticated, skilled public information processors take advantage of the more transparent public information environment in these firms. The informed trading of firms with and without government ownership is presented graphically in Figure 2.

***** Insert Figure 2 about here *****

6. Informed trading decomposition

Our argument for less informed trading in firms associated with government ownership centers on their increased exposure and the resultant increased availability of information to all investors. If a restricted information flow is associated with partially privatized firms, then there would be fewer opportunities for advantageous gains by the skilled processors of public information. However, as shown in the arguments and literature discussed in Section 2, there could remain informed trading in government-owned firms driven by explicitly private information and knowledge of stakeholders not motivated by value-maximization, which is particularly relevant when government officials serve on the

[21] The informed trading in partially privatized firms does gradually increase on the event day and remains high until two days after the earnings announcement. We expect these firms with government ownership to be subject to some informed trading concurrent with the announcement but to have significantly less of this type of trading compared to firms without state ownership.

board of directors.[22] Due to the state's media influence and its far-reaching network of resources, stakeholders of firms with government presence could acquire private, valuable trading information.[23] To further examine this relation, we decompose informed trading into two components, one reflecting the informational advantage of skilled public information processing traders, and the other reflecting the informational advantage arising from private information that cannot be predicted on the basis of public information.

We closely follow the conceptual framework and methodology of Bardong et al. (2009) to decompose the adverse selection measure into two components. One portion of the adverse selection measure is predictable based on public information, and specifically, three sets of publicly observable variables: first, those related to (time-varying) trading characteristics of the overall market as a whole; second, those related to (time-and-cross-sectionally-varying) trading characteristics of the individual firm; and third, those related to the (cross-sectionally-varying) firm's structural properties. The intuition is that skilled information processors, who gain their advantage through analysis of publicly available information, would be primarily responsible for the informed trading linked to these observable factors. The remaining component, labeled as the residual asymmetric information (RAIN), is the residual component of AS that cannot be predicted on the basis of the totality of publicly available variables that should be relevant, and hence, represents the informational advantage arising from explicitly private information. RAIN is, therefore, the final, unexplainable residual portion of AS determined by factoring out publicly-observable elements that explain informed trading.

The results we report are based on following a three-step decomposition procedure to elucidate how different levels of observed characteristics impact a stock's level of information asymmetry. The adverse selection measure is first regressed on firm-size-weighted daily average market-level measures of

[22] Dharwadkar et al. (2000) and Peng (2004) discuss how these state-appointed board members can be analogous to insiders, rather than independent directors.

[23] Examples of stakeholders in government-owned firms include government-appointed directors, state officials connected to the firm via direct management of ownership positions, various colleagues and cronies connected to these state officials, and political party members or supporters, among others.

bid-ask spread, turnover, volatility (proxied by Parkinson's (1980) measure), and order imbalance. Fitted values from this regression, minus the constant term, are then subtracted from the original calculated AS. This difference, serving as a proxy for the remaining unexplained informed trading, is then used as the dependent variable in a regression with daily firm-specific trading environment regressors: volatility, bid-ask spread, order imbalance, relative tick size, unexpected changes in bid-ask spread, and turnover.[24] Again, the informed trading explained by these variables is subtracted from the dependent variable values, and the difference is used as a regressand for a final decomposition regression. The firm structural characteristics used as explanatory terms here are insider and outsider ownership, capital expenditure, intangibles, the book-to-market ratio, the operating profit margin, option availability for a particular security, and total assets. Finally, the portion explained by these variates is removed from the remaining informed trading component, leaving a residual unexplained quantity labeled as RAIN. Importantly, we find coefficients similar in sign and significance when estimating a single regression using all right-hand side variables from the three decomposition models at once in unreported results.[25] We use the decomposition procedure with daily-averaged regressors and the adverse selection measure aggregated for each trade day.

Panel A of Table 7 shows that 43.0% of informed trading in the full sample remains unexplained by systematic factors and hence attributable to the informational advantage driven by the presence of explicitly private information and knowledge. However, while it is 41.7% for firms that are not government-owned, it is a significantly greater (p-value $<<$ 0.001) 46.9% for government-owned firms. These results specifically support the greater presence of information asymmetry based on explicitly

[24] Bid-ask spread is calculated as the residual of the daily change in a firm's bid-ask spreads regressed on market-level spread changes, the previous day's market-level spreads, market returns, the previous day's market returns, and the firm's squared returns.

[25] The results of these decomposition regressions are available from the authors and are consistent with the direction and strength of the relations reported in Bardong et al. (2009). Our analysis employing RAIN is limited by the ability of these models to capture the publicly-observable factors that influence informed trading. We find an R-squared value of 64.5% for the single decomposition regression using all explanatory variables at once. Failing to include relevant factors to informed trading in the decomposition would bias our RAIN values upwards but may not necessarily influence our comparison of RAIN across firms with and without government ownership.

private knowledge for state-owned firms as stated in *Hypothesis* H_2. From the opposite perspective, 57.0% of informed trading for the full sample (meaning 53.1% for government-owned and 58.3% for non-government-owned firms) is explained by the included market and firm observables, and hence attributable to the informational advantage of skilled public information processors. Given that we have already established empirically that overall informed trading in government-owned firms is significantly less than that in firms that are not government-owned, the fact that the proportion of informed trading attributable to skilled analysis of public information is also less for state-owned firms implies strong support for *Hypothesis* H_1.

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

Table 7, Panel B presents Tobit regressions of RAIN as a percentage of the total daily AS on (1) the partially privatized firm indicator, (2) the percentage of government ownership, and (3) the number of government-appointed board members. The daily trading-level variables serve as controls in these models, and we again include country and industry fixed effects, as well as robust standard errors. The regression coefficients for each of the three variables of interest are significant and positive. Similar to the results of Panel A, firms with government ownership have a significantly larger proportion (i.e., 4.603 percentage points more) of their informed trading that is attributable to unpredictable private information. The percentage of retained government ownership also has a positive, significant coefficient, and a greater number of government board members is also strongly associated with higher residual asymmetric information, providing further support for *Hypothesis* H_2.

Our results indicate that government presence reduces overall informed trading in a firm due to fewer potential advantages for skilled traders. At the same time, state ownership seems to prevent a corresponding reduction in the portion of informed trading based on explicitly private information and knowledge.

7. Concluding Remarks

We investigate how the presence of government ownership in a firm impacts its information environment. The divestiture of state owned enterprises, known as privatization, provides a backdrop of continuing relevance in which this question can be examined. Governments frequently retain a stake, directly or indirectly, in their former holdings and exert a corresponding influence. Without even considering fully state-owned firms, Megginson (2010) estimates remaining state holdings in privatized EU firms to be worth close to $700 billion, while comparable government stakes in emerging markets are valued at over $2 trillion.

We analyze the effects of government ownership on informed trading using a sample of fully and partially privatized firms, as well as firms never owned by the government, that are traded on Euronext. Our sample of firms with varying amounts of state ownership allows us to disentangle informed trading effects based on different levels of government presence, and we utilize direct proxies for information asymmetry from the market microstructure literature. In the context of extant research and the extensive government involvement in industry and markets, we first examine how state presence affects the overall levels of information asymmetry among traders. After this preliminary analysis, we drill down to test two major hypotheses in this paper. Given the poor disclosure linked to state-owned firms, our first hypothesis, *Hypothesis* H_1, is that firms with government presence have less informed trading related to skilled analysis of public information. At the same time, given the influence of government stakeholders not necessarily committed to maximizing firm value and possibly driven by self-serving behavior, our second hypothesis, *Hypothesis* H_2, is that firms with state presence have a higher proportion of information asymmetry arising from explicitly private information.

Our results show that government-owned companies are consistently linked with lower overall levels of informed trading relative to their non-government-owned counterparts. Based on regression analysis, firms in which the government has retained an ownership stake exhibit an adverse selection component of the bid-ask spread that is about 19 basis points lower than companies that have never been state-controlled. We further find that lower levels of informed trading are associated with higher

percentages of government ownership in firms. These regression results are not driven by firm characteristics specific to privatized firms, as we find no significant difference in the adverse selection spread component between privatized and *de novo* private firms.

We then investigate informed trading in the information intensive periods around earnings announcements. We posit that the informational advantage of skilled processors of *public* information should be reflected only after the announcement, while informed trading before the announcement should only reflect the informational advantage of traders with explicitly *private* information. Interestingly, only the government-ownership group of firms displays a significant spike in informed trading consistent with private information leakage prior to the announcement. Non-government owned firms, however, see their spreads climb the most in the period just after the release of earnings information. These relative changes in informed trading for different groups of firms and periods around earnings announcements accordingly enable us to provide clear support for both *Hypothesis* H_1 and *Hypothesis* H_2.

Finally, we decompose informed trading into two components: (1) informed trading that is predictable by a wide spectrum of market and firm-specific trading and structural characteristics, and hence related to skilled analysis of public information, and (2) the residual component of informed trading arguably arising from explicitly private information. We find strong evidence that government ownership and control is associated with informed trading of a significantly different composition than that of non-government-owned firms. Namely, state ownership is linked to a lower proportion of informed trading due to skilled analysis of public information (potentially driven by more opaque information environments) and a higher proportion of informed trading arising from explicitly private information (potentially driven by self-serving stakeholders not committed to value maximization), supporting both *Hypothesis* H_1 and *Hypothesis* H_2. This result echoes the findings of Ziobrowski et al. (2004) for U.S. Senators' investments, particularly since we find a positive association between government board members and the amount of unexplained informed trading, possibly tied to private information.

We add to the literature by presenting the varied, often conflicting influence of governments and studying some unanswered questions regarding state ownership and trading environments. Our sample of

Euronext privatized firms and their matches narrows our focus to specific nations in Western Europe, nonetheless ensuring that differences in legal environments and home exchanges will not impact the study and facilitating comparisons with other developed markets. The microstructure data processing methods employed here are computationally and time intensive, resulting in a sample that is comparable to other studies that use Euronext intraday data (e.g., De Winne and D'Hondt, 2007). However, future research can attempt to expand the scope of analysis to other institutional environments and time periods, as well as further investigate questions of government intervention and information asymmetry.

Acknowledgements

We would like to thank the editors, the referee, Rick Carter, Arnie Cowan, Louis Ederington, Mark Flannery, Sridhar Gogineni, Chris Koehn, Georgia Kosmopoulou, Bill Megginson, Vikas Raman, Duane Stock, and Wayne Thomas for helpful comments and suggestions, as well as seminar participants at the FMA meetings and at the University of Oklahoma. Brian McMurray and Mario Stamboliev provided excellent research assistance.

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Table 1
Variable definitions.

Microstructure and market variables are calculated based on order and trade files from Euronext. The adverse selection measure is calculated for each of the 7.5 million sample trades. Government variables are for the beginning of 2007 and taken from the database at www.privatizationbarometer.net, except for state board members which are collected from companies' financial statements provided by Global Access WorldScope or from their websites. Financial data are collected as of the beginning of 2007 from Thomson ONE Banker and manually supplemented, whenever missing.

Variable	Definition/calculation
Microstructure variables	
Adverse selection measure (AS)	$\|2 * D * (Midquote_{i+\tau} - Midquote_i) / Midquote_i\|$, where D is the direction of the trade and $Midquote_{i+\tau}$ is the mid-quote 15 minutes in the future. Expressed in basis points
Government variables	
% gov. ownership	Percentage stake in the company retained by the government
Privatized	Takes a value of 1 if the company is privatized, 0 otherwise
Fully privatized	Takes a value of 1 if the company is fully privatized (i.e., once government-owned but now completely divested by the state), 0 otherwise
Partially privatized	Takes a value of 1 if the company is partially privatized (i.e., partially divested by the state but still sustaining some government ownership), 0 otherwise
Gov. board members	The number of government-appointed board members, as described in company reports
Firm variables	
Size	The natural log of total assets
Profitability	EBIT / Total assets
Cap. ex.	Capital expenditures from the cash flow statement, divided by total assets
Dividend payer	Takes a value of 1 if the company paid a dividend in 2006, 0 otherwise
Block ownership	Amount of shares in the firm owned by all entities that hold at least 5%. Expressed as a percentage
Market variables	
Avg. volume	Total shares traded / number of transactions (directly provided by Euronext)
Avg. turnover	Total turnover in euros / number of transactions (directly provided by Euronext)
Volatility of returns	Standard deviation of daily returns using closing prices

Table 2
Variable summary statistics.

The table presents means, medians, standard deviations, and values at the 25% and 75% levels for the variables employed in the analysis. Microstructure and market variables are aggregated over the sample period for each of the 99 sample firms. The variables are calculated as defined in Table 1.

Variable	Mean	Median	Standard deviation	25%	75%
Microstructure variables					
AS	49.6	36.1	37.6	31.2	48.3
Firm variables					
Size	9.75	9.40	1.96	8.48	10.9
Profitability	0.084	0.066	0.085	0.030	0.102
Cap. ex.	0.130	0.045	0.267	0.018	0.099
Dividend payer	0.929	1.00	0.258	1.00	1.00
Block ownership	42.5	43.1	27.2	19.1	65.0
Market variables					
Avg. volume	985	327	2067	155	858
Avg. turnover	16098	12385	11474	8726	20329
Volatility of returns	0.015	0.014	0.006	0.012	0.017

Table 3
Comparisons of firms with different levels of government involvement.

The table presents differences in means between 54 privatized firms and 45 firms that have never been owned by the government (*De novo* private). The privatized firms consist of 25 partially privatized firms with residual government ownership, and 29 fully privatized firms that have been completely divested by the government. Microstructure and market variables are aggregated over the sample period. The variables are calculated as defined in Table 1.

			Government -owned	**Not government-owned**					
Variable	Full sample	Privatized	*Partially Privatized*	*Fully privatized*	*De novo* private	*P*-value (Privatized − *De novo* private)	*P*-value (Partially privatized − *De novo* private)	*P*-value (Fully privatized − *De novo* private)	*P*-value (Fully privatized − Partially privatized)
Microstructure variables									
AS	49.6	42.0	34.4	48.6	58.6	0.028	0.013	0.318	0.046
Firm variables									
Size	9.75	10.4	10.5	10.3	8.92	0.000	0.000	0.002	0.749
Profitability	0.084	0.075	0.064	0.084	0.094	0.258	0.101	0.639	0.421
Cap. ex.	0.130	0.108	0.106	0.109	0.156	0.370	0.474	0.493	0.958
Dividend payer	0.929	0.963	1.00	0.931	0.889	0.155	0.086	0.552	0.188
Block ownership	42.5	41.2	46.1	36.9	44	0.606	0.760	0.286	0.201
Market variables									
Avg. volume	985	1282	1793	842	628	0.117	0.053	0.524	0.130
Avg. turnover	16098	18772	20884	16952	12888	0.010	0.003	0.088	0.285
Volatility of returns	0.015	0.014	0.014	0.014	0.017	0.024	0.136	0.043	0.660

Table 4
Informed trading and government ownership.

This table reports results from regression models using country and industry fixed effects and robust standard errors. The regression models take the form of

$$AS_i = \alpha + \beta_1 Privatized_i + \beta_2 Size_i + \beta_3 Profitability_i + \beta_4 Cap.\ ex._i + \beta_5 Dividend\ payer_i + \beta_6 Block\ ownership_i + \beta_7 Avg.\ volume_i + \beta_8 Avg.\ turnover_i + \beta_9 Volatility\ of\ returns_i + \varepsilon_i \quad (1)$$

$$AS_i = \alpha + \beta_1 Partially\ privatized_i + \beta_2 Fully\ privatized_i + \beta_3 Size_i + \beta_4 Profitability_i + \beta_5 Cap.\ ex._i + \beta_6 Dividend\ payer_i + \beta_7 Block\ ownership_i + \beta_8 Avg.\ volume_i + \beta_9 Avg.\ turnover_i + \beta_{10} Volatility\ of\ returns_i + \varepsilon_i \quad (2)$$

$$AS_i = \alpha + \beta_1 \%\ gov.\ ownership_i + \beta_2 Size_i + \beta_3 Profitability_i + \beta_4 Cap.\ ex._i + \beta_5 Dividend\ payer_i + \beta_6 Block\ ownership_i + \beta_7 Avg.\ volume_i + \beta_8 Avg.\ turnover_i + \beta_9 Volatility\ of\ returns_i + \varepsilon_i \quad (3)$$

$$AS_i = \alpha + \beta_1 Gov.\ board\ members_i + \beta_2 Size_i + \beta_3 Profitability_i + \beta_4 Cap.\ ex._i + \beta_5 Dividend\ payer_i + \beta_6 Block\ ownership_i + \beta_7 Avg.\ volume_i + \beta_8 Avg.\ turnover_i + \beta_9 Volatility\ of\ returns_i + \varepsilon_i \quad (4)$$

with each equation specifying its corresponding model number below. The dependent variable is the adverse selection measure (*AS*). Microstructure and market variables are aggregated for each firm *i* over the sample period. Variables are defined in Table 1, and control variables are demeaned in Models 1 and 2. Coefficients are listed below, with *t*-statistics in parentheses. *** denotes significance at the 1% level, ** denotes significance at the 5% level, and * denotes significance at the 10% level.

	(1)	(2)	(3)	(4)
Privatized	-3.859			
	(-0.50)			
Partially privatized		-19.16**		
		(-2.13)		
Fully privatized		7.476		
		(0.84)		
% gov. ownership			-0.643**	
			(-2.59)	
Gov. board members				-5.832***
				(-2.74)
Size	-5.931*	-6.517*	-5.284*	-4.523
	(-1.81)	(-1.97)	(-1.69)	(-1.41)
Profitability	-62.23*	-83.60**	-69.79*	-67.53*
	(-1.82)	(-2.24)	(-1.92)	(-1.87)
Cap. ex.	-158.0	-155.6	-140.9	-136.7
	(-1.59)	(-1.52)	(-1.48)	(-1.40)
Dividend payer	-28.34	-19.82	-22.04	-23.83
	(-1.49)	(-1.06)	(-1.15)	(-1.30)
Block ownership	0.248	0.288*	0.329*	0.299*
	(1.49)	(1.81)	(1.93)	(1.81)
Avg. volume	0.00317*	0.00427***	0.00375**	0.00339**
	(1.92)	(2.81)	(2.41)	(2.15)
Avg. turnover	-0.000611*	-0.000456	-0.000772**	-0.000837**
	(-1.88)	(-1.47)	(-2.37)	(-2.59)
Volatility of returns	216.3	336.0	252.3	217.5
	(0.28)	(0.44)	(0.35)	(0.29)
Observations	99	99	99	99
R-squared	0.387	0.438	0.448	0.431

Table 5
Informed trading and government ownership in periods around earnings announcements.

This table reports regression results obtained by performing regressions with country and industry fixed effects and trading date-clustered standard errors using daily aggregated observations. The dependent variable is the adverse selection measure (*AS*), and the event is a firm's earnings announcement. Model 1 includes interaction variables between the retained percentage of government ownership (*%*) and dummy variables for five days before the event, the day of the event, and five days after. It is specified by

$$AS_{it} = \alpha + \beta_1 \%\ gov.\ ownership_i + \beta_2 Before\ event_{it} + \beta_3 Event_{it} + \beta_4 After\ event_{it} + \beta_5 (Before\ event\ x\ \%)_{it} + \beta_6 (Event\ x\ \%)_{it} + \beta_7 (After\ event\ x\ \%)_{it} + \beta_8 Avg.\ volume_{it} + \beta_9 Avg.\ turnover_{it} + \varepsilon_{it} \quad (5)$$

Models 2 and 3 employ the series of dummy variables that represent the three possible periods for subsamples consisting of companies with government ownership (i.e., partially privatized firms) and those without (fully privatized and *de novo* private firms). The base group omitted from the regression equation consists of days outside the 11-day event window (Non-event days). As an example, Model 2 is specified by

$$AS_{it} = \alpha + \beta_1 Before\ event_{it} + \beta_2 Event_{it} + \beta_3 After\ event_{it} + \beta_4 Number\ of\ trades_{it} + \beta_5 Avg.\ turnover_{it} + \varepsilon_{it} \quad (6)$$

Variables are aggregated for each firm *i* over each day *t* in the sample period. Variables not described here are defined in Table 1, and control variables in Models 2 and 3 are demeaned. Observations are constrained by earnings announcements that are not listed or fall outside of the sample period (16 firms). Coefficients are listed below, with *t*-statistics in parentheses. *** denotes significance at the 1% level, ** denotes significance at the 5% level, and * denotes significance at the 10% level.

	(1)	(2) Government-owned	(3) Not government-owned
% gov. ownership (%)	-0.304***		
	(-7.18)		
Before event	-3.326	5.332*	-4.793*
	(-1.29)	(1.94)	(-1.77)
Event	7.976**	6.899*	8.375**
	(2.10)	(1.79)	(2.06)
After event	7.059*	2.658*	8.204*
	(1.76)	(1.96)	(1.73)
Before event x %	0.160**		
	(2.46)		
Event x %	-0.0340		
	(-0.20)		
After event x %	-0.0318		
	(-0.30)		
Avg. volume	0.000822*	0.00178***	0.00895***
	(2.00)	(6.58)	(4.27)
Avg. turnover	-0.000628***	-0.000203***	-0.00117***
	(-7.55)	(-7.15)	(-8.56)
Observations	4,311	1,199	3,112
R-squared	0.046	0.061	0.046

Table 6
Informed trading and government ownership in the days around earnings announcements.

Panel A reports regression results obtained by performing a regression with country and industry fixed effects and trading date and hour-clustered standard errors using full hourly-aggregated observations. The dependent variable is the adverse selection measure (*AS*) and the event is the day of a firm's earnings announcement. Model 1 contains the retained ownership stake by the government, eleven dummy variables taking the value of one for each of the eleven days in the event period, and eleven interaction variables between the retained stake and the day dummies. It is specified by the below model, with all event days between -5 and 5 unlisted in the interest of brevity:

$$AS_{it} = \alpha + \beta_1 \%\ gov.\ ownership_i + \beta_2(D_{-5})_{it} + \beta_3(\%\ gov.\ ownership\ x\ D_{-5})_{it} + \cdots + \beta_{22}(D_5)_{it} + \beta_{23}(\%\ gov.\ ownership\ x\ D_5)_{it} + \beta_{24} Avg.\ volume_{it} + \beta_{25} Avg.\ turnover_{it} + \varepsilon_{it} \quad (7)$$

AS is aggregated for each firm *i* over each day *t* in the sample period. Other named variables are defined in Table 1. Observations are constrained by earnings announcements that are not listed or fall outside of the sample period (16 firms). Coefficients are listed below, with *t*-statistics in parentheses. *** denotes significance at the 1% level, ** denotes significance at the 5% level, and * denotes significance at the 10% level. Panel B presents two-tailed mean difference tests of the AS for firms with and without government ownership over the 11-day event period.

Panel A: Multiple regression analysis

	(1)		
% gov. ownership (%)	-0.160***		
	(-7.14)		
D_{-5}	-2.113	*% x* D_{-5}	-0.0114
	(-1.11)		(-0.24)
D_{-4}	6.185	*% x* D_{-4}	-0.138
	(1.53)		(-1.43)
D_{-3}	-0.113	*% x* D_{-3}	0.00903
	(-0.04)		(0.12)
D_{-2}	-0.849	*% x* D_{-2}	0.101
	(-0.35)		(1.29)
D_{-1}	-4.521**	*% x* D_{-1}	0.299**
	(-2.16)		(2.19)
D_0	9.441***	*% x* D_0	-0.0329
	(4.33)		(-0.35)
D_1	7.472*	*% x* D_1	0.0403
	(1.89)		(0.40)
D_2	4.928	*% x* D_2	-0.0789
	(1.32)		(-0.92)
D_3	9.174*	*% x* D_3	-0.109
	(1.85)		(-1.06)
D_4	8.790	*% x* D_4	-0.0594
	(1.54)		(-0.46)
D_5	7.750*	*% x* D_5	-0.00883
	(1.83)		(-0.09)
		Avg. volume	0.000364
			(1.54)
		Avg. turnover	-0.000289***
			(-5.80)
		Observations	25,504
		R-squared	0.020

Panel B: Two-tailed t-tests for differences in the AS for firms with and without state ownership over the 11-day event period

Day	Government-owned	Not government-owned	P-value
-5	30.1	34.7	0.156
-4	31.1	44.2	0.078
-3	28.1	38.3	0.066
-2	29.7	37.8	0.057
-1	33.9	33.3	0.888
0	35.8	47.5	0.004
1	34.5	46.1	0.153
2	30.4	43.4	0.071
3	29.1	49.5	0.029
4	30.1	49.8	0.074
5	29.8	48.7	0.025

Table 7
Comparison of adverse selection components.

Panel A shows means and difference in means tests for the unexplained residual asymmetric information (*RAIN*) contained in the daily-aggregated adverse selection measure (AS), determined by the three-step decomposition described in Bardong et al. (2009). *RAIN* is the percentage of the original AS not explained by known factors used in the three-step decomposition and is calculated as a percentage of AS. Panel B reports Tobit regression results with country and industry fixed effects, robust standard errors, and a dependent variable of *RAIN* as a percentage of AS for each firm *i* over each day *t* in the sample period, specified by the following equation for Model 1:

$$RAIN_{it} = \alpha + \beta_1 Government\text{-}owned_i + \beta_2 Avg.\ volume_{it} + \beta_3 Avg.\ turnover_{it} + \varepsilon_{it} \quad (8)$$

Models 2 and 3 substitute the percentage of state ownership and the number of government-appointed board members, respectively, for the government-owned dummy. Right-hand side variables are defined in Table 1, and control variables are demeaned in Model 1. Coefficients are listed below, with *t*-statistics in parentheses. *** denotes significance at the 1% level, ** denotes significance at the 5% level, and * denotes significance at the 10% level.

Panel A: Means and difference in means

Variable	Full sample mean	Government-owned	Not government-owned	P-value
RAIN	43.0	46.9	41.7	0.000

Panel B: RAIN regressed on government measures

	(1)	(2)	(3)
Government-owned	4.603***		
	(6.18)		
% gov. ownership		0.0962***	
		(4.68)	
Gov. board members			1.531***
			(8.00)
Avg. volume	0.000747***	0.000986***	0.000996***
	(2.81)	(3.73)	(3.76)
Avg. turnover	-0.0000327	-0.0000144	-0.0000108
	(-0.97)	(-0.43)	(-0.33)
Observations	4,419	4,419	4,419
F	42.84 ($p < 0.0001$)	43.18 ($p < 0.0001$)	47.20 ($p < 0.0001$)

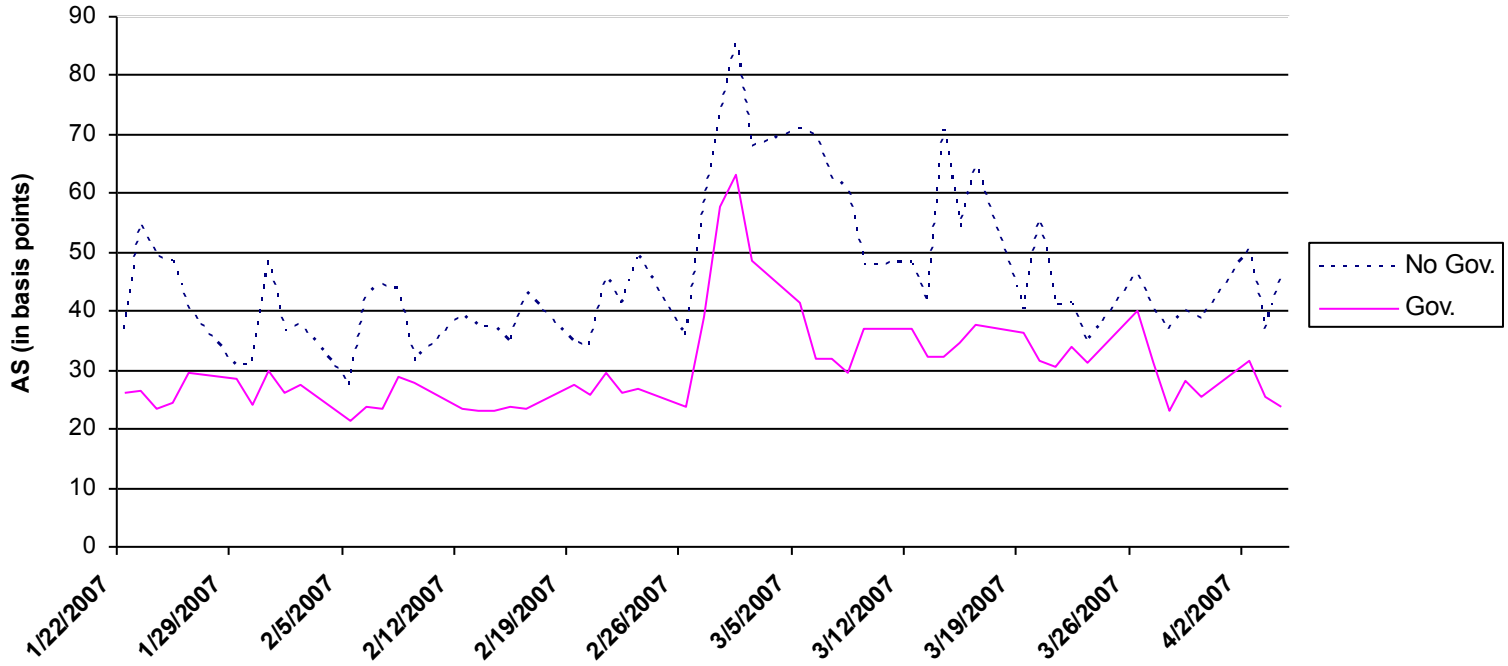

Fig. 1. Mean adverse selection component per day: Firms with and without government ownership. The graph plots the daily mean of the absolute value of the adverse selection component of the bid-ask spread (in basis points) scaled by the mid-quote in effect of the trade (AS) for the period examined in the study. The graph compares the AS of companies with state ownership, i.e., partially privatized firms (solid pink line), to that of companies without any state ownership, comprised of firms never owned by the government and fully privatized firms (dotted blue line).

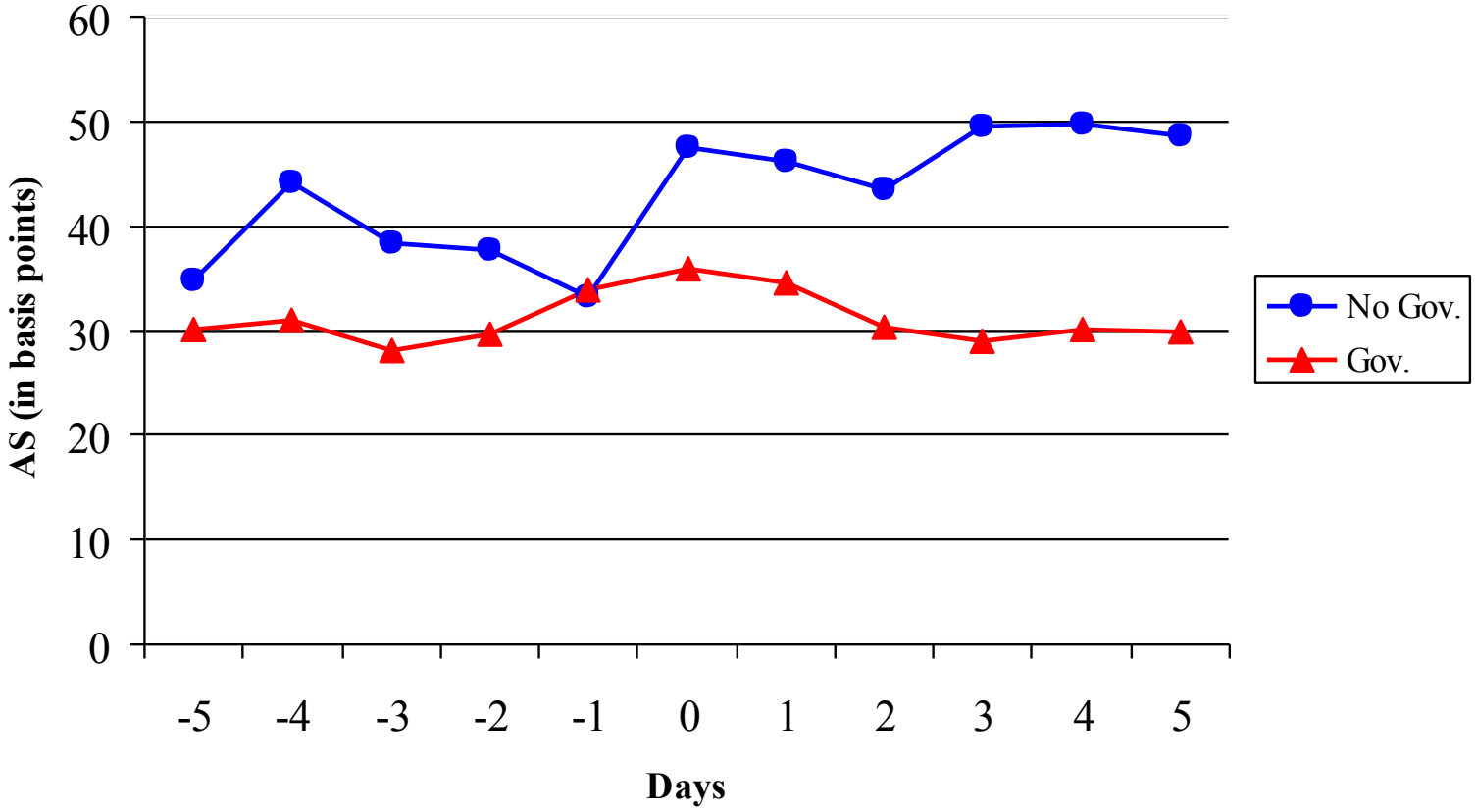

Fig. 2. Mean adverse selection component per event period day: Firms with and without government ownership. The graph plots the daily mean of the absolute value of the adverse selection component of the bid-ask spread (in basis points) scaled by the mid-quote in effect of the trade (AS) for the 11-day event period examined in the study. The period comprises the day of each firm's earnings announcement (day 0), five days before the event (days -5 to -1), and five days after the event (days +1 to +5). The graph compares the AS of firms with state ownership, i.e., partially privatized firms (red line with triangles), to that of companies without any state ownership, comprised of firms never owned by the government and fully privatized firms (blue line with circles).

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