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Corruption and insider trading

Kyriacos Kyriacou, Siming Liu, Bryan Mase *

Department of Economics and Finance, Brunel University London, UK

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ABSTRACT

We investigate firm corruption in China by extracting a measure of corruption from published financial statements and use this to demonstrate that corruption impacts the trading decisions of insiders. Specifically, we show that insiders in firms that are more corrupt trade more aggressively, and they are more willing to trade on their private information as evidenced by the increased informativeness of their trades, in respect of both purchases and sales. This link between firm corruption and trade informativeness is robust to the inclusion of a number of factors that are known to influence the informativeness of such trades, including trade characteristics, insider characteristics and the firm's information environment. We also consider the effect of the appointment of a new CEO or Chair. Overall, corruption related trade informativeness holds consistently for both purchases and sales. Finally, we show that this measure of corruption is robust to the inclusion of several alternative indicators of corporate misconduct.

1. Introduction

There is increasing interest in aspects of culture, how it relates to financial decision making by firms and how it can impact a firm's operation and performance. Culture has been defined as the systematic beliefs and values, or cultural norms, that pervade a defined group of people, and are transmitted from generation to generation (Guiso et al., 2006). This definition stresses the long-lived nature of culture, and how it can be persistent over time (Williamson, 2000). The importance of culture in influencing outcomes in institutions was identified by North (1991), who stressed the importance of the interplay between the informal (the beliefs and norms) and the formal, including institutions, legal framework and regulations. Cross-country differences in culture are found to be significantly related to differences in a variety of economic outcomes, ranging from economic growth rates (Levine, 2005) to investor participation in the stock market (Guiso et al., 2015). Associated with this interest in culture is a growing literature that documents a link between various aspects of culture and firm behavior. This finds that a country's culture appears to have a significant impact on a variety of different aspects of firms' decision making and performance, ranging from its link to the degree of entrepreneurship in a country (Lee and Peterson, 2000), to how firms design their executive remuneration structure (Bryan et al., 2015).

Much of the existing analysis of culture, and its relevance for firms, has been conducted on a cross-country basis, and from a Western viewpoint where aspects of culture are measured using country level value dimensions derived from Hofstede (1980) or Hofstede (2001). In this paper, we focus on China, where the Confucian culture remains influential, but is difficult to measure (Chen et al., 2019). Confucianism provides an ethical and moral system that is particularly focused on relationships, where people are regarded as being socially dependent, subordinate to the group. An important and distinctive aspect of this culture is the use of guanxi,

* Corresponding author at: Department of Economics and Finance, Brunel University London, Uxbridge UB8 3PH, UK.
E-mail address: bryan.mase@brunel.ac.uk (B. Mase).

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which emanates from the traditional Confucian values that emphasise interdependence and reciprocity (Kang et al., 2015; Wu et al., 2023). Guanxi can be defined as an emotional and social tie that is built on trust, maintained through gift exchange and entertainment, and facilitates the parties to exchange favours. It is an integral and pervasive part of life in China, both in personal relations and in business dealings. In business, guanxi can be defined as the development of social interactions and networks between individuals that generate benefits for both parties by overcoming obstacles or obtaining special or favourable treatment (Fock and Woo, 1998; Fan, 2002). Business guanxi, based on the cultivation of personal connections that are maintained through reciprocal gift giving and entertainment, can be decomposed into either business ties or government ties (Luo et al., 2012). While the development of political connections is common in developing countries (Faccio, 2006), government focused guanxi in China can be important in enabling firms to attract government subsidies or reduce tax burdens (Cheng et al., 2019), to gain protection from tunnelling by controlling shareholders (Haveman et al., 2017) or to take advantage of a pervasive system of 'special deals' for firms (Bai et al., 2020). The local governments that provide these special deals, and which enable firms to overcome bureaucratic restrictions, are then motivated to ensure their success due to their ongoing ability to extract private rents, and may even compete with other local governments to attract and retain the firms.[1] Moreover, local government officials have the additional incentive that their career progression is tied closely to the economic performance of their local province (Li and Zhou, 2005).

The pervasive use of guanxi in China means that cultivating guanxi could be regarded as a normal business practice. However, Luo (2008) argues that the use of guanxi and corruption are intertwined, and that guanxi can be regarded as a critical facilitator of corruption. Similarly, Li (2011) examines cases of bribery, and argues that guanxi is not simply connected with corruption but is 'part of the cultural root of corruption.' Partly as a consequence of guanxi, China is regarded as having a relatively high level of corruption, which is extensive and pervasive across firms (Piotroski and Wong, 2012). They argue that despite improvements, 'China's financial markets continue to be plagued by weak information systems and, as a result, low quality financial information.' They document that China continues to rank poorly on accounting and financial reporting transparency. While there have been several recent anti-corruption campaigns, including the implementation of an important anti-corruption campaign announced in 2012, the most recent Transparency International Corruption Perceptions Index of 2022 ranked China 65th, albeit an improvement from the 80th position it held in 2012. Factors that enable corporate corruption to persist in China include weak corporate governance (Allen et al., 2005) and weak enforcement of regulations (Zhu and Wang, 2015).

This paper contributes to the research on culture and financial decisions by examining the link between the corruption associated with Chinese guanxi culture and insiders' use of their private information when trading shares in their firms. We disentangle two aspects of guanxi, the relational spending that can be regarded as part of normal business practice (Bu and Roy, 2015) and the extra spending that is related to corruption (Steidlmeier, 1999), by extracting a measure of excessive guanxi spending. This approach therefore accommodates the view that there is a certain level of guanxi related spending that is a requirement of conducting business in China, while it is the excessive spending that is consistent with, and proxies for, corruption.[2]

Chinese firms have been required, since 2010, to identify and report guanxi related expenses, or relational capital, and we use these to extract our measure of corruption in Chinese firms. The expenses, reported under Entertainment and Travel Costs (ETC), are legitimate and can be treated as a business expense. The requirement to report these allows us to identify this spending consistently across firms, avoiding a potential bias that would arise if the reporting decision were endogenous. ETC are reported at the firm level, so consequently our corruption measure is also a firm-level measure. It represents an aggregation of individual insider decisions to generate and claim expenses, and therefore is different to the firm-specific measures used by, for example, Skaife et al. (2013) and Gao et al. (2014). As a result, it is well suited to examining how corruption within the firm can influence insider trading decisions.

There is a considerable literature examining the use of private information by insiders when trading in their own shares, identifying a number of trade, insider and firm characteristics that appear to be significantly related to insider trade informativeness. In this paper, we extend this research to examine the implications of the excessive use of guanxi by Chinese firms, and how this can be related to variations in the extent to which insiders profit from their information advantage. Insiders' ability to profit in China is heightened by weak corporate governance (Allen et al., 2005; Dai et al., 2016), weak enforcement of regulations (Zhu and Wang, 2015), limited enforcement of insider regulations (Du and Wei, 2004; Shen, 2008; Aussenegg et al., 2018), reduced litigation risk (Cheng and Lo, 2006), short shareholder investment horizons (Fu et al., 2020) and an opaque information environment (Huang and Liang, 2024). Using measurable variations in firm corruption, as proxied by abnormal ETC spending, we find that insiders in firms that are more corrupt trade more, and the informativeness of their trades is increased significantly. This is consistent with our expectation that insiders in firms that are more corrupt are more likely to use the information advantage that their access to private information gives them. We then conduct a multivariate analysis that controls for a number of insider, trade, and firm characteristics that have previously been found to impact on insider trade informativeness, and find that the increased trade informativeness persists, for both insider purchases and sales. We investigate whether there is a link between director rank and trade informativeness, as well as consider how a change in CEO/Chair impacts insider trade informativeness.[3] We thus contribute to the growing evidence of the importance of China's guanxi culture, and how it can have a significant impact on decision making within firms.

[1] While traditional economic theory argues that this type of behavior is detrimental (Murphy et al., 1993), Bai et al. (2020) suggest the competitiveness of this system in China may yield significant benefits that outweigh the costs, and therefore could be growth enhancing.

[2] The US Foreign Corrupt Practices Act 1977 recognises the potential requirement for US firms, when conducting business overseas, to need to make small payments, sometimes referred to as grease payments, to enable or accelerate a business outcome that would be inevitable. However, larger payments designed to secure or retain a contract or business deal are deemed illegal.

[3] We thank a referee for this suggestion.

This paper further contributes to the analysis of corruption in China by conducting a number of robustness tests to confirm our main result. We employ the Fama-French five factor methodology (Fama and French, 2015) to estimate abnormal returns over several alternative windows after the announcement of the insider trade. We then use several alternatives to our corruption variable. The first is the rank of our measure, the second controls for potential omitted variables driving corruption. Given the inherent difficulty in identifying and measuring corruption, an important issue considered in the literature when examining the impact of any corruption variable is whether the relationship identified (in our case between firm corruption and insider trade informativeness) is causal or merely an association, possibly due to an omitted variable. We address this directly by employing a modified corruption measure that is robust to the inclusion of several additional variables that have been suggested as potential proxies for firm corruption. These variables include a measure of corporate philanthropy that is expected to be negatively related to corporate misconduct (see, Liu, 2016; Bereskin et al., 2020), and several corporate governance variables that would be expected to restrict the ability of insiders to trade on their private information, while at the same time might limit the firm's expenditure on ETC (Gao et al., 2014). In our final robustness test, we apply a stochastic frontier analysis as an innovative and alternative approach to extracting firms' excess expenditure on ETC. Here abnormal ETC is measured relative to the minimum expected level given several observable variables that reflect a firm's relational capital expenditure. Our principal finding, that insiders in Chinese firms with higher levels of corporate corruption are more likely to use their private information when buying and selling their firm's shares, remains.

The layout of the paper is as follows. Section 2 reviews the existing empirical literature and develops the hypotheses. Section 3 describes the data and methodology. Section 4 presents the main empirical results, while Section 5 reports the results from several robustness checks. Finally, Section 6 summarises the main findings and discusses their implications.

2. Literature and hypothesis

Research that investigates culture, and in particular cultural influences across countries, shows that it can have a wide-ranging impact; it can be a factor in determining a country's financial development (Levine, 2005) and economic growth (Gorodnichenko and Roland, 2011; Boubakri and Saffar, 2016), the organisation of a country's financial system (Kwok and Tadesse, 2006) and institutions (Aggarwal and Goodell, 2009), and can induce variations in investor protection (Stulz and Williamson, 2003) and market regulations (Davis and Williamson, 2016; Cline et al., 2021). Related research also demonstrates a link between culture, individuals' attitudes to risk, and aspects of their financial decision making, resulting in culture appearing to have an influence on investment behavior in terms of the extent of stock market participation (Guiso et al., 2015), investor trading decisions (Grinblatt and Keloharju, 2001), investors' focus on firms' corporate social responsibility decisions (Dyck et al., 2019) and on the synchronicity in stock prices (Eun et al., 2015).

Culture can also have an important influence on the operation and behavior of firms (Williamson, 2000; Guiso et al., 2015). At the firm level, culture can impact firms by influencing the extent of decentralisation (Bloom et al., 2012), affecting entrepreneurship intensity (Lee and Peterson, 2000), or by influencing venture capital activity (Li and Zahra, 2012). Ahern et al. (2015) find a significant impact of the cultural differences between cross-border merging firms and the synergy gains associated with the merger, and Lim et al. (2016) show that cultural differences negatively impact the premium paid for US firms' cross-border merger targets. Boubakri et al. (2021) identify the impact of firm culture on firm innovativeness, while further studies find that culture can impact firms' decision making in relation to their cash holdings (Alipour and Yaprak, 2024; Tran, 2020), their dividend policy (Shao et al., 2010) and their determination of executive remuneration (Bryan et al., 2015).

Much of this literature has focused on the relationship between corruption and firms at the country level. Our analysis focuses on Chinese firms, operating in a society that is heavily influenced by a Confucianism value system and the associated guanxi culture that emphasises interdependence and reciprocal obligations. An integral aspect of guanxi is the development and maintenance of trust through entertainment and gift giving. For firms in China, the maintenance and utilisation of business ties is regarded as a distinctive and important aspect of doing business (Peng and Luo, 2000). While conducting business within a social network of relations is not unique to China (Granovetter, 1985), it is argued that its use in China is essential as a means of conducting routine business between firms (Bu and Roy, 2015), particularly in a context of limited market supporting institutions, and constraints on contract enforcement (Puffer et al., 2010). The resulting evidence suggests that guanxi focused on business partners can be important for firm performance in China (Li et al., 2008), and may be as important as the benefit obtained from government focused guanxi (Luo et al., 2012; Sheng et al., 2011). At the firm level, it is argued that there will be significant variations in a firm's need for guanxi, depending on firm and industry characteristics, as well as due to differences in the extent of their business-state ties (Haveman et al., 2017).

Despite the requirement of guanxi when conducting business in China, its use has been identified as being related to corruption (Luo, 2008). Once practiced, it is argued that corruption becomes normalised within an organisation, with the result that idiosyncratic corruption contaminates and is practiced collectively (Ashforth and Anand, 2003; Zyglidopoulos and Fleming, 2008). Variations in corruption at the firm level arise because industries vary in their sensitivity to corruption, and differences in corporate governance influence the ability for managers to engage in corrupt behavior (Donadelli et al., 2014). Additionally, variations in corruption can be a consequence of both organisational norms and the ease with which regulations can be violated (Gorsira et al., 2018). This implies that corruption related to the guanxi culture can become more widespread in an organisation, influencing behaviors through shared norms and values (Graham et al., 2022), and that this will vary between firms depending on the extent of their use of guanxi.

Our focus is on insider trade informativeness, and there is an extensive literature that investigates the factors that impact this informativeness. Existing research has consistently found that insider trades are informative in the sense that they have predictive ability for returns (Seyhun, 1986; Lakonishok and Lee, 2001; Huddart and Ke, 2007). Considerable effort has since focused on identifying the factors that determine insider trade informativeness, in terms of trade characteristics, insider characteristics and firm

characteristics. For trade characteristics, informativeness has been found to be dependent on trade size (Seyhun, 1986) and is more significant for purchases rather than sales (Jeng et al., 2003; Aboody and Lev, 2000; Jagolinzer et al., 2011) although there is evidence that sales that are significant for the insider may be informative (Scott and Xu, 2004; Kallunki et al., 2009). The reduced informativeness of insider sales would be consistent with them being motivated by liquidity, but could also be caused by the increased legal risk for the insider associated with sales. Informativeness is also greater for trades that are classified as being opportunistic rather than routine (Cohen et al., 2012; Ali and Hirshleifer, 2017).

The literature on insider characteristics and trade informativeness has examined the importance of gender, Gregory et al. (2013) suggesting that trades by female executives may be more informative than those by males, and the rank of the insider, Ravina and Sapienza (2010) identifying possible differences between executives and independent directors. Similarly, Wang et al. (2012) suggest that trades by CFOs are more informative than those by CEOs. The research on firm characteristics includes the relevance of firm size and the book-to-market ratio (Lakonishok and Lee, 2001; Rozeff and Zaman, 1998). The early findings that trade informativeness is driven by these characteristics is more likely due to related aspects of the information asymmetry between the firm and outside investors (Aboody and Lev, 2000; Tang and Xin, 2023), together with associated features of the firm's corporate governance. Trade informativeness increases with information asymmetry as measured by analyst following (Frankel and Li, 2004; Huddart and Ke, 2007), while a reduction in analyst coverage increases insider trade profitability (Ellul and Panayides, 2018). Additionally, the quality of the firm's corporate governance also impacts on insider trade informativeness. Better governance encourages the implementation of restrictions on insiders, which prevent them from trading on their private information, particularly in respect of sales where there is greater legal risk (Dai et al., 2016), while it also restricts the flow of information on which insiders can trade profitability (Bowen et al., 2023).

Despite the range of characteristics that have been found to be related to the informativeness of insider trades, Hillier et al. (2015) argue that the combined explanatory power of these observable insider and firm characteristics remains small. They suggest that unobservable fixed individual attributes or personality traits remain much more significant. Motivated by the desire to address this, we propose that the extent of corruption has a significant impact on the willingness of insiders to use their information advantage when trading, and hence on insider trade informativeness.

In this paper, we contribute to the research on how culture can influence financial decision making by examining whether the extent of guanxi related corruption is related to insiders' use of their private information when trading shares in their own firms. In doing so, we bring together two distinct strands of research, the one that focuses on corruption, its measurement and impact, the other that identifies the factors that determine and influence the informativeness of insiders' trades. While there are a number of observable and measurable factors that impact this trade informativeness, the willingness of an individual insider to engage in opportunistic trading that would lead to an informed trade is more difficult to measure. However, attempts have been made to identify proxies for this willingness. One such proxy is weak internal control over financial reporting, which implies a lack of board integrity and a corresponding increased insider trade informativeness (Skaife et al., 2013). Alternatively, Gao et al. (2014) propose that a firm's spending on corporate social responsibility will have a negative impact on insider trading informativeness because the expenditure cultivates a positive image that constrains the insider's trading behavior. Kallunki et al. (2016) use Swedish tax compliance data to suggest that there is a positive relation between insiders' tax noncompliance (which proxies for their ethical behavior) and insider trade informativeness. Liu (2016) measures culture by the aggregate of US directors' attitudes to corruption, which are determined by the level of corruption in their country of origin, and suggests this is also positively related to trade informativeness. Finally, Ali and Hirshleifer (2017) classify insiders as opportunistic if they have previously traded profitably prior to a quarterly earnings announcement, and find that their subsequent trades are relatively more informative.

Our measure of corruption is extracted from the ETC reported by Chinese firms. There is a portion of ETC that is a normal part of business operations, and an excess that captures the extent of corruption within the firm. Insiders use these additional expenditures in order to obtain private benefits, either for the insider directly or indirectly by supporting their firm (Cai et al., 2011; Zeng et al., 2016). It is from these expenses that we extract excess expenditure, our measure of firm corruption in China. ETC expenses are incurred as a result of decisions made by the insiders, and a component of these can be regarded as discretionary expenses. This measure of corruption has previously been found to be a measure of the ability of firms to overcome restrictions or obstacles, for example, by enhancing access to bank finance through the maintenance of political connections (Chen et al., 2013). These expenditures have subsequently been used successfully to; proxy for the withholding of information by firms (Gul et al., 2011), examine its relationship to stock price crash risk (Xu et al., 2014; Hu et al., 2020), and examine the link between corruption and the power of Chinese bank CEOs (Ting and Huang, 2018).

We extend this literature by investigating whether corporate corruption impacts the trading decisions of company insiders. We hypothesise that firm level corruption will be directly related to the willingness or ability of the firm's insiders to use their private information when trading, and therefore result in an increased informativeness of insider trades.[4] Given the relative importance of unobserved individual traits, we hypothesise that this informativeness will persist after controlling for the insider, trade and firm characteristics that have previously been found to explain some insider trade profitability.

This paper is also related to the research on the impact of restrictions to insider trading. There is some evidence that the reduced informativeness of sales compared to purchases is related to their associated increased litigation risk (Brochet, 2010; Huddart et al., 2007). The reduced informativeness of sales relative to purchases persists when firms implement voluntary restrictions on insider

[4] An alternative channel could be that insiders in more corrupt firms are less likely to be discouraged or prevented from using their private information when trading, although this alternative would produce the same qualitative result.

trading (Lee et al., 2014), and is robust to variations in the enforcement of insider trading regulations between countries (Aussenegg et al., 2018). Our hypothesis of a link between corruption and insider trade informativeness implies that the insiders are less likely to be influenced by either litigation risk (which is substantially lower in China) or other restrictions on their trading. As a result, we would expect that the relation should hold for both purchase and sale decisions.

This paper is also related to the analysis of aspects of culture within a firm, and how that culture can influence decision making in the firm. There is evidence, for example, that frugal CEOs oversee a culture where other insiders are less likely to be fraudulent (Davidson et al., 2015). An unethical culture is positively related to the likelihood of a firm engaging in financial fraud and earnings management (Biggerstaff et al., 2015), while the extent of corruption in executives' country of origin is positively related to the opportunistic behavior and corporate misconduct of US executives (Liu, 2016).

Finally, this paper also contributes to the studies on the impact of the anti-corruption campaign associated with Xi Jinping that was first announced in 2012, and implemented in 2013. Din et al. (2020) find a greater stock price impact of the announcement for firms that were smaller, not connected and not SOEs (State Owned Enterprises), implying that these firms were expected to lose the benefits previously obtained from corruption-related behavior. Other studies have investigated a variety of related issues including the impact of the campaign on charitable donations (Hao et al., 2020), the impact on stock price crash risk (Hu et al., 2020), the effect of the removal of corrupt officials (Pan and Tian, 2020), the impact on the release of company information (Cao et al., 2018) and the impact on firm-level total factor productivity (Kong et al., 2020). If the anti-corruption campaign were effective, we would expect it to reduce insider trade informativeness by reducing the willingness of insiders to take advantage of their information advantage. More generally, it might also be expected to discourage firms' expenditure on ETC, which would in turn imply a reduction in the relevance of our corruption measure.

3. Data and methodology

Our initial sample contains all A-shares companies listed on two stock exchanges, the Shanghai Stock Exchange (SSE) and the Shenzhen Stock Exchange (SZSE). We exclude financial services firms with a SIC code starting with 4300–4395. Insider trading data are collected from WIND Financial Database. Other financial information is collected from China Stock Market and Accounting Research (CSMAR) database.

3.1. Insider trading

We collect insider trading data relating to SSE and SZSE's A-share companies from WIND for the period January 2010 to December 2020. The dataset reports the company's name and code, the insider's name and position, transaction direction (buy or sell), the date of announcement, the date of the transaction, the number of shares bought (sold), and the price paid (received). We only consider secondary market transactions[5] made by corporate insiders (executive directors, officers and others, which include supervisors and independent directors). We exclude stock awards, stock dividends, option exercises, and transactions by third-party block shareholders (classified as those who control more than 5 % of the company). We remove trades associated with a share volume lower than 100 shares, and trades valued at less than 10,000 RMB. Multiple transactions by a single insider on the same day for a given firm are aggregated to give a single trade, either buy or sell. Thus, where a director purchases and sells shares on the same day, we net the transaction. A trade is, therefore, a purchase (sale) event if the net trade quantity is greater (less) than zero. As indicated by previous research (e.g. Heinkel and Kraus, 1988; Maynes and Rumsey, 1993; Campbell and Wesley, 1993), thin trading may induce a bias for event studies, hence we remove thinly traded firms during the sample period for calculating abnormal returns.[6] The resulting sample comprises 2574 firms and 67,326 transactions, of which 22,648 transactions are purchases and 44,678 transactions are sales. As detailed in Table 1, there are more transactions classified as a sale than a purchase, which is consistent with previous studies of the Chinese market (Bowen et al., 2023). On average, 0.96 (1.83) insider purchases (sales) are made per Chinese firm per year, and the value of sales are on average approximately 50 % greater.

3.1.1. Measure of Informativeness of insider trading

All relevant data for A-share companies listed on SSE and SZSE, (including closing price, total market value, expenses, revenue, etc.) is either directly obtained from the WIND or China Stock Market and Accounting Research (CSMAR) databases. We follow the insider trading literature (Lakonishok and Lee, 2001; Fidrmuc et al., 2006; Ravina and Sapienza, 2010; Kolasinski and Li, 2013) to measure the informativeness of insider trades. The Fama-French five factors model (Fama and French, 2015) residuals are used as the measure of abnormal returns. Parameters are estimated using an estimation window (interval of −250 to −31 days) prior to the announcement/filing date of each trade. Parameters are then used to estimate the abnormal returns across the event windows. We construct the daily factors as follows[7]:

$$R_{i,k,t} - R_{f,t} = \alpha + \beta_1 \left(R_{m,t} - R_{f,t}\right) + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 RMW_t + \beta_5 CMA_t + \varepsilon_{i,t} \quad (1)$$

[5] Secondary market transactions are open market sales and open market purchases in China.

[6] Following Bartholdy et al., (2007), we define firms as thinly traded if they have trades on fewer than two days per week on average.

[7] To construct comparable asset pricing factors, including the market risk, size, value, profitability and investment factors, this paper refers to the methodology described on Ken French's website and carefully follows related studies (see, Carhart, 1997; Fama and French, 1993, 2015).

Table 1
Trade characteristics including type of insiders.

	No. of Firms	No. of Transactions	Average Trades	Value of trades		Volume of trades	
				mean	median	mean	median
All	2574	67,326	2.38	384.98	68.17	26.39	4.14
Purchases	2137	22,648	0.96	287.76	36.77	24.08	3.00
-ExecDirectors		13,172		406.13	84.09	34.53	6.33
-Officers		5381		187.42	10.43	14.74	1.00
-Others		4095		70.73	17.55	5.62	1.50
Sales	2224	44,678	1.83	434.01	87.55	27.56	5.00
-ExecDirectors		23,813		640.80	149.73	41.78	9.00
-Officers		11,811		217.66	39.38	12.79	2.00
-Others		9054		180.27	58.00	10.19	3.00

Value is measured in 10,000 RMB. Volume is measured in 10,000 transactions.
Average Trades is the average number of trades per firm per year.
ExecDirectors are insiders who are members of board of executive directors.
Officers are senior officers who work in the firm but are not members of the board of directors.
Others include independent directors and supervisors.

where $R_{i,k,t}$ is the daily stock return for firm i on day t after the announcement of an insider trade k; $R_{f,t}$ is the risk-free interest rate on day t; and $R_{m,t}$ is the daily value-weighted return on the corresponding stock market composite index (i.e., Shanghai Stock Exchange or Shenzhen Stock Exchange composite index) on day t. SMB_t is the size factor on day t, which is defined as the return on small stocks minus the returns of big stocks[8]; and HML_t is the value factor on day t, which is defined as the difference between the return on high and low book-to-market stocks[9]; RMW_t is the profitability factor on day t, which is defined as the difference between returns on stocks with robust and weak operating profitability[10]; CMA_t is the investment factor on day t, which is defined as the difference between returns on stocks of low and high investment firms.[11] We use cumulative abnormal returns (CARs) as the measure of informativeness of insider trades following 10, 22 and 30 trading days after the announcement/filing of the trade. In order to test if cumulative average returns are equal to zero for our sample, we use two parametric tests: cross-section *t*-test (see, e.g. Brown and Warner, 1980); and standardized cross-section t-test (see Boehmer et al., 1991). We also use two non-parametric tests: the Corrado rank test (see Corrado, 1989); and the generalised sign test (see Cowan, 1992). We present the details of these test statistics in Appendix B.

3.2. Measure of corruption – Abnormal entertainment and traveling costs (AbnETC)

There is a growing literature that investigates the reporting of ETC by Chinese firms, and uses this as a measure to provide an indicator of corrupt behavior within these firms. ETC can, however, be a legitimate expense incurred as part of the normal business of a firm. It is generally argued that the use of ETC is pervasive in China because of the widespread practice and general acceptance of client entertainment to develop and promote business networks. Its significance is reflected by Sun (2016) who states that a sample of over 200 Shanghai Stock Exchange listed firms in 2007 reported an average ETC spend equivalent to 10 % of profits. While ETCs were reported prior to 2010, reporting was made mandatory only in 2010. This appears to be linked to the entitlement, since 2008, of Chinese firms' ability to claim tax deductions against up to 60 % of entertainment expenses, or an amount equivalent to 0.5 % of sales. We therefore begin our sample period from 2010.

We collect details of notes from annual financial statements for A-share companies (excluding financial services companies) over the period 2010–2020 that are matched to the insider trading data in our previous section. Following Cai et al. (2011) who first proposed the use of ETC spending as a measure of corruption in Chinese firms and Zeng et al. (2016), we hand-collect (filter) six items from the management and selling expenses that are related to entertainment and travel costs: business entertainment expense (Ye Wu Zhao Dai Fei or Jiao Ji Ying Chou Fei in Chinese), travel expense (Chai Lv Fei, Chu Chai Fei, Zhu Su Fei, or Jiao Tong Fei in Chinese), overseas training expense (Chu Guo Pei Xun Fei or Chu Guo Fei in Chinese), meeting expense, board meeting expense, and car expense. The aggregate of these items is the measure of ETC. We combine management and selling expenses because of the potential ability of firms to shift expenses between different classifications (Choi et al., 2024).

Given its legitimate use as part of normal business practice in China, we follow closely the approach in Zeng et al. (2016) and

[8] The median market value is used to divide all firms into small and big size groups.
[9] The 30th and 70th percentile of book-to-market ratios are used to divide all firms into three groups.
[10] The measure of operating profitability is defined as in Fama and French (2015), which is annual revenues minus the cost of goods sold, interest expense, selling, and general and administrative expenses during the previous fiscal year divided by the end book value of equity. The 30th and 70th percentiles are used as data breakpoints.
[11] Calculated as the change in the book value of total assets from the beginning to the end of the previous period divided by the previous end book value of total assets. The 30th and 70th percentiles are used as data breakpoints.

Table 2
Summary statistics of ETC and related variables.

	No. of Firms	No. of firm-year obs.	Mean	P25	Median	P75	SD
ETC	2574	10,072	0.015	0.004	0.01	0.02	0.014
ExecPay	2574	10,072	0.002	0.001	0.001	0.002	0.001
OwnCon	2574	10,072	0.577	0.48	0.587	0.682	0.129
BSize	2574	10,072	8.387	7	9	9	1.324
AccPay	2574	10,072	0.177	0.087	0.149	0.238	0.119
AccRcv	2574	10,072	0.29	0.118	0.24	0.411	0.22
Size	2574	10,072	15	14.253	14.899	15.66	0.965
AbnETC	2574	10,072	0	−0.007	−0.003	0.005	0.012

ETC is defined as entertainment and travel costs collected from annual reports, scaled by sales revenue.
ExecPay is the executive pay of the top three executives, scaled by sales revenue, OwnCon is ownership concentration measured as the percentage of shares held by the ten largest shareholders, BSize is the total number of directors on the board, AccPay is accounts payable scaled by sales revenue, AccRcv is accounts receivable scaled by sales revenue, Size is the log of total assets, respectively.
AbnETC is the measure of corruption using the residuals from the eq. (2).
All variables are winsorized at the 1 % and 99 % percentiles.

transform ETC into a measure of corruption by extracting the excess expenditure on ETC, which we refer to as abnormal ETC.[12] The partial deductibility of ETC implies that regulators expect some of the expenses incurred might be excessive. We regress ETC scaled by sales revenue on several variables including accounts payable, accounts receivable, executive pay and board size, as shown below. These variables allow us to control for a normal or expected level of spending on ETC that is linked to both relational capital building and managerial excess by the firm, while the residuals from the model can be viewed as the excess or abnormal ETC expenditure.

$$ETC_{i,t} = \alpha + \beta_1 ExecPay_{i,t} + \beta_2 OwnCon_{i,t} + \beta_3 Bsize_{i,t} + \beta_4 AccPay_{i,t} + \beta_5 AccRcv_{i,t} + \beta_6 Size_{i,t} + \theta_{jpt} + \varepsilon_{i,t} \quad (2)$$

where ETC is the entertainment and travel costs scaled by sales revenue, ExecPay is the executive pay of the top three executives, scaled by sales revenue, OwnCon is ownership concentration measured as the percentage of shares held by the ten largest shareholders, BSize is the total number of directors on the board, AccPay is accounts payable scaled by sales revenue, AccRcv is accounts receivable scaled by sales revenue, Size is the log of total assets, θ_{jpt} are sets of dummy variables to control for industry (j), province(p)[13] and year(t) fixed effects, respectively. We then extract the measure of the degree of corruption within each firm (i.e. AbnETC) using the residuals obtained from the estimation of eq. (2).

Table 2 presents some statistics relating to ETC, and AbnETC, our measure of corruption. These are firm year estimates for firms that have at least one insider trade during the period, 2010–2020. It is notable that there appears to be little variation in board size and the level of executive pay, suggesting a degree of uniformity among Chinese firms during this period. As shown in Table 2, the mean of AbnETC is 0, by definition, although all firms are assumed to be corrupt to some extent, variations about the mean indicating the extent of the corruption. Thus, a positive AbnETC indicates that a firm's ETC level is excessive relative to the mean level of corruption, consistent with a weak corporate culture and increased corruption, whereas a negative AbnETC value implies that a firm's ETC level is below the norm, implying lower corruption than the average firm.[14]

Table 3 presents the trade characteristics across quartiles of AbnETC. This shows that in the higher quartile of AbnETC (classified as the more corrupt firms), insiders trade more frequently on average, and their trades generally have higher values and volumes, than the less corrupt firms. For purchases, the upper quartile firms have on average 23 % more trades per firm, and their average value is 23 % greater, as compared to the lower quartile firms. For sales, insider trading frequency is 73 % higher and the average trade value 13 % greater. This suggests that there is a positive relation between the level of corruption in the firm and the insiders' propensity to trade in their firm's shares. The mean firm size is consistent across the quartiles, which confirms that there is no evidence of a small firm effect in the classification of the more corrupt firms.

4. Results

Our analysis is focused on testing our central hypothesis that more corrupt firms, as measured by AbnETC, will be associated with more profitable trading by insiders. This would confirm that they are more willing to use their private information when trading. We begin this analysis with a univariate test, and then proceed to a multivariate test where we include a number of controls in light of the previous research findings on factors that influence insider trade informativeness.

[12] Zeng et al. (2016) demonstrate that their approach is a substantial improvement on Cai et al. (2011) as their model generates a much-improved fit, and therefore provides a superior method of identifying the controls for the normal or expected level of spending on ETC. As a result, we follow Zeng et al. since this model is better able to identify excess or abnormal ETC spending.
[13] Province is defined as the province where the company's headquarters is located.
[14] We find no evidence of a decline in AbnETC since 2012, as would be implied by a successful anti-corruption campaign.

Table 3
Trade characteristics across AbnETC quartiles.

Quartile 1 of AbnETC								
	No. of Firms	Firm Size	No. of Transactions	Average Trades	Value of trades		Volume of trades	
					mean	median	mean	median
Purchases	689	15.53	5027	0.66	262.50	32.82	21.76	3.00
Sales	973	15.33	10,341	0.97	409.90	80.28	25.92	5.00
Quartile 2 of AbnETC					Quartile 2 of AbnETC			
Purchases	890	15.79	6457	0.66	272.17	40.12	24.39	3.22
Sales	881	15.45	11,814	1.22	448.08	95.51	27.42	5.00
Quartile 3 of AbnETC					Quartile 3 of AbnETC			
Purchases	791	15.87	5980	0.69	296.80	33.49	25.03	2.88
Sales	887	15.56	10,861	1.11	415.86	86.08	27.13	4.50
Quartile 4 of AbnETC					Quartile 4 of AbnETC			
Purchases	581	15.80	5184	0.81	323.56	45.18	25.58	3.00
Sales	630	15.48	11,662	1.68	464.88	88.77	30.03	5.00

Difference in means between Quartile 4 and Quartile 1 of AbnETC			
	Average Trades (Q4-Q1)	Average Value of trades (Q4-Q1)	Average Volume of trades (Q4-Q1)
Purchases	0.15	61.07**	3.82**
		(2.235)	(2.148)
Sales	0.71	54.98**	4.11***
		(1.964)	(3.090)

Value is measured in 10,000 RMB. Volume is measured in 10,000 transactions.
AbnETC is the measure of corruption using the residuals from the eq. (2).
Quartile 1–4 of AbnETC is constructed based on quartiles of values of AbnETC.
Average Trades is the average number of trades per firm per year.
Firm size is the natural logarithm of the market value of the firm.
All variables are winsorized at the 1 % and 99 % percentiles.

4.1. Univariate analysis

In Table 4 we present the results of a univariate analysis based on the same quartiles of our corruption measure, AbnETC, from Table 3. For robustness, we calculate the average CAR across several windows after the insider trades. Irrespective of the window, the results for the purchases and sales are consistently positive and negative respectively. For example, over the 30-day period following the trade announcement, purchases/sales by insiders generate average abnormal returns of 4.52 %/−4.24 %, respectively. We use a variety of parametric and non-parametric tests, (see Appendix B for details), which demonstrate that these abnormal returns are statistically significant, confirming that insider trades contain significant information for returns.

The magnitude of the abnormal returns reported here indicate that insiders in China are able to profit substantially from their insider trading. This can be explained by significant differences across a number of aspects in the institutional and regulatory framework in China, which have been shown to give insiders an enhanced ability to take advantage of their private information. Weak corporate governance in China is linked to increased frequency and profitability of insider trading (Allen et al., 2005; Dai et al., 2016; Bowen et al., 2023), while in China shareholder protection is weak (Allen et al., 2005) and the punishments for securities violations are limited (Jiang and Kim, 2015).[15] Firms do the minimum to meet the requirements of China's Corporate Governance Code, such as appointing no more than three independent directors (Jiang and Kim, 2015). The enforcement of insider trading cases in China is low (Du and Wei, 2004; Shen, 2008), yet it is argued that insider trading is deterred only through effective enforcement (Bhattacharya and Daouk, 2002; Aitken et al., 2015). In China, the China Securities Regulatory Commission (CSRC) has potentially competing objectives, being expected to both enforce insider regulations while at the same time maintaining stability, protecting state assets and advancing state policies (Tong et al., 2013). The investment horizon of traders in China is short (Jiang and Kim, 2015), and is dominated by unsophisticated small retail investors (Qiu et al., 2018; Titman et al., 2022), which means there is a reduction in both the incentive and the ability to monitor directors, resulting in more profitable insider trading (Fu et al., 2020). The litigation risk faced by insiders is limited in China since investors are unable to file claims against directors (Huang, 2021), yet litigation risk is regarded as being an

[15] The lack of a deterrence effect is consistent with the finding that the punishment for insider trading abuses are generally less harsh in countries categorised as being less individualistic (Cline et al., 2021).

Table 4
Cumulative abnormal returns (CARs) across ETC quartiles.

Panel A: average of CAR after announcement of trades and significance tests

		Purchases					Sales				
	Window	Average CAR (%)	Cross-sec. t-test	Stdz. Cross-sec. t-test	Corrado rank test	Gen. sign test	Average CAR (%)	Cross-sec. t-test	Stdz. Cross-sec. t-test	Corrado rank test	Gen. sign test
All AbnETC	0 to 10	2.127	36.763	42.403	16.652	27.568	−2.450	−53.650	−46.459	−14.273	−11.734
	0 to 22	3.785	47.658	53.656	31.548	30.937	−3.814	−62.332	−53.081	−26.410	−12.784
	0 to 30	4.520	51.574	56.811	39.227	31.663	−4.243	−63.409	−53.275	−31.845	−13.806
Q1 AbnETC	0 to 10	1.903	15.696	18.652	15.583	24.098	−2.399	−25.915	−21.476	−14.544	−9.817
	0 to 22	3.101	18.359	21.882	27.590	25.287	−3.392	−27.163	−21.494	−27.703	−10.325
	0 to 30	3.652	19.684	22.889	33.105	25.584	−3.753	−27.437	−21.557	−33.604	−12.904
Q2 AbnETC	0 to 10	1.727	16.021	19.088	16.915	27.531	−2.406	−26.167	−22.964	−13.960	−14.304
	0 to 22	3.385	22.899	25.761	33.095	30.923	−3.885	−33.167	−28.308	−27.938	−16.283
	0 to 30	4.029	24.287	26.961	41.172	32.784	−4.301	−33.740	−28.805	−33.960	−17.158
Q3 AbnETC	0 to 10	2.333	20.440	22.248	17.007	29.215	−2.476	−26.378	−22.836	−13.740	−11.860
	0 to 22	4.242	27.231	29.576	32.141	35.528	−3.956	−31.175	−26.506	−24.404	−12.691
	0 to 30	5.103	30.112	31.642	39.916	36.008	−4.296	−31.482	−27.151	−28.636	−13.353
Q4 AbnETC	0 to 10	2.622	21.741	25.072	17.061	29.370	−2.514	−28.871	−25.614	−14.857	−15.892
	0 to 22	4.489	27.477	30.607	33.249	30.933	−3.998	−32.784	−28.570	−25.657	−14.762
	0 to 30	5.395	29.908	32.780	42.651	32.134	−4.595	−34.459	−30.063	−31.264	−15.924

Panel B: Differences in Average CAR between Q4 and Q1 of AbnETC

	Window	Average CAR (%) Q4 AbnETC	Average CAR (%) Q1 AbnETC	*Diff*	t-stats	*p*-value
Purchases	0 to 10	2.622	1.903	0.719	−4.198	0.000
	0 to 22	4.489	3.101	1.388	−5.894	0.000
	0 to 30	5.395	3.652	1.743	−6.724	0.000
Sales	0 to 10	−2.514	−2.399	−0.115	−0.906	0.365
	0 to 22	−3.998	−3.392	−0.605	−3.468	0.000
	0 to 30	−4.595	−3.753	−0.841	−4.405	0.000

Four significance tests are used (reported is the corresponding test statistic and the *p*-value): (i) Cross-section t-test (see, e.g. Brown and Warner, 1980); (ii) Standardized Cross-section t-test (see Boehmer et al., 1991); (iii) Corrado Rank test (see Corrado, 1989); (iv) Generalised Sign test (Cowan, 1992). See Appendix B for details of the tests.
AbnETC is the measure of corruption using the residuals from eq. (2).
Quartile 1–4 of AbnETC is constructed based on quartiles of values of AbnETC.
Diff is the difference in average CAR between Quartile 4 AbnETC and Quartile1 AbnETC.
All variables are winsorized at the 1 % and 99 % percentiles.

important factor in curtailing the use of private information, particularly in relation to insider sales (Cheng and Lo, 2006). Insider sales are also likely to be relatively more informative in China because selling to diversify and generate liquidity is expected to be less important as Chinese firms do not use share-based remuneration schemes (Jiang and Kim, 2015). Finally, China suffers from an opaque information environment which increases the information asymmetry between directors and shareholders, enabling insiders to trade more profitably (Aboody and Lev, 2000; Qiu et al., 2018; Huang and Liang, 2024). While the presence of short sellers can help to reduce these information asymmetries and in turn reduce inside trade profitability (Chen et al., 2022), the ability to short sell is restricted in China (Wan, 2020). All these factors should enhance insider trade profitability.

Subdividing by the AbnETC quartile, Table 4 further shows that insider trades are consistently informative for both purchases and sales across all quartiles and across all windows. In Panel B, we test the difference between the upper and lower quartile AbnETC, and find that the quartile 4 (most corrupt) average abnormal return is significantly greater than the quartile 1 (least corrupt) average abnormal return across all windows, except for the sales estimated over the short 10-day window. While these results are consistent with our expectation that insider trading is more informative in the more corrupt firms, this relation is stronger for the purchases. This differing impact implies the sensitivity of insider trade informativeness to corruption, as proxied by AbnETC, is stronger for insider purchases.

We explain this disparity between purchases and sales as being likely related to the differing level of scrutiny to which insider purchases and sales are subjected to in China. On the one hand, the discussion above identifies several reasons why insider sales will be relatively more informative in China, in particular the absence of significant litigation risk that is normally associated with sale

decisions. On the other hand, although the enforcement of insider trading cases is low in China, there is evidence that the focus of enforcement efforts is almost exclusively directed toward purchases, rather than sales (Huang, 2021). Therefore, if the insider purchase decisions are more contentious and subjected to more rigorous external scrutiny, then it follows that the sensitivity of insider trade informativeness to corruption will be greater for the purchase decisions. This result is consistent with our central hypothesis that there will be a positive relation between trade informativeness and corruption.

4.2. Multivariate analysis

Our multivariate analysis investigates the implied informativeness of corporate corruption, while at the same time incorporating and controlling for the trade, firm and insider characteristics that have previously been identified as influencing insider trade informativeness. For our baseline regressions, we use the cumulative abnormal return (CAR) over 10, 22 and 30 days following the announcement/filing of the trade as our main dependent variable because it is more likely to capture the full market reaction to the trades (Betzer and Theissen, 2010). We perform the multivariate analysis using the following model:

$$CAR_{i,k,t} = \alpha + \beta_1 AbnETC_{i,t} + \beta_2 Controls_{i,k,t} + \theta_{ipt} + \varepsilon_{i,k,t} \quad (3)$$

where $CAR_{i,k,t}$ is the cumulative abnormal returns following ten, twenty-two, and thirty trading days of the insider trade (k) in year (t) at firm (i); $AbnETC_{i,t}$ is the measure of corruption using the residuals from model (2); θ_{ipt} are sets of dummy variables to control for firm (i), province(p) and year(t) fixed effects. We also employ a number of controls (see below).

4.2.1. Control variables

The controls we include are firm-level characteristics (firm size, leverage and return on equity),[16] trade characteristics (multiple trade dummy, trade value, executive directors' trades, large insider shareholding above 5 %),[17] the past stock return,[18] idiosyncratic volatility,[19] and controls for the information environment (book-to-market, R&D expenses, analyst coverage, institutional ownership),[20] which are defined in Appendix A. Firm, province and year dummies are included to control for fixed effects.

The inclusion of variables that proxy for the informational asymmetry between insiders and external investors may be particularly important in our context given that Gul et al. (2011) argue expenditure on ETC is negatively related to stock price informativeness. Lower stock price informativeness would help to mask the corrupt behavior of insiders, and therefore controlling for aspects of the information environment will help to identify the specific contribution of firm level corruption to trade informativeness.

4.2.2. Descriptive statistics

We first present in Table 5 the complete summary statistics of the variables that we use in our analyses, including in subsequent robustness tests. The magnitude of the post trade CARs is similar for the purchases and sales, but opposite signed, as expected. Table 5 also shows that most controls are similar for the purchases and sales. PastRet is negative and positive for the purchases and sales, respectively, showing that insiders appear to trade as contrarians (see, Rozeff and Zaman, 1998; Lakonishok and Lee, 2001).

4.2.3. Results analysis

Tables 6 and 7 show the impact of AbnETC on the informativeness of insider trades for purchases and sales, respectively. To confirm the robustness of our results, we test each model using the CAR measured over three post trade announcement windows - 10, 22 and 30-days. AbnETC is significantly positive for purchases, and significantly negative for sales, in line with our central hypothesis that the extent of corporate corruption increases insider trade informativeness. Insiders are more willing to exploit their information advantage in firms that are more corrupt. Further, a comparison of our univariate and multivariate results illustrates that the coefficients on AbnETC are remarkably consistent. As with the univariate results, we find a stronger relation for the purchases than the sales, meaning that the sensitivity of insider trade informativeness to corruption is greater for insider purchases, which could be consistent with the increased scrutiny of insider purchases in China, as discussed above. Overall, these results demonstrate that the impact of AbnETC on the abnormal returns following an insider's trades is unaffected by the inclusion of variables that control for trade, firm and insider characteristics.

While this is not the focus of our paper, it is notable that there are several control variables that are significantly related to post trade abnormal returns. Among these MultiTrade and Own5 % give a consistent pattern of being associated with increased trade profitability, and therefore increased trade informativeness, for both the purchases and the sales. Of the remainder, FirmSize, PastRet, IVOL and TradeValue are negatively related to post trade abnormal returns, implying they reduce the trade informativeness of the purchases but increase it for the sales, while InstOwn is also negatively related to sale abnormal returns. Finally, the coefficient for ExecDir is positive and significant for the purchases, implying it is associated with an increase in trade informativeness that is

[16] Seyhun (1986), Aboody and Lev (2000) and Jagonlizer et al. (2011).
[17] Seyhun (1986), Ravina and Sapienza (2010).
[18] Lakonishok and Lee (2001).
[19] Gider and Westheide (2016).
[20] Rozeff and Zaman (1998), Huddart and Ke (2007), Aboody and Lev (2000), Frankel and Li (2004), Ellul and Panayides (2018) and Tang and Xin (2023).

Table 5
Descriptive statistics for variables.

	Purchases					Sales				
	Mean	P25	Median	P75	SD	Mean	P25	Median	P75	SD
$CAR_{0,10}$	2.127	−2.85	2.568	7.611	8.699	−2.45	−8.508	−2.469	3.424	9.643
$CAR_{0,22}$	3.785	−4.072	5.205	13.677	11.939	−3.814	−15.162	−4.243	5.754	12.924
$CAR_{0,30}$	4.52	−4.661	6.729	18.029	13.185	−4.243	−19.262	−5.192	7.092	14.133
AbnETC	0.0003	−0.007	−0.003	0.005	0.011	0.001	−0.008	−0.003	0.006	0.012
FirmSize	15.754	15.149	15.679	16.318	0.798	15.451	14.832	15.32	15.969	0.798
Leverage	0.472	0.082	0.309	0.752	0.474	0.341	0.038	0.187	0.487	0.406
ROE	0.094	0.039	0.088	0.143	0.091	0.096	0.038	0.091	0.158	0.101
MultiTrade	0.369	0	0	1	0.483	0.336	0	0	1	0.472
TradeValue	0.292	0.011	0.049	0.266	0.55	0.448	0.038	0.151	0.524	0.657
ExecDir	0.582	0	1	1	0.493	0.533	0	1	1	0.499
CEO_Chair	0.334	0	0	1	0.472	0.147	0	0	0	0.353
CFO	0.050	0	0	0	0.218	0.053	0	0	0	0.223
OtherExe	0.198	0	0	1	0.452	0.333	0	0	1	0.478
CEOonly	0.085	0	0	0	0.279	0.049	0	0	0	0.215
Chaironly	0.153	0	0	0	0.360	0.057	0	0	0	0.232
Dual_CEOChair	0.096	0	0	0	0.295	0.041	0	0	0	0.198
CEOChair_Change	0.216	0	0	0	0.411	0.183	0	0	0	0.387
PastRet	−7.041	−19.929	−8.481	2.36	17.55	9.555	−2.787	7.602	20.299	17.96
IVOL	2.274	1.72	2.171	2.719	0.692	2.392	1.921	2.31	2.781	0.64
Own5 %	0.19	0	0	0	0.392	0.095	0	0	0	0.294
BTM	0.329	0.199	0.296	0.43	0.167	0.319	0.188	0.284	0.418	0.166
R&D	0.465	0	0	1	0.499	0.477	0	0	1	0.499
Analyst Cov	1.072	0	1.099	1.792	0.874	0.956	0	0.693	1.609	0.902
InstOwn	6.74	0.78	3.384	9.121	8.951	6.86	0.318	2.948	9.672	9.297
Phi	0.154	0	0	0	0.361	0.162	0	0	0	0.368
EM	0.089	0.026	0.058	0.119	0.1	0.09	0.026	0.061	0.119	0.094
SOE	0.225	0	0	0	0.418	0.104	0	0	0	0.306
Big_4	0.034	0	0	0	0.181	0.026	0	0	0	0.16
BMeets	10.757	8	10	13	4.432	9.822	7	9	12	4.09
SupMeets	1.631	0	0	0	3.221	2.016	0	0	4	3.402
ShMeets	3.711	2	3	5	2.035	3.464	2	3	4	1.91
Opp	0.995	1	1	1	0.067	0.994	1	1	1	0.076

See Appendix A for variable definitions.
All variables are winsorized at the 1 % and 99 % percentiles.

consistent with executive directors being better informed.

4.2.4. *Insider rank and CEO change*

The above analysis controls for the rank of insider by distinguishing only the executive directors, who are members of the Board. Executive directors are expected to be better informed, which we confirm above in respect of the purchases. In this section, we evaluate the relevance of insider roles by incorporating a more granular distinction of insider rank. The results are reported in Table 8 below. Previous research on the US has identified the CEO and the CFO as being important for trade informativeness (Ravina and Sapienza, 2010; Wang et al., 2012). In China, classification of roles can be different since the CEO (frequently referred to as the General Manager) is not always the person in control, instead it is often the Chair, and these roles of CEO and Chair can be combined (Jiang and Kim, 2015). We therefore extend our model by identifying the role of CEO/Chair (CEO_Chair, which comprises either the CEO, the Chair or the combined role), the CFO and the remaining executives, (columns 1 and 4).[21] The CEO_Chair is then subdivided into its separate constituents, CEOonly, Chaironly and CEOChair (see columns 2 and 5 in Table 8). The results show that, for the purchases, the different roles are uniformly informative (except for the Chaironly), while for the sales only the combined CEO_Chair role or the Chaironly are associated with an increased trade profitability. Importantly, the coefficients on AbnETC, our corruption measure, remain qualitatively unchanged after the inclusion of the insider rank.

Additionally, we examine the impact of a change in CEO/Chair on trade informativeness. A new CEO/Chair could impact the ability or willingness of insiders to engage in informed trading. Columns 3 and 6 present the results for the purchases and sales respectively, where CEOChair_Change is a dummy variable representing the appointment of a new CEO/Chair. We find that, following the appointment of a new CEO/Chair, there is a significant reduction in the abnormal returns and therefore the general informativeness of insider purchases (but not sales). Recall that in China, insider purchases are subject to more rigorous external scrutiny, and so this may be related to the new appointment effect. Alternatively, it could simply be due to increased uncertainty about the firm's future earnings

[21] For brevity, we report the results for the 30-day windows only. The results are qualitatively similar for the additional windows. In all our subsequent analyses, we continue to use these three distinctions CEO_Chair, the CFO and Other (the remaining executives).

Table 6
Impact of AbnETCs on the informativeness of purchases.

	$CAR_{0,10}$	$CAR_{0,10}$	$CAR_{0,22}$	$CAR_{0,22}$	$CAR_{0,30}$	$CAR_{0,30}$
AbnETC	26.455***	23.99***	37.223***	30.03***	47.714***	39.40***
	(2.620)	(3.091)	(2.412)	(2.979)	(3.291)	(3.087)
FirmSize		−1.705***		−3.074***		−3.509***
		(−5.269)		(−7.798)		(−8.446)
Leverage		−0.461		−0.842*		−0.078
		(−1.206)		(−1.809)		(−0.160)
ROE		1.115		0.893		1.437
		(0.874)		(0.575)		(0.878)
MultiTrade		0.589***		0.734***		0.590***
		(4.471)		(4.571)		(3.485)
TradeValue		−0.250**		−0.387***		−0.310**
		(−2.147)		(−2.728)		(−2.071)
ExecDir		0.250**		0.468***		0.392**
		(2.044)		(2.934)		(2.270)
PastRet		−0.014***		−0.045***		−0.050***
		(−3.819)		(−10.08)		(−10.82)
IVOL		−0.298**		−0.523***		−0.804***
		(−1.990)		(−2.871)		(−4.188)
Own5 %		0.816***		1.502***		1.670***
		(4.064)		(6.142)		(6.478)
BTM		1.031		0.758		2.184
		(0.885)		(0.534)		(1.460)
R&D		0.277		1.052***		1.151***
		(0.856)		(2.675)		(2.777)
Analyst_Cov		−0.277*		−0.111		−0.046
		(−1.728)		(−0.571)		(−0.224)
InstOwn		0.041***		−0.016		−0.023
		(3.100)		(−0.966)		(−1.329)
Constant	2.214***	29.08***	3.870***	52.74***	4.605***	60.03***
	(46.95)	(5.498)	(67.88)	(8.184)	(76.42)	(8.840)
Observations	22,648	21,045	22,648	21,045	22,648	21,045
R-squared	0.201	0.246	0.192	0.213	0.232	0.304
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Province FE	YES	YES	YES	YES	YES	YES

The dependent variable is the cumulative abnormal return (CAR) following 10, 22 and 30 trading days of the insider trade announcement/filing date.
AbnETC is the measure of corruption using the residuals from eq. (2).
All variables are winsorized at the 1 % and 99 % percentiles.
See Appendix A for variable definitions.
Significance at 10 %, 5 %, and 1 % level is represented by *, **, and ***, respectively.

due to uncertainty about the managerial ability of the new appointment (Pan et al., 2015). However, the coefficient on our corruption measure is qualitatively unchanged, implying that the appointment of a new CEO/Chair does not change the sensitivity of insider trade informativeness to corruption.

5. Robustness tests

In addition to confirming that our results hold across different short-term windows, we now conduct several robustness tests to confirm the validity of these findings. We confirm our results using raw returns, market adjusted returns, as well as the abnormal returns calculated over longer windows up to 6 months (see Table 12 in Appendix C). These confirm our overall finding of a consistent relationship between AbnETC and the abnormal return after the insider trade. We also re-estimate our model using alternative measures of AbnETC. The first measure we use is a ranking of our variable AbnETC. The second is more comprehensive and is based on a re-estimation of eq. (2) to incorporate additional factors that could proxy for corporate corruption. In our third test, we apply a stochastic frontier analysis to extract both our initial measure of corruption and the re-estimated version. For brevity, we report the results in subsequent tables for the purchases and sales estimated over the 30-day post trade window.

Table 7
Impact of AbnETCs on the informativeness of sales.

	$CAR_{0,10}$	$CAR_{0,10}$	$CAR_{0,22}$	$CAR_{0,22}$	$CAR_{0,30}$	$CAR_{0,30}$
AbnETC	−7.701*	−7.093*	−9.529**	−9.342**	−18.153***	−17.278***
	(−1.773)	(−1.836)	(−2.031)	(−1.976)	(−2.926)	(−3.099)
FirmSize		−1.466***		−2.606***		−2.903***
		(−7.417)		(−10.64)		(−11.16)
Leverage		0.061		0.019		0.543
		(0.225)		(0.058)		(1.528)
ROE		0.016		2.464***		3.556***
		(0.020)		(2.590)		(3.519)
MultiTrade		−0.806***		−1.113***		−1.179***
		(−8.147)		(−9.078)		(−9.047)
TradeValue		−0.198***		−0.498***		−0.567***
		(−2.632)		(−5.341)		(−5.718)
ExecDir		0.006		−0.146		−0.008
		(0.066)		(−1.235)		(−0.062)
PastRet		−0.019***		−0.033***		−0.035***
		(−6.840)		(−9.750)		(−9.708)
IVOL		−1.624***		−1.884***		−2.165***
		(−16.35)		(−15.31)		(−16.55)
Own5 %		−0.678***		−0.972***		−1.037***
		(−3.525)		(−4.079)		(−4.096)
BTM		0.973		3.665***		5.979***
		(1.421)		(4.320)		(6.632)
R&D		−0.189		−0.061		−0.336
		(−0.943)		(−0.246)		(−1.277)
Analyst_Cov		0.112		0.033		−0.165
		(0.992)		(0.234)		(−1.109)
InstOwn		−0.031***		−0.058***		−0.028**
		(−3.629)		(−5.474)		(−2.485)
Constant	−2.477***	24.57***	−3.826***	41.10***	−4.247***	45.07***
	(−59.02)	(7.808)	(−77.39)	(10.54)	(−80.73)	(10.88)
Observations	44,678	41,559	44,678	41,559	44,678	41,559
R-squared	0.194	0.205	0.198	0.209	0.202	0.253
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Province FE	YES	YES	YES	YES	YES	YES

The dependent variable is the cumulative abnormal return (CAR) following 10, 22 and 30 trading days of the insider trade announcement/filing date.
AbnETC is the measure of corruption using the residuals from eq. (2).
All variables are winsorized at the 1 % and 99 % percentiles
See Appendix A for variable definitions.
Significance at 10 %, 5 %, and 1 % level is represented by *, **, and ***, respectively.

Table 8
Impact of directors' position on the informativeness of trades.

	Purchases			Sales		
	$CAR_{0,30}$	$CAR_{0,30}$	$CAR_{0,30}$	$CAR_{0,30}$	$CAR_{0,30}$	$CAR_{0,30}$
AbnETC	35.89***	36.20***	39.79***	−17.41***	−17.42***	−17.21***
	(3.110)	(3.123)	(3.289)	(−3.123)	(−3.125)	(−3.085)
CEO_Chair	0.439*	–	0.440*	−0.424**	–	−0.426**
	(1.934)		(1.933)	(−2.028)		(−2.040)
CEOChair_Change	–	–	−0.836***	–	–	−0.233
			(−3.164)			(−1.282)
CEOonly	–	0.533*	–	–	−0.160	–
		(1.704)			(−0.545)	
Chaironly	–	0.220	–	–	−0.733**	–
		(0.738)			(−2.378)	
Dual_CEOChair	–	0.658*	–	–	−0.471	–
		(1.696)			(−1.238)	
CFO	0.683*	0.714*	0.711*	0.425	0.424	0.426
	(1.851)	(1.933)	(1.926)	(1.582)	(1.579)	(1.586)
OtherExec	0.432**	0.473**	0.469**	−0.105	−0.010	−0.106
	(2.052)	(2.244)	(2.226)	(−0.753)	(−0.715)	(−0.762)
FirmSize	−3.511***	−3.514***	−3.469***	−2.906***	−2.899***	−2.889***
	(−8.450)	(−8.453)	(−8.347)	(−11.17)	(−11.14)	(−11.09)
Leverage	−0.087	−0.084	−0.169	0.569	0.591*	0.563
	(−0.177)	(−0.171)	(−0.343)	(1.600)	(1.661)	(1.583)
ROE	1.426	1.438	1.724	3.530***	3.542***	3.517***
	(0.872)	(0.879)	(1.052)	(3.492)	(3.502)	(3.479)
MultiTrade	0.577***	0.583***	0.585***	−1.189***	−1.195***	−1.189***
	(3.403)	(3.434)	(3.452)	(−9.122)	(−9.165)	(−9.121)
TradeValue	−0.319**	−0.325**	−0.312**	−0.540***	−0.538***	−0.541***
	(−2.106)	(−2.141)	(−2.063)	(−5.415)	(−5.390)	(−5.421)
PastRet	−0.050***	−0.050***	−0.050***	−0.036***	−0.035***	−0.036***
	(−10.78)	(−10.78)	(−10.78)	(−9.758)	(−9.745)	(−9.764)
IVOL	−0.800***	−0.799***	−0.760***	−2.158***	−2.157***	−2.150***
	(−4.167)	(−4.158)	(−3.951)	(−16.49)	(−16.49)	(−16.42)
Own5 %	1.628***	1.574***	1.596***	−0.833***	−0.720**	−0.827***
	(5.988)	(5.529)	(5.864)	(−3.061)	(−2.507)	(−3.036)
BTM	2.161	2.166	2.386	5.986***	5.986***	6.011***
	(1.445)	(1.448)	(1.594)	(6.640)	(6.638)	(6.667)
R&D	1.154***	1.160***	1.130***	−0.334	−0.337	−0.322
	(2.784)	(2.795)	(2.725)	(−1.268)	(−1.279)	(−1.222)
Analyst_Cov	−0.049	−0.048	−0.0542	−0.164	−0.165	−0.174
	(−0.236)	(−0.234)	(−0.264)	(−1.107)	(−1.112)	(−1.173)
InstOwn	−0.023	−0.022	−0.0258	−0.028**	−0.029**	−0.029**
	(−1.330)	(−1.307)	(−1.507)	(−2.509)	(−2.537)	(−2.561)
Constant	57.98***	58.02***	59.37***	45.13***	45.02***	44.91***
	(8.832)	(8.832)	(8.741)	(10.89)	(10.86)	(10.83)
Observations	21,045	21,045	21,045	41,559	41,559	41,559
R-squared	0.303	0.303	0.319	0.243	0.243	0.221
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Province FE	YES	YES	YES	YES	YES	YES

The dependent variable is the cumulative abnormal return (CAR) following 30 trading days of the insider trade announcement/filing date. AbnETC is the measure of corruption using the residuals from eq. (2).
All variables are winsorized at the 1 % and 99 % percentiles.
See Appendix A for variable definitions.
Significance at 10 %, 5 %, and 1 % level is represented by *, **, and ***, respectively.

5.1. *Alternative measures of AbnETC*

5.1.1. *Rank of AbnETC*

Taking the rank of AbnETC transforms the data by its rank prior to performing the regression. Rank transformation of this type is useful in the presence of non-normality and outliers [see for example, Conover and Iman, 1981]. Taking the rank of AbnETC has two advantages – first it reduces the potential impact of extreme values and secondly, in the presence of non-normality, ranking can make AbnETC more robust for subsequent analysis. Thus, ranking AbnETC allows us to assess the sensitivity of the results and ensure conclusions hold under different conditions.

Rank transformed ETC was also used in Zeng et al. (2016), albeit in a different context. We replace our variable AbnETC with RankAbnETC, where RankAbnETC is the percentile rank of AbnETC, and report the results in Table 9. Table 9 shows that the rank

Table 9
Alternative measure of ETC - RankAbnETC.

	Purchases	Sales
	$CAR_{0,30}$	$CAR_{0,30}$
RankAbnETC	0.023***	−0.018***
	(2.746)	(−3.929)
FirmSize	−3.562***	−2.934***
	(−10.00)	(−11.27)
Leverage	−0.169	0.589*
	(−0.405)	(1.658)
ROE	1.273	2.961***
	(0.907)	(2.898)
MultiTrade	0.501***	−1.189***
	(2.940)	(−9.126)
TradeValue	−0.292*	−0.538***
	(−1.913)	(−5.393)
CEO_Chair	0.420*	−0.426**
	(1.842)	(−2.038)
CFO	0.668*	0.427
	(1.807)	(1.590)
OtherExec	0.456**	−0.097
	(2.158)	(−0.697)
PastRet	−0.045***	−0.036***
	(−9.728)	(−9.905)
IVOL	−0.755***	−2.147***
	(−4.231)	(−16.40)
Own5 %	1.674***	−0.832***
	(6.296)	(−3.055)
BTM	2.037	5.884***
	(1.571)	(6.524)
R&D	0.355	−0.344
	(1.049)	(−1.308)
Analyst_Cov	−0.031	−0.150
	(−0.173)	(−1.011)
InstOwn	−0.037***	−0.027**
	(−2.607)	(−2.401)
Constant	56.39***	46.51***
	(10.66)	(11.18)
Observations	21,045	41,559
R-squared	0.237	0.243
Firm FE	YES	YES
Year FE	YES	YES
Province FE	YES	YES

The dependent variable is the cumulative abnormal return (CAR) following 30 trading days of the insider trade announcement/filing date. RankAbnETC is the percentile rank of the value of AbnETC, where AbnETC is the measure of corruption using the residuals from eq. (2).
All variables are winsorized at the 1 % and 99 % percentiles.
See Appendix A for variable definitions.
Significance at 10 %, 5 %, and 1 % level is represented by *, **, and ***, respectively.

transformation yields results that are broadly unchanged from Tables 6 and 7. There is a decline in significance level for the purchases, suggesting that there is some loss of information as a result of the rank transformation of AbnETC.

5.1.2. Control for alternative proxies of corporate corruption

One of the potential criticisms of an analysis of the impact of corruption on insider trade informativeness is that it could be argued our results are due to an omitted variable. We argue that our measure, the excess or abnormal spending on ETC, is a measure of corruption and that this measure of corruption explains the propensity of insiders to use their private information when trading shares in their firms. Specifically, we hypothesise that excess, or abnormal, ETC has a measurable impact on insider trade informativeness. However, it could be argued that there is an omitted variable that encapsulates corruption within the firm, and is at the same time responsible for both the AbnETC that we measure and the associated CAR that we report. In order to confront this issue, we estimate an alternative corruption measure that captures the effect of the other proxies for corruption that have been proposed in the literature. Controlling for these alternative proxies ensures that our analysis is robust to these potentially omitted variables. The proxies that have been proposed in previous studies relating to corporate corruption include a measure of corporate philanthropy, the degree of state ownership, the extent of earnings management by the firm, the quality of the firm's auditor, aspects of the firm's corporate governance and a measure of opportunistic insider trading.

The philanthropy measure we include is the firm's corporate charitable donations, which Bereskin et al. (2020) propose as a measure of positive corporate culture. They find that firms with more philanthropic activities are associated with a lower likelihood of corporate misconduct.[22]

We distinguish between State Owned Enterprises (SOEs) and non-SOEs due to the way in which corruption and the practice of guanxi combine in China to create a pervasive system of 'special deals' to firms provided by local government (Bai et al., 2020). The support that local governments provide with these special deals is of particular benefit to non-SOEs, and is persistent due to the ongoing ability of the local government to extract private rents from the firms. This is confirmed by Pan and Tian (2020), who show that the removal of a corrupt official results in a decline in the performance of non-SOEs. This result implies that non-SOEs benefit directly from such corruption as it reduces frictions and enables the firm to overcome regulatory and other obstacles.

We include earnings management given the evidence that firms that engage in corrupt practices will be motivated to conceal information by managing earnings. Managing earnings to prevent such corrupt practices from being easily identifiable (Hu et al., 2020) is increasingly important in China given the significant anti-corruption campaigns under Xi Jinping and the associated penalties that have been imposed. Liu (2016) also finds a link between corporate corruption and earnings management. We measure earnings management using the Kothari et al. (2005) model, which has been widely used in the literature.

We include auditor quality since several studies document that a higher audit quality improves the credibility and informativeness of financial reports (Gul et al., 2011). Auditors perform a monitoring role to mitigate agency problems and help to detect and deter corporate misconduct (Jensen and Mecklin, 1976; DeAngelo, 1981; Watts and Zimmerman, 1986). Our measure of auditor quality is indicated by the firm's auditor being one of the Big 4 auditors.

Previous studies have suggested that the propensity for corporate corruption is influenced by the extent of the firm's corporate governance activities (Rajan and Wulf, 2006; Gul et al., 2011). Board and shareholder activities, including the frequency of meetings, have been documented as important indicators of the quality of a firm's corporate governance. We therefore include the number of board, supervisor and shareholder meetings to measure corporate board activities, a proxy for the quality of corporate governance within the firm.

Finally, we note that insiders who engage in opportunistic trading could be designated as corrupt because they are more likely to be trading to take advantage of their private information. This would be consistent with the evidence that opportunistic trading appears to be associated with other aspects of corporate misconduct (Ali and Hirshleifer, 2017). Following Cohen et al. (2012), and several other studies (e.g., Alldredge and Cicero, 2015; Massa et al., 2015; Sun et al., 2022), we identify routine trades as those that are made by an insider in the same calendar month for at least three consecutive years; we identify the remainder as opportunistic trades.

In order to incorporate these alternative proxies into our analysis, and to determine the robustness of the results presented in Tables 6 & 7, we include these variables as additional controls in our estimation of the firm's abnormal expenditure on ETC. We therefore modify our initial abnormal ETC eq. (2), and estimate eq. (4) below. The residuals obtained from the estimation of eq. (4) we denote as AbnETC2, and insert in place of AbnETC to re-estimate the CAR equation, eq. (5). This means that the estimated relationship between AbnETC2 and the CAR following the trade is now robust not just to the standard trade, firm and insider characteristics, but also to the additional proxies for corporate corruption that have been identified in the literature. The results are presented in Table 10.

$$\begin{aligned} ETC_{i,t} =& \alpha + \beta_1 ExecPay_{i,t} + \beta_2 OwnCon_{i,t} + \beta_3 Bsize_{i,t} + \beta_4 AccPay_{i,t} + \beta_5 AccRcv_{i,t} + \beta_6 Size_{i,t} + \beta_7 Phil_{i,t} + \beta_8 SOE_{i,t} + \beta_9 EM_{i,t} \\ &+ \beta_{10} Big_4_{i,t} + \beta_{11} BMeets_{i,t} + \beta_{12} SupMeets_{i,t} + \beta_{13} ShMeets_{i,t} + \beta_{14} Opp_{i,t} + \theta_{ipt} + \varepsilon_{i,t} \end{aligned} \tag{4}$$

$$CAR_{i,k,t} = \alpha + \beta_1 AbnETC2_{i,t} + \beta_2 Controls_{i,k,t} + \theta_{ipt} + \varepsilon_{i,k,t} \tag{5}$$

Table 10 reports the results for both the insider purchases and sales, for the CAR measured over a 30-day post trade window. The results show that the coefficients on AbnETC2 are significantly positive and negative, respectively, implying that insider trade informativeness increases with the extent of firm level corruption. These results confirm our earlier finding of the importance of corruption in explaining the abnormal return associated with insider trades, and remains robust to the incorporation of the alternative corruption related proxies.

5.2. AbnETC without statistical noise

Based on the previous analysis, our measure of firm level corruption, the excess or abnormal ETC spending, is measured by the residuals obtained from eq. (2) or (4). Both positive and negative residuals could be affected by statistical noise that is unrelated to corruption. Positive (negative) residuals might not indicate that firms are more (less) corrupt because of statistical noise in the estimation of abnormal ETC spending. In order to distinguish between pure statistical noise and firms' individual characteristics that may affect its abnormal spending and level of corruption, we decompose the residuals obtained in eq. (2) or (4) using stochastic frontier analysis (SFA). We follow the rationale of SFA, which is employed to analyse efficiency in production or cost functions. First proposed by Aigner et al. (1977) and Meeusen and van Den Broeck (1977), there is a substantial literature on stochastic frontier models since these pioneering studies. For example, Schmidt and Sickles (1984) consider the following stochastic frontier model specification:

$$Y_{i,t} = \beta X_{i,t} + \varepsilon_{i,t} = \beta X_{i,t} + v_{i,t} + u_i \tag{6}$$

[22] Liu (2016) also includes a corporate philanthropy variable when examining corporate culture and misconduct.

Table 10
Impact of AbnETC on trade informativeness after controlling for proxies of corporate corruption.

	Purchases	Sales
	$CAR_{0,30}$	$CAR_{0,30}$
AbnETC2	30.08***	−29.54**
	(3.480)	(−2.053)
FirmSize	−4.054***	−3.509***
	(−8.541)	(−9.044)
Leverage	1.225**	0.800
	(2.175)	(1.441)
ROE	0.464	1.475
	(0.263)	(1.067)
MultiTrade	0.579***	−1.111***
	(3.248)	(−8.128)
TradeValue	−0.364**	−0.313***
	(−2.297)	(−3.038)
CEO_Chair	0.115	−0.505**
	(0.541)	(−2.256)
CFO	0.678*	0.193
	(1.753)	(0.682)
OtherExec	0.343	−0.255*
	(1.532)	(−1.718)
PastRet	−0.049***	−0.047***
	(−10.18)	(−12.12)
IVOL	−0.689***	−2.450***
	(−3.398)	(−15.31)
Own5 %	1.696***	−1.043***
	(5.909)	(−3.699)
BTM	0.206	4.511***
	(0.121)	(3.379)
R&D	1.511***	−1.330***
	(3.112)	(−3.158)
Analyst_Cov	0.029	0.490**
	(0.123)	(2.302)
InstOwn	−0.100***	−0.049***
	(−4.769)	(−2.757)
Constant	69.32***	55.82***
	(8.898)	(9.021)
Observations	18,965	36,200
R-squared	0.300	0.252
Firm FE	YES	YES
Year FE	YES	YES
Province FE	YES	YES

The dependent variable is the cumulative abnormal return (CAR) following 30 trading days of the insider trade announcement/filing date. AbnETC2 is the measure of corruption using the residuals from eq. (4).
See Appendix A for variable definitions.

where $Y_{i,t}$ is the cost and $X_{i,t}$ is a vector of cost determinants, i and t are cross section and time subscripts, respectively. The cost frontier represents the minimum cost achievable given a set of cost determinants. Firms operating on this frontier are deemed fully efficient, while those operating off the frontier are inefficient to some degree. This inefficiency is captured by the SFA model through a composite error term ($\varepsilon_{i,t}$), which comprises a random error component ($v_{i,t}$) and an inefficiency component (u_i). The random error component accounts for statistical noise and measurement errors, while the inefficiency component captures the firm-specific deviations from the cost frontier, which is measured as $[u_i = \widehat{u}_i - min(\widehat{u}_i)]$. u_i represents the proportion by which $Y_{i,t}$ falls short of the frontier, and has a natural interpretation as proportional or percentage inefficiency.

SFA therefore offers an innovative approach by conceptualising corruption as an 'inefficiency' within a firm. In our context, all listed Chinese firms have been required by regulators to disclose their level of ETC spending (output $Y_{i,t}$). Based on the unique Chinese guanxi culture, we expect a level of normal ETC spending determined by observable firm variables (inputs $X_{i,t}$), related to relational capital building. Firms with an excessive level of spending (abnormal spending) reflects the extent of corruption within the firm, and is captured by u_i. We re-estimate eqs. (2) and (4) based on the normal (expected) level of ETC spending proxies with firm-specific fixed effects. Individual fixed effects are obtained and then adjusted to generate our robust measure of corruption $[u_i = \widehat{u}_i - min(\widehat{u}_i)]$. The frontier in this context represents the 'minimum abnormal spending'. Therefore, a firm's distance from this 'minimum abnormal spending' frontier measures by how much the firm's spending on ETC exceeds the minimum abnormal spending within our sample, and represents the extent of corporate corruption. The higher the u_i, the greater the corruption within the firm.

As before, we then estimate the relationship between the abnormal return following the trade and corruption, in this case inserting our new measures of corruption Alt_Corrupt in eq. (7). Alt_Corrupt2 is the estimate based on the standard variables in eq. (2).

Table 11
Measure of corruption based on stochastic frontier analysis.

	Purchases		Sales	
	$CAR_{0,30}$	$CAR_{0,30}$	$CAR_{0,30}$	$CAR_{0,30}$
Alt_Corrupt2	20.85***	–	−24.70***	–
	(2.601)		(−3.990)	
Alt_Corrupt4	–	23.74***	–	−31.16***
		(2.976)		(−4.789)
FirmSize	−0.967***	−1.016***	−0.938***	−1.038***
	(−6.600)	(−6.512)	(−6.795)	(−6.972)
Leverage	−0.670***	−0.684***	0.773***	0.806***
	(−3.502)	(−3.367)	(4.047)	(4.044)
ROE	5.843***	5.181***	3.484***	2.486***
	(5.759)	(4.872)	(4.236)	(2.887)
MultiTrade	0.630***	0.581***	−1.059***	−1.036***
	(3.827)	(3.331)	(−8.363)	(−7.654)
TradeValue	−0.468***	−0.530***	−0.512***	−0.488***
	(−3.155)	(−3.412)	(−5.387)	(−4.848)
CEO_Chair	0.414**	0.403*	−0.379*	−0.349*
	(2.110)	(1.935)	(−1.918)	(−1.657)
CFO	1.074***	1.132***	0.007	−0.084
	(3.154)	(3.138)	(0.025)	(−0.296)
OtherExec	0.491***	0.535***	−0.497***	−0.492***
	(2.611)	(2.682)	(−3.716)	(−3.442)
PastRet	−0.035***	−0.037***	−0.026***	−0.028***
	(−7.793)	(−8.017)	(−7.203)	(−7.417)
IVOL	−1.058***	−1.015***	−1.506***	−1.541***
	(−7.243)	(−6.641)	(−12.61)	(−12.35)
Own5%	1.063***	1.048***	−0.537**	−0.635**
	(4.642)	(4.329)	(−2.196)	(−2.525)
BTM	4.414***	4.688***	4.676***	3.792***
	(6.633)	(6.705)	(8.104)	(6.307)
R&D	0.914***	0.889***	0.016	−0.089
	(5.295)	(5.022)	(0.099)	(−0.546)
Analyst_Cov	0.240*	0.301**	0.146	0.270**
	(1.919)	(2.288)	(1.259)	(2.148)
InstOwn	−0.018	−0.060***	−0.008	−0.038***
	(−1.565)	(−4.586)	(−0.766)	(−3.193)
Constant	18.96***	20.06***	13.44***	15.67***
	(8.302)	(8.215)	(6.333)	(6.849)
Observations	21,045	18,965	41,559	36,200
R-squared	0.016	0.018	0.015	0.017
Year FE	YES	YES	YES	YES
Province FE	YES	YES	YES	YES

The dependent variable is the cumulative abnormal return (CAR) following 30 trading days of the insider trade announcement/filing date. Both Alt_Corrupt2 and Alt_Corrupt4 are measures of corruption based on stochastic frontier analysis, see section 5.2 for details.
All variables are winsorized at the 1 % and 99 % percentiles.
See Appendix A for variable definitions.
Significance at 10 %, 5%, and 1 % level is represented by *, **, and ***, respectively.

Alt_Corrupt4 is estimated based on the extended controls applied in eq. (4). The results are presented below in Table 11.

$$CAR_{i,k,t} = \alpha + \beta_1 Alt_Corrupt_i + \beta_2 Controls_{i,k,t} + \theta_{pt} + \varepsilon_{i,k,t} \quad (7)$$

The results in Table 11 demonstrate that our main findings are robust to the application of SFA to the derivation of our corruption measure. The abnormal returns following insider purchases and sales remain consistently and significantly positive and negative, respectively. Overall, insiders in firms that are more corrupt are more likely to trade on their private information.

6. Conclusion

Motivated by the interest that has developed in how corruption can influence firms' financial decision making and the performance of firms, we investigate the impact of the guanxi-related corruption in Chinese firms by relating it to the informativeness of insider trades. Measuring firm level corruption by the abnormal expenditure by firms on entertainment and travel costs, we find that the post trade abnormal return following both insider purchases and insider sales is significantly related to the level of corruption within the firm. Our results demonstrate that insiders in the more corrupt firms trade more aggressively, and are more likely to use their information advantage when trading. The strength of our results for the sale decisions confirms that insider trading in Chinese firms

appears to be unaffected by increased litigation risk that is normally associated with sales as compared to purchases. Further, we find evidence of generally greater sensitivity in the purchase abnormal returns to corruption, possibly related to the additional focus of enforcement on purchases relative to sales.

We show that our results are robust to controlling for a number of insider, trade and firm characteristics that have previously been reported as being significantly related to trade informativeness. The insider characteristics include a distinction between the CEO/Chair, CFO and other executives, as well as the effect of the appointment of a new CEO/Chair. We further conduct several robustness tests to confirm the validity of our findings. We include additional controls to accommodate several alternative proxies relating to firm level corruption in our measurement of the firm's abnormal expenditure on entertainment and travel costs. Our results are broadly unchanged, confirming that our measure of corruption remains significantly related to insider trade informativeness, and is robust to the inclusion of these additional measures. We further confirm the robustness of our results by conducting a stochastic frontier analysis to determine a firm's expenditure on entertainment and travel costs, and extract the excess as the firm's spending over and above the minimum efficient level. Treating ETC as a cost in this way conforms to the notion that some level of guanxi-related spending is a requirement of normal business in China, and therefore produces a measure that is more intuitive as it is bounded at zero and increases with the extent of corruption. Again, we find that insider trade profitability increases significantly with firm corruption.

This paper shows that there are important determinants of the willingness of insiders to trade on their private information, and as a result of the determinants of the profitability of insider trading, that have not been captured by the traditional controls that have been used in the literature to date. We propose and show that one of these is represented by our measure of firm level corruption. Our results imply that outside investors who intend to extract the information contained in insider trading decisions should be aware of firm level corruption as an additional firm characteristic that needs to be incorporated into their decision making. Moreover, our paper suggests that hitherto unobserved characteristics that are important for individual insiders' trading decisions may also have important implications for other aspects of financial decision making by the firm.

Finally, our results imply that the anti-corruption crackdown first announced in China in 2012 has not yet been effective in restricting insiders from using their private information when trading. More broadly, our finding that a measure of corruption extracted from abnormal expenditure on entertainment and travel has explanatory power for insider trading profitability suggests that firms are still able to spend excessively on the items that comprise this measure.

Declaration of compeitng interest

None.

CRediT authorship contribution statement

Kyriacos Kyriacou: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Siming Liu:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Bryan Mase:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Data availability

Data will be made available on request.

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Appendix A. Variable definitions

Variables	Definition
Dependent Variables:	
$CAR_{0,10}$; $CAR_{0,22}$; $CAR_{0,30}$	Cumulative abnormal returns (CAR) in % following 10, 22 and 30 trading days of the insider trade announcement/filing date. CARs are tabulated based on purchases and sales respectively.
Key Independent Variables:	
AbnETC	Measure of corruption using the residuals from eq. (2)
RankAbnETC	Percentile rank of the value of AbnETC.

(*continued on next page*)

(*continued*)

Variables	Definition
AbnETC2	Alternative measure of abnormal ETC that is over and above other aspects of corporate culture. It is obtained using the residuals from eq. (4), which include proxies for additional aspects corporate culture.
Alt_Corrupt2 (or Alt_Corrupt4)	Robust measure of corruption is measured as the distance between individual firm fixed effects from model 2 (4) and the minimum of firm fixed effects from eq. 2 (4) using stochastic frontier analysis based on Schmidt and Sickles (1984).
Control Variables:	
FirmSize	Natural logarithm of the market value of the firm
Leverage	Total debt over book value of assets
ROE	Net income for the year divided by the prior year of total assets
MultiTrade	Equals one if more than one director buys/sells on the same day
TradeValue	Natural logarithm of value of the trade by an insider
ExecDir	Equals one if the insider is the executive director of the company
CEO_Chair	Equals one if the insider is the CEO or the Chair of the board of the company
CEOonly	Equals one if the insider is the CEO of the company only
Chaironly	Equals one if the insider is the Chair of the board of the company only.
Dual_CEOChair	Equals one if the insider is holding concurrent positions of the CEO and the Chair of the board of the company
CFO	Equals one if the insider is the CFO of the company
OtherExec	Equals one if the insider is the executive director other than the CEO, Chair or CFO of the company
CEOChair_Change	Equals one if there is a change of CEO or Chair in the previous year
PastRet	Past 30 days raw return in % before the event date
IVOL	Idiosyncratic volatility in % which is measure as the standard deviation of the residuals from a five-factor model regression estimated for firm i from 250th trading day prior to day t to 31st trading day prior to day t
Own5%	Equal to one if the insider owns 5% or more of shares of the company, zero otherwise
BTM	Book value of assets divided by market value of assets
R&D	Equal to one if the company has R&D expenses
Analyst_Cov	Natural logarithm of the number of analysts following the company
InstOwn	Percentage of institutional ownership of the company
Other Variables:	
ExecPay	Executive pay of the top three executives, scaled by sales revenue
OwnCon	Ownership concentration measured as the percentage of shares held by the ten largest shareholders
BSize	Total number of directors on the board
AccPay	Accounts payable scaled by sales revenue
AccRcv	Accounts receivable scaled by sales revenue
Size	Natural logarithm of total assets
Phil	Philanthropy variable, which equals to one if the company made social donations, zero otherwise
EM	Earnings management for each firm i at year t is measured as the absolute value of discretionary accruals. Following Kothari et al. (2005), discretionary accruals are residuals from estimating Kothari et al. (2005) performance-matched model $Accr_{i,t} = \alpha_0 + \alpha_1\left(\frac{1}{Assets_{i,t-1}}\right) + \alpha_2\Delta Rev_{i,t} + \alpha_3 PPE_{i,t} + \alpha_4 ROA_{i,t} + \varepsilon_{i,t}$, where $Accr_{i,t}$ is total accruals, measured as the change in non-current assets minus the change in current non-interest bearing liabilities, minus depreciation and amortisation for firm i at period t, scaled by beginning total assets; ΔRev is the annual change in revenues scaled by beginning total assets; *PPE* is property, plant and equipment scaled by beginning total assets; *ROA* is the return on assets.
SOE	Equals one if the company is state-owned, zero otherwise
Big_4	Equals one if the company is audited by one of the big four auditors, zero otherwise
BMeets	Number of board meetings per year
SupMeets	Number of supervisors meetings per year
ShMeets	Number of shareholders meetings per year
Opp	Equal to one if trades are opportunistic trades, zero otherwise. Opportunistic trades are trades that are non-routine.

Appendix B. Details of test statistics

To test the null hypothesis that the CAARs are equal to zero for a sample of N *sec*urities

1. Cross-sectional *t*-test (based on Brown and Warner, 1980):

$t = \sqrt{N}\,\frac{CAAR}{S_{CAAR}}$ with $S^2_{CAAR} = \frac{1}{N-1}\sum_{i=1}^{N}(CAR_i - CAAR)^2$.
CAR_i defines as cumulative abnormal return; *CAAR* defines as the cumulative average abnormal return.

2. Standardized cross-sectional t-test (based on Boehmer et al., 1991):

$t = \sqrt{N}\,\frac{\overline{SCAR}}{S_{\overline{SCAR}}}$ where $\overline{SCAR} = \frac{1}{N-1}\sum_{i=1}^{N} SCAR_i$ and $S^2_{\overline{SCAR}} = \sum_{i=1}^{N}(SCAR_i - \overline{SCAR})^2$, where $SCAR_i = \frac{CAR_i}{S_{CAR_i}}$ and S_{CAR_i} is the sample standard deviation of the individual cumulative abnormal returns during the estimation window.

3. Corrado Rank test (based on Corrado, 1989)

$$K_{i,t} = rank\left(AR_{i,t}\right), t = -250, \ldots, +30$$

For any given t, $\overline{K}_t = \frac{1}{N_t}\sum_{i=1}^{N} K_{i,t}$ and $S_{\overline{K}}^2 = \frac{1}{N_1+N_2}\sum_{t=T_0}^{T_2}(\overline{K}_t - 0.5)^2$

$z = \sqrt{N_2}\left(\frac{\overline{K}_{T_1+1,T_2}-0.5}{S_{\overline{K}}}\right)$ with $\overline{K}_{T_1+1,T_2} = \frac{1}{N_2}\sum_{t=T_1+1}^{T_2}\overline{K}_t$.

$AR_{i,t}$ is the abnormal return for firm i at time t; the estimation window starts from T_0 to T_1; the even window starts from $T_1 + 1$ to T_2; N_t denotes number of abnormal return ($AR_{i,t}$) at period t; N_1 denotes the number of ($AR_{i,t}$) during the estimation window; N_1 denotes the number of ($AR_{i,t}$) during the event window.

4. Generalised Sign Test (based on Cowan, 1992)

$$z = \frac{w - N \times p}{\sqrt{N \times p(1-p)}}$$

w is the number of CAR_i during the event window that are positive; p is the fraction of AR_i during the estimation window (across both i and t) that are positive.

Appendix C. Appendix

Table 12: Impact of AbnETCs on the informativeness of trades - alternative measures of CARs.

	Purchases				Sales			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	CAR_3m	CAR_6m	CAR_mktadj	CRawRet	CAR_3m	CAR_6m	CAR_mktadj	CRawRet
AbnETC	11.58*	20.39*	7.969**	11.79*	−13.16*	−18.45*	−8.43*	−15.14**
	(1.753)	(1.871)	(2.422)	(1.872)	(−1.871)	(−1.909)	(−1.807)	(−2.069)
FirmSize	−6.202***	−8.373***	−4.640***	−5.608***	−8.423***	−9.636***	−4.030***	−6.091***
	(−9.398)	(−12.09)	(−8.426)	(−7.931)	(−17.04)	(−17.88)	(−14.34)	(−9.968)
Leverage	1.016	0.335	−0.144	−1.530*	1.247*	0.219	−0.879**	0.438
	(1.306)	(0.410)	(−0.222)	(−1.850)	(1.847)	(0.297)	(−2.295)	(0.526)
ROE	−4.048	2.790	24.05***	30.20***	5.148***	6.360***	21.72***	23.12***
	(−1.562)	(1.026)	(11.15)	(10.83)	(2.681)	(3.032)	(19.62)	(9.610)
MultiTrade	0.927***	0.948***	0.128	−0.662*	−2.335***	−2.516***	−0.872***	−1.447***
	(3.459)	(3.369)	(0.486)	(−1.955)	(−9.438)	(−9.327)	(−6.204)	(−4.729)
TradeValue	−0.252	−0.638**	−0.550**	−0.454	−0.663***	−0.860***	−0.907***	−1.149***
	(−1.050)	(−2.536)	(−2.334)	(−1.498)	(−3.501)	(−4.170)	(−8.428)	(−4.906)
CEO_Chair	0.296	0.183	−0.197	−0.297	−1.612***	−1.332***	−0.548**	−0.366
	(0.932)	(0.549)	(−0.636)	(−0.743)	(−4.060)	(−3.076)	(−2.426)	(−0.745)
CFO	0.825*	0.932*	−0.460	−0.065	0.383	0.502	−0.371	−0.279
	(1.652)	(1.780)	(−0.916)	(−0.010)	(0.752)	(0.904)	(−1.282)	(−0.443)
OtherExec	0.264	0.305	0.117	−0.136	−0.437*	−0.028	−0.353**	−0.197
	(0.908)	(1.000)	(0.407)	(−0.367)	(−1.651)	(−0.096)	(−2.346)	(−0.601)
PastRet	−0.070***	−0.045***	−0.119***	−0.156***	−0.058***	−0.071***	−0.0887***	−0.118***
	(−9.481)	(−5.830)	(−16.73)	(−17.02)	(−8.346)	(−9.462)	(−22.64)	(−13.87)
IVOL	−2.521***	−3.390***	1.027***	1.700***	−3.688***	−6.010***	−1.160***	−1.431***
	(−8.253)	(−10.58)	(3.717)	(4.805)	(−14.84)	(−22.18)	(−8.204)	(−4.659)
Own5%	2.464***	2.587***	1.117***	1.558***	−1.204**	−1.072*	0.0198	−0.485
	(5.722)	(5.726)	(2.724)	(2.953)	(−2.332)	(−1.904)	(0.068)	(−0.759)
BTM	4.617*	2.840	5.535***	5.257**	3.258*	9.027***	5.400***	5.696***
	(1.952)	(1.144)	(2.760)	(2.045)	(1.900)	(4.826)	(5.541)	(2.693)
R&D	0.687	1.471**	−0.743	−0.515	−2.933***	−3.193***	−1.149***	−1.823***
	(1.041)	(2.126)	(−1.419)	(−0.768)	(−5.866)	(−5.859)	(−4.039)	(−2.949)
Analyst_Cov	0.114	0.595*	0.141	0.526	0.554**	0.827***	0.320**	−0.298
	(0.348)	(1.735)	(0.512)	(1.492)	(1.963)	(2.690)	(1.991)	(−0.854)
InstOwn	−0.0445	−0.154***	−0.0144	−0.029	−0.098***	−0.059**	−0.038***	−0.034
	(−1.639)	(−5.408)	(−0.659)	(−1.034)	(−4.604)	(−2.537)	(−3.162)	(−1.298)
Constant	110.1***	158.5***	69.91***	82.45***	137.8***	158.2***	61.06***	96.19***
	(10.21)	(14.00)	(7.747)	(7.118)	(17.51)	(18.43)	(13.64)	(9.887)

(continued on next page)

(*continued*)

	Purchases				Sales			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	CAR_3m	CAR_6m	CAR_mktadj	CRawRet	CAR_3m	CAR_6m	CAR_mktadj	CRawRet
Observations	20,771	20,771	20,944	21,058	41,559	41,559	41,610	41,647
R-squared	0.292	0.225	0.213	0.207	0.206	0.274	0.197	0.185
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Province FE	YES	YES	YES	YES	YES	YES	YES	YES

The dependent variable in column (1, 2, 5, 6) is cumulative abnormal return following 3 months (CAR_3m) or 6 months (CAR_6m) of the insider trade announcement/filing date. The dependent variable in column (3 and 7) is cumulative abnormal return (CAR_mktadj) following 30 trading days of the insider trade announcement/filing date, where the abnormal return is measured as Ri – Rm. The dependent variable in column (4 and 8) is cumulative raw return (CRawRet) following 30 trading days of the insider trade announcement/filing date.
AbnETC is the measure of corruption using the residuals from the eq. (2).
All variables are winsorized at the 1 % and 99 % percentiles.
See Appendix A for variable definitions.
Significance at 10 %, 5%, and 1 % level is represented by *, **, and ***, respectively.

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Further-reading

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