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CFR-WORKING PAPER NO. 07-07

**INSIDER TRADING AND
CORPORATE GOVERNANCE:
THE CASE OF GERMANY**

A. BETZER • C. THEISSEN

centre for financial research
Look deeper

Insider Trading and Corporate Governance: The Case of Germany^{*}

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Abstract: We analyze transactions by corporate insiders in Germany. We find that insider trades are associated with significant abnormal returns. Insider trades that occur prior to an earnings announcement have a larger impact on prices. This result provides a rationale for the UK regulation that prohibits insiders from trading prior to earnings announcements. Both the ownership structure and the accounting standards used by the firm affect the magnitude of the price reaction. The position of the insider within the firm has no effect, which is inconsistent with the informational hierarchy hypothesis.

JEL classification: G14, G30, G32

Keywords: Insider trading, directors' dealings, corporate governance

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1 Introduction

The trading activity of corporate insiders has attracted the attention of financial economists for more than 30 years. Most of the research devoted to the issue (e.g. the classical papers by Jaffee 1974, Finnerty 1976, Seyhun 1986 and Lakonishok and Lee 2001) has been motivated by the efficient markets paradigm. Analyzing the profitability of insider trades allows a test for strong form efficiency. By considering the profitability of mimicking strategies (i.e., trading strategies that buy [sell] shares after publication of the fact that insiders bought [sold]), a test for semi-strong form efficiency can be performed. The by-now common methodology is an event study in which the day on which insider trading occurred, or the day on which the insider trade was announced, are the events under scrutiny.

The determinants of insider trading profits have also been an important subject of investigation. Researchers have related measures of profitability to variables that measure the intensity of insider trading, the position of the insider within the firm, firm size, and the size of the bid-ask spread. Recent studies (most notably Fildmuc et al. 2006) have broadened the scope of analysis by considering variables related to corporate governance and other appropriate firm-specific factors. Investigating this relationship is important, because it allows conclusions to be drawn about both the degree and the determinants of informational asymmetries between corporate insiders and the capital market.

The present paper extends this line of research. Its contribution is twofold. Most importantly, we analyze whether a blackout period that prevents insiders from trading prior to specified corporate events, as is implemented in the UK, is warranted. In addition, we provide evidence

from Germany, and thus from a bank-dominated financial system. This is in contrast to the vast majority of previous papers, which used data from either the US or the UK.¹

In the UK, the LSE Model Code prevents corporate insiders from trading during a blackout period, which consists of the two months preceding final or interim earnings announcements and the month prior to quarterly earnings announcements. This rule imposes severe restrictions on the trading activity of corporate insiders, because it prohibits trading for six months of the year. It is thus an important question whether these trading restrictions are warranted. The rule is obviously based on the assumption that informational asymmetries are particularly large prior to earnings announcements.² In Germany, no blackout period exists. We make use of this institutional difference by testing whether trades by corporate insiders prior to earnings announcements convey more information than trades at other times. The results of this test allow conclusions to be drawn as to whether or not a blackout period is warranted; hence, they have potentially important implications for policy.

The German financial system is characterized by a strong role for banks, a two-tier board structure (an executive board and a supervisory board, with the latter consisting partially of employee representatives, in accordance with codetermination laws), and a low degree of protection for minority shareholders.³ German standards for financial reporting are often considered to be intransparent.

These characteristics of the financial system may have a bearing on the impact on share prices of insider trades. Lower transparency and weak minority protection may increase informational asymmetries between corporate insiders and the capital market. This may result in a

¹ Among the few exceptions are Eckbo and Smith (1998) and Bajo and Petracci (2004). None of these papers analyzes the determinants of the information content of insider trades.

² Hillier and Marshall (2002) report that corporate insiders in the UK tend to trade in the days after the announcement is made. These trades are still profitable, which suggests that insiders use more information than is contained in the announcements.

larger impact of insider trades on share prices than has been documented for the US or the UK. Some firms apply international accounting standards (either IAS or US-GAAP). To the extent that these are more informative than German accounting standards, we would expect to find less pronounced reactions of share prices to insider trades in the shares of these firms. The two-tier board structure divides corporate insiders into two categories. Members of the executive board (Vorstand) are involved in the day-to-day operation of the company and should, therefore, have privileged access to information. Members of the supervisory board (Aufsichtsrat), on the other hand, are not usually involved in day-to-day operations.⁴ Further, the supervisory board holds only a limited number of meetings each year. Therefore, we would expect the reaction of share prices to trades by members of the supervisory board to be smaller. This pattern would be consistent with the informational hierarchy hypothesis, according to which trades by insiders who are more involved with the operations of the company should have a larger impact on share prices.⁵

Another variable that is of interest is ownership structure. Large shareholders have stronger incentives to monitor the management. Consequently, corporate insiders have less leeway to maximize their own utility. However, whether the stronger monitoring incentives of large shareholders increases or decreases informational asymmetries between insiders and the capital market is an open issue, because the interests of large shareholders are not necessarily aligned with those of minority shareholders.

Companies with less liquid stocks (as measured by market capitalization or trading volume) are likely to be followed by fewer analysts. Consequently, informational asymmetries be-

³ For the last point, see La Porta et al. 1998. See Drobetz et al. (2004) and Heiss and Köke 2004 for more information about the German corporate governance system.

⁴ The members of the supervisory board appoint and monitor the members of the executive board.

⁵ This hypothesis has been tested in several papers (e.g. Seyhun 1986, Lin and Howe 1990, Fidrmuc et al. 2006), though with inconsistent results.

tween insiders and the capital market are likely to be larger, and so the impact on share prices of insider trades should be correspondingly larger.⁶

We performed our empirical tests on a sample of 2,051 insider trades initiated between July 2002 and June 2004. Using event-study methodology, we found that insider trades affect share prices significantly. In the 20 days after the trade, market-model adjusted cumulative abnormal returns (CARs) amounted to 3.60% after purchases and -3.54% after sales. Using the reporting date as the event date yielded similar results. Although we did not find the asymmetry between the impact on share price of purchases and sales reported in other studies, our results do confirm previous findings that corporate insiders tend to sell after price run-ups.

Our results provide a rationale for the UK type of regulation that prevents insiders from trading prior to earnings announcements. Trades that occur during the blackout period do have a larger impact on share prices. This is consistent with the hypothesis that informational asymmetries between corporate insiders and the capital market are larger prior to earnings announcements.

We also find that ownership structure matters. The impact on share prices of insider trades tends to be larger in widely held firms. The position of the insider within the firm does not have a discernible impact on the magnitude of the CARs. In particular, trades initiated by the CEO do not convey more information than trades by other insiders. This result is in contrast to the informational hierarchy hypothesis. Differences in accounting standards (German versus IAS / US GAAP) do have an impact on the magnitude of the CARs. Contrary to our expectations we find that CARs are, if anything, larger in firms that adopt international accounting standards.

⁶ This hypothesis has been tested in earlier research (e.g. Seyhun 1986, Lin and Howe 1990, Lakonishok and

The remainder of the paper is organized as follows. In Section 2, we describe the legal framework for the reporting of insider trades in Germany. We further describe our data set and present descriptive statistics. Section 3 presents the results of the event study. Section 4 presents the cross-sectional analysis that relates event-study CARs to firm-specific variables. Section 5 discusses the implications of the results and concludes.

2 Legal Background and Data

Germany was very slow in implementing rules against insider trading (see Bris 2005 for details). The Securities Trading Act (Wertpapierhandelsgesetz) was implemented as late as 1994. The Act prohibited trading on private information, where private information is defined as a fact that is not publicly known and that, if published, would affect the stock price significantly.⁷ Corporate insiders (members of the executive and the supervisory board) were subject to this restriction. Apart from this, however, their trading activity was not restricted and there was no requirement to report trades. The reporting requirement was amended later and became effective on July 1, 2002.⁸

Under this new regulation, corporate insiders are still allowed to trade freely, as long as they do not trade on private information as it is defined above. In particular, there is no blackout period that would ban corporate insiders from trading prior to earnings announcements. Members of the executive board and members of the supervisory board, as well as their spouses and children, now have to report trades in shares and other equity-related securities (such as

Lee 2001, and Fidrmuc et al. 2006), but with inconclusive results.

⁷ It is important to note that a general feeling that the firm is doing well is not a "fact" in the sense of the securities trading law. A fact is an identifiable piece of information, such as a pending merger announcement or the information that the chairman will resign. A disclosure requirement in the securities trading act requires publication of these facts ("ad hoc disclosure"), unless the Bundesanstalt für Finanzdienstleistungsaufsicht explicitly grants exemption from this requirement.

⁸ The rules for the Neuer Markt, the (now defunct) segment for technology stocks of Deutsche Börse AG, required quarterly publication of the shareholdings of corporate insiders. These rules were revised in 2001, when reporting of individual trades became mandatory. Thus, for companies listed on the Neuer Markt, there were publication requirements in effect from 1997 onwards.

options, convertible bonds or warrants) of their company. Board members of firms with exchange-listed subsidiaries also have to report trades in shares of the subsidiary. Unlike in the US and the UK, former board members and large shareholders do not have to report their trades. Further, there is no initial statement of shareholdings.

Trades have to be reported both to the company and to the Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin).⁹ Reports must be made without delay.¹⁰ The report has to contain the trading date, information about the security traded, the size of the trade, and the price. The company has to publish the trade information, which it usually accomplishes by posting the information on its website.

There are several exemptions from the reporting requirement. First, securities obtained as a part of the remuneration (e.g. stock options) do not have to be reported. However, when stock options are exercised, the purchase of the shares has to be reported. Second, when the total transaction value in a 30-day window does not exceed € 25,000, no report is required.¹¹ Once the threshold is reached, all trades have to be reported. Third, the rules do not apply to firms the shares of which are only traded over the counter.¹²

The BaFin maintains a database of all insider trades that have been reported. It contains information about the following:

- the company name and ISIN code,

⁹ The Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin), the German analogue to the Securities and Exchange Commission, is the federal authority charged with the supervision of securities trading. It was created in 2002 when three formerly independent institutions [the Bundesaufsichtsamt für das Kreditwesen (banking supervision), the Bundesaufsichtsamt für das Versicherungswesen (supervision of the insurance industry) and the Bundesaufsichtsamt für den Wertpapierhandel (supervision of securities trading)] were merged.

¹⁰ The law was not specific as to what exactly that meant. In practice, substantial reporting delays were not uncommon. In October 2004 (after our sample period) new rules became effective. They require reporting within five working days.

¹¹ The new rules, which became effective in October 2004, require that all transactions be reported unless the total volume of transactions by the same insider in a calendar year does not exceed € 5,000.

¹² There is an OTC segment on German exchanges termed "Freiverkehr". Listing requirements are generally low in this segment.

- the trading date and the reporting date,
- the security traded, the transaction type (purchase or sale), the transaction volume and the price,
- the name and the function of the person reporting the trade (executive board member, supervisory board member, or other person subject to the trade reporting requirement).

Our empirical analysis is based on the BaFin database. It covers the period from July 1st 2002 to June 30th 2004. During this period, a total of 4,272 transactions by insiders in firms listed on a German exchange were reported.

We complemented the data on insider transactions with supplementary data obtained from various sources. By matching the names given in the BaFin database with information on the composition of the executive and supervisory boards provided in Hoppenstedt Aktienführer,¹³ we identified transactions initiated by the chairman of either the executive or the supervisory board. We further collected data on the ownership structure of the firm from Hoppenstedt Aktienführer, which lists all investors with a stake of at least 5% of the shares outstanding. Data on (dividend-adjusted) daily closing prices was obtained from Datastream. We collected information on the publication dates of annual reports, intermediate reports, and quarterly earnings announcements from Bloomberg, Datastream, and corporate web sites. Finally, we obtained information on the accounting standards by checking the annual report of the fiscal year preceding the insider trade.

In 163 cases, the entries in the BaFin database were incomplete, e.g. because a trade was not characterized as being a purchase or a sale. We eliminated these observations from our sample. Further, there were cases in which the same person reported more than one equal-sized

¹³ The Hoppenstedt Aktienführer is a yearly publication that provides detailed information (e.g., ownership structure, board composition, balance sheet information) on German listed firms.

trade in the same security and at the same price on the same day. We interpreted these observations as duplicates and retained only one trade in the sample. In some cases, the reported trading or reporting date fell on a weekend or a holiday. In these cases, we replaced the date with the date of the first subsequent trading day. Finally, in 15 cases, the reporting date as it appears in the BaFin database was prior to the trading day. In those cases, we corrected the dates after cross-checking the data with other sources.¹⁴

Some insider transactions do not lead to a change in the number of shares held. There are two categories of transaction for which this is true. First, there are interinsider trades, i.e., transactions in which one insider is the buyer and another insider is the seller. There are 15 such cases in our sample. The most likely reason for these transactions is the transfer of stocks between spouses, or between executives and their children, possibly for tax reasons. It is arguable that interinsider trades do not constitute a signal to the market. We dropped the corresponding observations from the sample. Second, when stock options are exercised and the shares are sold immediately, shares are bought and sold on the same day by the same insider. It is arguable that such a transaction does convey a negative signal. We therefore retained the sale of the shares from such transactions in our sample.

When measuring the reactions of share prices to insider trades, the event date can be defined as either the trading day or the reporting day.¹⁵ On the trading day, market participants may infer from market data that there is abnormal trading volume. They will, however, not usually know the details of the trade (e.g., the identity of the trader). On the reporting day, this information becomes available. Following Lakonishok and Lee (2001) and Chang and Suk (1998),

¹⁴ To provide an example, in one case the trading day as indicated in the BaFin data base is August 22, 2003 and the reporting date is August 19, 2002. We changed the reporting date to August 22, 2003 after cross-checking with www.insiderdaten.de, another source of data on directors' dealings.

¹⁵ Both approaches have been used in previous studies. Seyhun (1986) and Friederich et al. (2002) use the trading day as their event date, Fidrmuc et al. (2006) use the reporting date, and Lakonishok and Lee (2001) and Chang and Suk (1998) use both approaches.

we constructed two samples for our event study analysis. In the *trading day sample*, the event date is defined by the trading date. The *reporting day sample* takes the reporting date of the trade to be the event date.

When constructing the trading day sample, we aggregated all trades in the shares of a given firm that were executed on the same day, irrespective of whether the trades were initiated by the same insider or by different insiders. The aggregated transactions were treated as one trade. We took the (net) transaction volume to be the sum of the volumes of the individual trades. If the net transaction volume was positive [negative], we classified the aggregated transaction as a purchase [sale]. We proceeded in a similar way when constructing the reporting day sample. However, in this case we aggregated trades that were *reported* on the same day.

As noted above, transactions need not be reported when the total transaction value in a 30-day window does not exceed € 25,000. However, once that threshold is reached, all trades have to be reported. Therefore, when an insider buys shares on three different days and reaches the threshold on the third day, three trades with different trading dates will be reported on the same day. Consequently, we had more observations when considering trading dates than when considering reporting dates.¹⁶

The final dataset for the event study consisted of 2,051 observations (1,140 purchases and 911 sales) in 340 companies in the trading day sample and of 1,355 observations (728 purchases and 627 sales) in 339¹⁷ companies in the reporting day sample.

¹⁶ As a consequence, there are more small trades in the trading day sample than in the reporting day sample. To check the robustness of the results, we repeated both the event studies and the cross-sectional analysis with a sample restricted to large trades.

¹⁷ In one case (Tiptel AG), there were several transactions completed on different trading days but reported on the same day. The aggregated volume was zero. These are the only transactions for Tiptel AG remaining in our sample. These transactions (and, consequently, the firm) were included in the trading day sample but were excluded from the reporting day sample.

The discrepancy between the initial number of observations (4,272) and the number of observations in the final data sets appears to be large. Table 1 provides a detailed record of all reasons that led us to exclude observations from the sample. The figures show that the dominant reason for exclusion is the occurrence of multiple trades (either by the same insider or by different insiders) on the same day. These observations must be aggregated for the event study, and doing so is a standard procedure. In our cross-sectional regressions, we included a dummy variable that controls for cases in which more than one insider traded, or reported a trade, on the same day.

Insert Table 1 about here

Table 2 presents descriptive statistics for our sample.¹⁸ Panel A describes the sample firms. All figures are for the end of the fiscal year prior to the insider transaction. Thus, if there was an insider trade in 2002, the respective firm is included in our sample and the information on firm size and ownership structure is for the fiscal year ending in 2001. The column labelled "2001" contains summary statistics for those firms for which there were insider transactions in 2002.

The distribution of firm size is heavily skewed, as is shown by the large differences between the mean and the median size of firms. Many firms have large controlling shareholders. The free float, defined as the fraction of shares held by shareholders with stakes less than 5%, is clearly below 50%. The mean value is slightly above 40%, while the median is slightly lower. Figures on shareholdings by executive and supervisory board members are to be interpreted as lower bounds to the actual values. This is because only holdings larger than 5% have to be

¹⁸ The figures in the table are based on the disaggregated sample. If two trades in the shares of the same firm were executed on the same day, both were included. Consequently, the number of observations is larger than the number of observations included in the event study.

reported.¹⁹ Executive directors hold from 7-10% of the shares outstanding. There appears to be an upward trend over time, possibly due to the increased use of stock option plans. The median value of zero indicates that in the average firm, no executive director holds more than 5% of the equity. Members of the supervisory board hold, on average, from 4-5% of the equity.

Insert Table 2 about here

Panel B of Table 2 presents summary statistics for the transactions in our sample. Purchases account for 54.7% of the transactions (1,379 out of a total of 2,522). However, the average purchase is much smaller than the average sale. Their average size is 382,217 € (which represents 0.46% of the value of shares outstanding), whereas the average size of a sale is about three times as large, amounting to 1,141,151 € (1.24% of the value of shares outstanding). The large average size of the sales more than compensates for their lower number. Sales account for 71.3% of the total volume of insider transactions. The relation between the total sale volume and the total purchase volume is similar to that reported by Lakonishok and Lee (2001).

The last Panel of Table 2 differentiates the insider transactions with respect to the position of the insider in the firm. Members of the executive board account for 772 purchases and 540 sales. The CEOs alone account for 304 purchases and 171 sales. Members of the supervisory board trade less frequently. The number of purchases and sales amount to 487 and 389, respectively. Trades by other persons who are required to report their transactions are less frequent. This group accounts for 120 purchases and 214 sales. All groups are net sellers of shares. Although the number of purchases exceeds the number of sales for all groups but the

¹⁹ As noted previously, no initial statement of shareholdings by executives is required in Germany.

"Others", the higher average size of the sales more than compensates for their smaller number.

3 Event Study Results

We used standard event-study methodology to assess the impact on share prices of insider trades. We performed separate event studies for insider purchases and sales, and for the trading day sample and the reporting day sample. Following Fidrmuc et al. (2006) we repeated the analysis for the trading day sample after excluding trades that constituted a volume smaller than 0.1% of the value of the shares outstanding.

We chose a 41-day event window that extended from day t_{-20} to day t_{20} , where t_0 is the event day. Abnormal returns during the event window are defined as

$$AR_{i,t} = R_{i,t} - [\alpha_i + \beta_i R_{m,t}]$$

where $R_{i,t}$ and $R_{m,t}$ denote the return of stock i and the market, respectively, on day t . The parameters α_i and β_i are the intercept and slope estimates, respectively, from a market-model regression. The estimation window comprises 180 trading days, the last of them being t_{-21} . We used the CDAX performance index, which is a broad, value-weighted index calculated by Deutsche Börse AG, as our proxy for the market return.

To check the robustness of the analysis, we repeated the event study using index-adjusted returns rather than market model-adjusted returns. Index adjustment has two advantages, both of which are related to the fact that no estimation window is required. First, there is no problem with contamination of the estimation window (i.e., the occurrence of insider trades in the estimation window). Second, there is no problem with infrequent trading during the estimation window (and the bias in the estimation of beta it may entail). The results with index adjustment are very similar to those obtained using market model adjustment and are thus omitted.

Statistical tests were based on the CARs, defined as

$$CAR_{\tau,T} = \frac{1}{T-\tau} \sum_{t=\tau}^T \left[\frac{1}{n} \sum_{i=1}^n AR_{i,t} \right]$$

We followed Friederich et al. (2002) and Hillier and Marshall (2002) in using the standardized cross-sectional test statistic proposed by Boehmer et al. (1991). The abnormal returns were divided by the residual variance from the market model regression in the estimation window. The test statistic was based on the cross-sectional standard deviation of these standardized abnormal returns.²⁰ This test procedure is robust in the case of an event-induced increase in variance.

As an alternative to the standardized cross-sectional test, we used the rank test proposed by Corrado (1989). The latter test has several advantages.²¹ It is robust in the presence of non-normality. It is, according to Campbell and Wasley (1993), the best test in the presence of infrequent trading problems. Further, it is well-specified in the case of event-clustering or event-induced variance.

The results are presented in Table 3. Insider purchases (Panel A) have a positive impact on prices. Over the entire 41-day event window, the CAR amounts to 3.69%. This value is significantly different from zero when considering the t-statistic. The Corrado test, however, does not reject the null hypothesis of a zero CAR. The abnormal return is due to the postevent period. Pre-event CARs are close to zero. The postevent CARs ($CAR_{0,10}$ and $CAR_{0,20}$) amount to 2.18% and 3.60%, respectively. Both values are significantly different from zero according to both test statistics.

²⁰ For details of the test procedure, see the appendix in Friederich et al. (2002).

²¹ See Fidrmuc et al. (2006, Appendix) for a discussion in a closely related context.

The results are confirmed by the lower graph in Figure 1, which depicts the $CAR_{s-20,t}$ as a function of t . Until the event day, t_0 , the graph is essentially flat. After the event day, the CARs increase steadily.

Insert Table 3 about here

The results are even more pronounced when we consider only transactions that have a value of at least 0.1% of the value of shares outstanding. The CAR over the entire event window is 9.29% and is highly significant. The pre-event CARs shown in Table 3, as well as in the upper graph of Figure 1, are positive²² but not significant. The postevent CARs are large (4.36% and 6.01% in a 10- and a 20-day window, respectively) and are highly significant.

Results based on the reporting day sample are similar to those based on the trading day sample when all trades are included.

Insert Figure 1 about here

Results for insider sales are reported in Panel B of Table 3. Over the full event period, the CARs are positive, though not significant. Pre-event CARs are significantly positive, whereas postevent CARs are significantly negative. The complete pattern can best be assessed by considering the lower graph in Figure 2. CARs increase until the event day, t_0 , and then start to decline. However, they do not revert to their initial level. Therefore, the CAR over the complete event window is positive. The results are similar (albeit more pronounced) when the analysis is confined to trades with a volume of at least 0.1% of the value of shares outstanding. The pattern documented in Table 3 and Figure 2 is consistent with corporate insiders selling shares after price run-ups. A similar pattern has been reported for the UK by Fidrmuc et al. (2006).

²² This result differs from the result that Fidrmuc et al. (2006) report for the UK. There, pre-event CARs for large purchases are significantly *negative*. We return to this issue below, when we discuss event clustering.

The pattern for the reporting day sample is similar. There are positive and significant pre-event CARs and negative and significant postevent CARs. However, unlike in the trading day sample, pre- and postevent CARs are approximately equal in magnitude, which results in a CAR for the total event period that is close to zero.

Insert Figure 2 about here

A comparison of the results for insider purchases and insider sales yields interesting insights. Firstly, postevent CARs are similar in magnitude (but different in sign, of course) for purchases and sales. Secondly, when we restrict the analysis to large trades (i.e., those with a value of at least 0.1% of the value of shares outstanding) we find slightly larger price reactions to insider purchases (6.01% as compared to -4.97% for the $CAR_{0,20}$). The latter result is consistent with previous findings.

We have hypothesized that the impact on prices of insider trades is larger in the bank-dominated German financial system than in market-oriented financial systems, such as those in the US and the UK. Table 4 summarizes the results of previous studies that rely on data from either the UK or the US. These studies use different definitions of the event day (trading day or reporting day) and different event windows. To enhance comparability between our results and those of previous studies, we also report the results we obtained using the same definitions as in the respective previous papers. The postevent abnormal returns we found are not generally larger than those reported in previous studies. Hence, we are unable to conclude that insider trades in Germany convey more information than insider trades in countries with a market-based financial system.

Insert Table 4 about here

One issue that deserves attention is event clustering. In some cases, insiders execute several trades in close succession. In this case, the cumulated (postevent) abnormal return for the first trades incorporates the price reaction to later trades that were executed during the event win-

dow. Similarly, the cumulated (pre-event) abnormal return for later trades incorporates the price reaction to earlier trades. Event contamination may bias the CAR estimates, and particularly so when the event window is long. The issue has been largely ignored in the literature on insider trading. The only paper that addresses it explicitly is Fidrmuc et al. (2006), in which it is argued that event clustering is not a serious problem for the study reported because the average number of insider trades per firm is sufficiently low.

In our reporting day sample, the average number of insider purchases [sales] per firm and year is 1.6 [1.36]. However, inspection of the data set reveals that several trades in close succession occur more frequently than would be expected if the trades were distributed randomly over time. Consequently, event clustering is a possible cause for concern. To address the issue, we constructed data sets that are free from event window contamination. Trades that are less than 20 days apart were considered to form a series. We included only the first trade of each series in the pre-event sample and only the last trade of each series in the postevent sample. We then repeated the event study, using the pre-event sample to calculate pre-event CARs and using the postevent sample to calculate postevent CARs. The full event window CARs (i.e., the $CAR_{-20,20}$) were calculated from a sample that does not contain trades that are part of a series (i.e., the sample contains only trades that were neither preceded by, nor followed by, another trade).

Insert Table 5 about here

The results are shown in Table 5. Comparing them with those in Table 3 reveals several important insights. First, the pre-event CARs for insider purchases are generally lower. We no longer observe significantly positive pre-event CARs for large purchases; in some cases, there are even significantly negative pre-event CARs. Second, the pre-event CARs for insider sales remain significantly positive but are somewhat smaller in magnitude. Third, the post-event CARs obtained from the trading day sample are slightly smaller in magnitude but depict the

same general pattern as before. Finally, the postevent CARs obtained from the reporting day sample hardly change. Hence, we may conclude that our earlier results, and in particular the postevent CARs that are the focus of our analysis, are robust.

4 Cross-Sectional Analysis

In the previous section, we described the results of our event study without differentiating with respect to the characteristics of the trade, the position of the insider, the ownership structure of the firm, or other relevant variables. In this section, we extend the analysis by investigating the determinants of the CARs. We focus on the $CAR_{0,20}$ because it captures the complete market reaction to the insider trade. We perform the analysis with the CARs on the basis of both the trading day and the reporting day samples.

4.1 Two-Dimensional Sorts

Before turning to multivariate regressions, we first calculated average CARs for different types of firm and different types of insider trade. We first provide a breakdown of the CARs with respect to the ownership structure of the firm. We classify firms as follows:

- Firms in which no single shareholder holds more than 25% of the voting shares are considered to be widely held.
- Firms in which there is at least one shareholder who holds more than 25% of the equity are considered to be controlled by dominating shareholders. The choice of the 25% threshold is motivated by the fact that, according to German corporate law, some important decisions require a 75% majority in the shareholders' meeting. Consequently, a 25% stake provides significant control rights. Firms with a dominant shareholder are categorized further with respect to the identity of the largest shareholder:

- A firm is manager-controlled if the largest shareholder is a member of the executive board.
- A firm is family-controlled if the largest shareholder is a family (where holdings of different family members are aggregated whenever family members can be identified). Note, however, that the firm is considered to be manager-controlled when a family member is represented on the executive board.
- A firm is industry-controlled if the largest shareholder is another nonfinancial firm.
- Firms in which the largest shareholder does not belong to any of these groups are placed together in the category "other controlling shareholder".

The results are reported in Panel A of Table 6. There are large differences between the CARs for the different categories of firms. Considering the trading day sample, first we find that trades by insiders in industry-controlled firms and firms with other controlling shareholders do not have a significant impact on prices. In contrast, insider trades in family-controlled firms do have a significant impact on prices. Prices rise after insider purchases and fall after sales. In manager-controlled firms, purchases have a positive impact, whereas insider sales do not trigger significant CARs.

The most striking results are those for widely held firms. The average CAR after purchases amounts to 5.79%. The average CAR after sales is negative and is almost equal in magnitude, amounting to -5.40%. Thus, we find that widely held firms have the largest impact on prices. This result supports the hypothesis that informational asymmetries between corporate insiders and the capital markets are larger in widely held firms.

The finding of significant price reactions to insider trades in widely held firms is confirmed in the reporting day sample. However, there are certain differences when considering the type of

the controlling shareholder. CARs after insider purchases are positive and significantly different from zero in all but the family-controlled firms. We observe negative and significant price reactions after insider trades in manager- and family-controlled firms, but not in industry-controlled firms or firms with other controlling shareholders.

Insert Table 6 about here

According to the informational hierarchy hypothesis, trades by insiders who have more privileged access to information should have a more pronounced impact on prices. Consequently, we should expect trades by the CEO to have the largest impact. Trades by members of the executive board should have larger impacts on prices than trades initiated by members of the supervisory board. We tested the informational hierarchy hypothesis by analyzing the CARs after trades of distinct groups of insiders.

The results are presented in Panel B of Table 6. Trades by both members and the chairman of both the executive and the supervisory board have impacts on prices that are significant at least at the 10% level. Sales by members of the "others" group have a significant impact only in the trading day sample, whereas purchases by members of this group do not have a significant impact.

There is no general pattern as to whether purchases or sales trigger larger price reactions. For example, sales by the CEO are associated with larger CARs than purchases, while the reverse is true for other members of the executive board.

Contrary to our expectations, trades by the CEO do not have the largest impact on prices. Neither is their impact generally larger than the impact of trades made by other members of the executive board; nor is it larger than the impacts of trades made by the chair of the supervisory board. In fact, the largest CARs (-12.6% and -10.0% in the trading day and the reporting day sample, respectively) are observed after sales by the chairman of the supervisory board.

In summary, therefore, our results, as are those of Fidrmuc et al. (2006), are inconsistent with the informational hierarchy hypothesis.

UK regulations prevent corporate insiders from trading in the two months preceding final or interim earnings announcements and in the month prior to quarterly earnings announcements. These rules are based on the assumption that informational asymmetries are particularly large prior to earnings announcements. In Germany, no such blackout period exists. We make use of this institutional difference by testing whether trades by corporate insiders prior to earnings announcements convey more information than trades at other times. To this end, we sort insider trades into two groups. The first group (757 observations) contains trades that occur within 60 days prior to an annual or interim earnings announcement and trades that occur within 30 days prior to a quarterly earnings announcements. The second group (1147 observations) contains all other trades.²³ Panel C of Table 6 presents the average CARs for both groups.

Insider purchases outside the blackout period have an impact on prices (as measured by the $CAR_{0,20}$) of 1.96% in the trading day sample (2.90% in the reporting day sample). The impact of those trades occurring within the blackout period is about twice as large, amounting to 5.26% (4.60%). An analysis of insider sales reveals a similar pattern. Sales outside the blackout period have a negative CAR of -2.75% (-3.42%) whereas the corresponding value for trades executed within the blackout period is -4.85% (-4.50%). These results indicate clearly that informational asymmetries are larger prior to earnings announcements. They further provide a rationale for passing legislation to prevent insiders from trading prior to the release of earnings announcements.

²³ We could not identify the earnings announcement dates for some of the sample firms. Furthermore, several insider trades occurred exactly on the announcement day. We cannot classify these trades because we do not know the exact time of the trade and the announcement. The corresponding observations (147 out of a total of 2,051) were excluded from the analysis.

4.2 Cross-Sectional Regression Analysis

The two-dimensional sorts presented thus far do not control for characteristics of the insider trades (e.g., their size) and the firm; neither do they account for interactions between the independent variables. We therefore now turn to a multiple regression analysis.

We used the $CAR_{0,20}$, the $CAR_{0,5}$ and the $CAR_{0,1}$ based on both the trading day and the reporting day sample as our dependent variable. We multiplied the CARs for the sales by -1. This allowed us to pool the data for purchases and sales. In the regressions based on the trading day sample, we included independent variables that control for the characteristics and governance structure of the firm and for the characteristics of the transaction itself. Specifically, we included the following variables:

- A dummy variable that takes the value 1 if the corporate insider is selling. Inclusion of this variable allows for different price reactions to insider purchases and sales.
- The natural logarithm of the market value of equity. We expect a negative sign because larger firms tend to be followed by more analysts. Hence, informational asymmetries between corporate insiders and the capital market should be smaller.
- The size of the insider trade measured by the relative trade size, i.e., the trade size expressed as a percentage of the value of the shares outstanding.²⁴ We expect positive coefficients because larger transactions should provide a stronger signal to the market.
- A set of firm-specific control variables; namely, the market-to-book ratio, the return on equity and the debt-assets ratio as a measure of leverage.²⁵

²⁴ There were 14 cases in which the price of the insider trade was either missing or was reported to be zero. We dropped these observations.

²⁵ We also estimated regressions, including the price-earnings ratio. Since we needed to exclude firms with negative earnings, the number of observations is reduced by approximately 25%. We omit the results for brevity. They are similar to those reported in the text.

- A set of dummy variables for the ownership structure of the firm. We include dummies for widely held firms, and manager-controlled, family-controlled, and industry-controlled firms. Firms controlled by other dominating shareholders are the base case.
- A dummy variable that takes the value 1 when the firm used international accounting standards (IAS or US-GAAP) in the annual report preceding the trading date.
- A dummy variable that takes the value 1 when the transaction occurs within the blackout period (i.e., the transaction would be illegal under UK regulations). We expect a positive sign because informational asymmetries are likely to be higher prior to earnings announcements.

We estimated seven distinct models. In Models 1 to 5 inclusive, the dependent variable is the $CAR_{0,20}$. Model 1 includes all trades. Model 2 excludes small trades (defined as trades with a size smaller than 0.1% of the shares outstanding). Model 3 excludes small trades and block trades (defined as trades with a size larger than 5% of the shares outstanding). Models 4 and 5 show separate results for purchases and sales, respectively.²⁶ In Models 6 and 7, the dependent variable is the $CAR_{0,5}$ and the $CAR_{0,1}$, respectively. These models serve as robustness checks.

The results are presented in Table 7. All t-values are based on White heteroscedasticity-consistent standard errors. The explanatory power of the regressions as measured by the adjusted R^2 is, albeit modest, of the same order of magnitude as the corresponding values in Fidrmuc et al. (2006).

We consider the results for Models 1-5 first. There is no difference between the impact on prices of purchases and sales. Insider trades in larger firms tend to have smaller impacts. This

²⁶ Since the dependent variable (the $CAR_{0,20}$) is multiplied by (-1) for insider sales we expect the same coefficient signs in models 4 and 5.

result is significant in Model 1 (all observations) and in Model 4 (purchases only). Surprisingly, the relation between relative trade size and impact on prices is negative (and significant in three cases), which implies that larger insider trades have smaller impacts. The coefficients of the firm-specific control variables are negative in all models and significant in several cases. This is particularly true for the return on equity. It thus appears that the CARs are related negatively to profitability, as measured by the return on equity. This is consistent with the market reacting more heavily to insider trades in less profitable firms.

Four dummy variables capture the impact of the ownership structure. Consistent with the results from the two-dimensional sorts, we find that insider trades in widely held firms have a greater impact on prices. The identity of the controlling shareholder does not have a discernible impact. Although we observe individual significant coefficients, their sign changes across models. For example, insider purchases in family-controlled firms have smaller impacts on prices, but insider sales have larger impacts.

Insert Table 7 about here

The coefficient that identifies firms that use international accounting standards is positive in all cases and significantly so in some cases. This indicates that informational asymmetries between insiders and the capital market are, if anything, larger in these firms. This is clearly inconsistent with the hypothesis that German accounting standards are less informative than international accounting standards.

Insider transactions that occur inside the blackout period have a larger impact on prices than those outside the blackout period. The corresponding coefficient is significant in all seven models. This provides support for the hypothesis that informational asymmetries between corporate insiders and the capital market are larger prior to earnings announcements.

When we used the $CAR_{0,5}$ or the $CAR_{0,1}$ as the dependent variable (Models 6 and 7) we obtained lower R^2 s. Insider sales have smaller impacts on prices than insider purchases. Consis-

tent with our previous results, we found that insider trades in widely held firms and insider trades prior to earnings announcements have larger impacts. The accounting standards do not have a significant impact.

Once an insider trade is reported, market participants learn who traded and whether more than one insider traded. Consequently, the price reaction after the announcement may depend on both the identity and the number of the traders. Therefore, in our regressions that were based on the reporting day sample, we included additional dummy variables that identify the trader and indicate whether more than one trader traded. Apart from this modification, we estimated the same seven models as before. However, some trades were reported with very long delays. Including these trades in the regression based on the reporting day sample may bias the results, because the CARs are measured over a period long after the trade has occurred. To avoid a potential bias, we excluded all trades that were reported with a delay of more than 30 days (one month) from the reporting day sample.²⁷

The results are shown in Table 8. The R^2 s are of the same order of magnitude as those in Table 7 and the results are generally similar. We again find that the impact on prices is related negatively to firm size and that larger trades tend to have smaller impacts. Insider trades in widely held firms have a larger impact on prices. However, the results are somewhat weaker than those in Table 7, with one coefficient now being (not significantly) negative. We again find a tendency for impacts on prices to be larger for firms that use international accounting standards, and we confirm the result that insider trades prior to earnings announcements tend to have a larger impact.

²⁷ Fifty-three observations were excluded. As a robustness check, we included the reporting delay as an additional independent variable. It proved to be insignificant and its inclusion did not change the results materially.

The coefficient of the dummy variable that identifies trades by more than one insider is insignificant. The identity of the insider does not materially affect the size of the abnormal return. Most of the individual coefficients are insignificant, and in five out of seven models, the coefficients are also insignificant as a group at the 5% level. Hence, the regression results, like those of the univariate analysis, do not provide support for the informational hierarchy hypothesis.

Although the results of the 14 models in Table 7 and Table 8 do not coincide perfectly, some general patterns do emerge. The most important result is that insider trades prior to earnings announcements have larger impacts on prices. This result provides a rationale for the type of regulation that is implemented in the UK.

Ownership structure appears to be important. Trades, and sales in particular, by insiders in widely held firms are associated with larger CARs than trades by insiders in firms that have a dominating shareholder. This is consistent with larger informational asymmetries between corporate insiders and the capital market in firms with dispersed ownership. Trades by the CEO and other members of the executive board apparently do not convey more information than trades by other insiders. This result is inconsistent with the informational hierarchy hypothesis, but is consistent with previous empirical findings (e.g. Fidrmuc et al. 2006). Contrary to our expectations, we found that price reactions to trades by insiders tend to be larger in firms that use international accounting standards.

5 Summary and Conclusion

Germany was very late in passing legislation that requires corporate insiders to report their trades. We have provided herein a thorough empirical analysis of directors' dealings in Germany. The German financial system differs in many respects from the market-dominated financial systems of the US and the UK. These differences may have a bearing on the impact on prices of insider trades.

Our sample consisted of 2,051 insider trades completed between July 1st, 2002 and June 30, 2004. Using event-study methodology, we found that insider trades affect share prices significantly. In the 20 days after the trade, market model adjusted CARs amounted to 3.6% after insider purchases and -3.54% after insider sales. Using the reporting date as the event date yielded similar results. We confirm previous findings that corporate insiders tend to sell after price run-ups. Evidence of this is provided by significant pre-event CARs.

In a second step, we related the event-study CARs to variables that control for the characteristics of the trade, the ownership structure of the firm, the position of the insider within the firm, and the accounting standards employed by the firm. We further identified trades that were made in the two months prior to an annual or interim earnings announcement or in the month prior to a quarterly earnings announcement. Under UK regulations, these trades would be illegal.

We found that trades that occur prior to earnings announcements have a larger impact on prices. This result is consistent with informational asymmetries between corporate insiders and the capital market being larger prior to earnings announcements. In addition, it provides a rationale for the UK type of regulation that prevents insiders from trading prior to earnings announcements.

We further found that ownership structure matters. The impact on prices of insider trades tends to be larger in widely held firms. The position of the insider within the firm does not

have a discernible impact on the magnitude of the impact. Our results are therefore inconsistent with the informational hierarchy hypothesis. Contrary to our expectations, insider trades in firms that report according to international accounting standards (IAS or US GAAP) cause, if anything, larger CARs than trades by insiders in firms that report according to German accounting standards. This result runs counter to the view that German accounting standards are less informative.

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Table 1: Sample selection

This table describes the composition of the final data set. The first column provides a record of all reasons that led us to exclude observations from the sample. The second column shows the number of excluded observations. The third column shows the number of remaining observations. Separate figures are given for the trading day sample (TD) and the reporting day sample (RD) wherever appropriate.

| Reason for exclusion | Nr. of observations excluded | Remaining Data |
|---|------------------------------|--------------------|
| Initial number of observations | | 4,272 |
| For 163 cases, the entries for the transaction type (buy or sell) are missing and the missing information could not be retrieved from the company's website or other sources. | 163 | 4109 |
| Inter-insider trades (one insider sold, another - e.g. the spouse - bought) | 15 | 4094 |
| If transactions on the same day were similar in the amount and the price traded we recognized the transactions as duplicate and deleted one of these transactions. | 42 | 4052 |
| We aggregate the transactions the same insider made on the same day and present those as one transaction with the net amount traded and the weighted average transaction price. | TD 1352 RD 2162 | TD 2700 RD 1890 |
| Transactions whose transaction dates or announcement dates were not covered by price data sufficient to conduct the event study with an event window of 41 days and an estimation window of 180 days. | TD 178 RD 142 | TD 2522 RD 1748 |
| Finally, we aggregate the transactions made by different insiders in shares of the same firm on the same day and present those as one transaction with the net amount traded and the weighted average transaction price. At the same time, we define a dummy variable that reports whether more than one insider traded on that day. This variable is included in the cross-sectional analysis. | TD 471 RD 393 | TD 2051 RD 1355 |

Table 2: Descriptive Statistics

The table presents descriptive statistics. Panel A shows the number of firms in the sample and presents summary statistics (mean and median) for firm size and ownership structure. Panel B presents descriptive statistics for the size of the trades in our sample, where size is measured by the number of shares traded, by the € volume of the transaction, and by the transaction volume expressed as a percentage of the number of shares outstanding. Panel C shows the number and average size of trades initiated by insiders holding different positions within the firm.

Panel A: Firms in the sample

| | | 2001 | 2002 | 2003 |
|--|--------|----------|----------|----------|
| Number of firms | | 174 | 224 | 133 |
| Market capitalization € million | mean | 4,025.03 | 2,549.52 | 2,857.93 |
| | median | 65.82 | 45.47 | 116.71 |
| Free float, % of shares outstanding | mean | 40.79 | 44.39 | 42.95 |
| | median | 36.90 | 42.00 | 39.32 |
| Shareholdings of executive direc- tors, % of shares outstanding | mean | 7.00 | 8.04 | 10.03 |
| | median | 0 | 0 | 0 |
| Shareholdings of supervisory board members, % of shares outstanding | mean | 4.04 | 4.28 | 4.94 |
| | median | 0 | 0 | 0 |

Panel B: Transaction size

| | | All transactions | Purchases | Sales |
|---|--------|------------------|-----------|------------|
| Number of observations | | 2,522 | 1,379 | 1,143 |
| Size, number of shares | mean | 95,898.56 | 41,100.83 | 162,010.62 |
| | median | 5,000 | 2,500 | 10,000 |
| Size, € | mean | 725,817.3 | 382,217 | 1,141,151 |
| | median | 40,000 | 23,496.8 | 89,899.9 |
| Size, percentage of shares out- standing | mean | 0.82% | 0.46% | 1.24% |
| | median | 0.04% | 0.02% | 0.07% |

Panel C: Transactions by position of insider

| | Purchases | | Sales | |
|---------------------------------------|-----------|-------------------|-------|-------------------|
| | # | mean size, shares | # | mean size, shares |
| CEO | 304 | 47,090.8 | 171 | 181,909.2 |
| Other members of executive board | 468 | 31,139.8 | 369 | 135,912.6 |
| Head of supervisory board | 134 | 23,391.9 | 84 | 184,675.6 |
| Other members of supervisory board | 353 | 51,005.0 | 305 | 72,200.2 |
| Others | 120 | 55,414.4 | 214 | 310,215.5 |

Table 3: Event Study Results

The table shows the percentage CARs for insider purchases (Panel A) and sales (Panel B). Both Panels show the CAR for the full event period (-20,20) and for subperiods (-20,-1), (-10,-1), (0,10) and (0,20). We present separate results for the trading day sample, the trading day sample including large trades only, and the reporting day sample. In the trading day sample, the event date is the date on which the insider trade was executed. In the reporting day sample, the event date is the day on which the trade was reported. A trade is considered large when the volume exceeds 0.1% of the volume of shares outstanding. In addition to the CARs, we present the standardized cross-sectional test statistic proposed by Boehmer et al. (1991) and the test statistic of the non-parametric Corrado test. A superscript a (b, c) denotes significance at the 1% (5%, 10%) level.

Panel A: Purchases

| | CAR(-20,20) | CAR(-20,-1) | CAR(-10,-1) | CAR(0,10) | CAR(0,20) |
|--|-------------------|--------------------|--------------------|-------------------|-------------------|
| CAR trading day, all trades | 3.6927 | 0.0897 | -0.1541 | 2.1759 | 3.6030 |
| cross-sectional test | 1.66 ^c | -2.99 ^a | -3.54 ^a | 3.18 ^a | 5.10 ^a |
| Corrado test statistic | 1.06 | -2.45 ^b | -3.01 ^a | 3.06 ^a | 3.87 ^a |
| CAR trading day, trades ≥0.1% of shares outstanding | 9.2853 | 3.2769 | 1.9290 | 4.3629 | 6.0084 |
| t-value | 3.73 ^a | 1.16 | 0.61 | 3.03 ^a | 4.07 ^a |
| Corrado test statistic | 2.99 ^a | 0.96 | 0.84 | 2.88 ^a | 3.25 ^a |
| CAR reporting date | 2.8211 | -0.6791 | -0.5938 | 1.9300 | 3.5002 |
| t-value | 0.4253 | -3.84 ^a | -3.22 ^a | 3.39 ^a | 4.52 ^a |
| Corrado test statistic | -0.16 | -3.96 ^a | -3.54 ^a | 3.02 ^a | 3.64 ^a |

Panel B: Sales

| | CAR(-20,20) | CAR(-20,-1) | CAR(-10,-1) | CAR(0,10) | CAR(0,20) |
|--|---------------|-------------------|-------------------|--------------------|--------------------|
| CAR trading day, all trades | 2.1865 | 5.7260 | 4.5685 | -1.9977 | -3.5395 |
| t-value | 1.53 | 7.97 ^a | 8.24 ^a | -4.37 ^a | -6.72 ^a |
| Corrado test statistic | 0.74 | 5.65 ^a | 5.65 ^a | -2.55 ^b | -4.48 ^a |
| CAR trading day, trades ≥0.1% of shares outstanding | 4.2533 | 9.2203 | 7.1738 | -3.3651 | -4.9669 |
| t-value | 1.48 | 7.04 ^a | 6.54 ^a | -4.40 ^a | -5.84 ^a |
| Corrado test statistic | 0.65 | 5.41 ^a | 4.73 ^a | -3.02 ^a | -4.37 ^a |
| CAR reporting date | 0.0730 | 3.5593 | 1.8472 | -2.4087 | -3.4863 |
| t-value | 0.55 | 5.90 ^a | 5.30 ^a | -5.20 ^a | -5.60 ^a |
| Corrado test statistic | 1.10 | 4.97 ^a | 4.42 ^a | -2.20 ^b | -3.31 ^a |

Table 4: International evidence on short-term abnormal returns after insider trades

The table reports the postevent CARs for insider trades as reported in previous empirical studies. The last two columns show the results we obtain when we use the same sample definition (all trades or large trades only), the same event date definition (trading day (TD) or reporting day (RD)) and the same event window.

| Study | Sample Period and Country | Event Date | N, purchases (p) and sales (s) | Event Window | previous results | | our results | |
|--|---------------------------|------------|--------------------------------|----------------|------------------|--------|-------------|--------|
| | | | | | purchases | sales | purchases | sales |
| Fidrmuc et al. (2006), all-trades sample | 1991-98 UK | RD | p: 10,140 s: 5,523 | (0;1) (0;4) | 1.16% | -0.26% | 0.52% | -0.42% |
| | | | | | 1.65% | -0.49% | 1.02% | -0.94% |
| Fidrmuc et al. (2006), large-trades sample | 1991-98 UK | RD | p: 1,861 s: 2,004 | (0;1) (0;4) | 3.12% | -0.37% | 1.12% | -0.65% |
| | | | | | 4.62% | -0.53% | 1.45% | -1.37% |
| Friederich et al. (2002) | 1986-94 UK | TD | p: 1,887 s: 1,522 | (0;1) | 0.42% | -0.17% | 0.45% | 0.13% |
| Lakonishok and Lee (2001) | 1975-95 US | TD | na | (0;4) | 0.59% | 0.17% | 1.29% | -0.58% |
| | | RD | | (0;4) | 0.13% | -0.23% | 1.02% | -0.94% |
| Chang and Suk (1998) | 1988-90 US | TD | p: 330 | (1;3) | 0.63% | -0.12% | 0.51% | -0.36% |
| | | RD | s: 377 | (0;2) | 0.33% | -0.44% | 0.68% | -0.45% |
| Seyhun (1986) | 1975-81 US | TD | p: 24,355 s: 34,793 | (1;20) | 1.1% | -0.9% | 3.15% | -3.67% |

Table 5: Event Study Results - Adjusted Samples

The table shows the percentage cumulative abnormal returns for insider purchases (Panel A) and sales (Panel B) obtained from samples that are free of event clustering. Trades that are less than 20 days apart are considered to form a series. We calculate pre-event CARs from a sample that only contains the first trade of each series (denoted "Pre") and we calculate post-event CARs from a sample that only contains the last trade of each series (denoted "Post"). The full event window CARs (i.e., the $CAR_{-20,20}$) are calculated from a sample (denoted "Pre+Post") that does not contain trades that are part of a series (i.e., the sample only contains trades that were neither preceded by, nor followed by, another trade). Both Panels show the CAR for the full event period (-20,20) and for subperiods (-20,-1), (-10,-1), (0,10) and (0,20). We present separate results for the trading day sample, the trading day sample including large trades only, and the reporting day sample. In the trading day sample, the event date is the date on which the trade was executed. In the reporting day sample, the event date is the day on which the trade was reported. A trade is considered large when the volume exceeds 0.1% of the volume of shares outstanding. In addition to the CARs, we present the standardized cross-sectional test statistic proposed by Boehmer et al. (1991) and the test statistic of the nonparametric Corrado test. A superscript a (b, c) denotes significance at the 1% (5%, 10%) level.

Panel A: Purchases

| | CAR(-20,20) | CAR(-20,-1) | CAR(-10,-1) | CAR(0,10) | CAR(0,20) |
|--|-------------------|--------------------|--------------------|-------------------|-------------------|
| | Pre+Post | Pre | Pre | Post | Post |
| CAR trading day, all trades | 1.6631 | -1.8304 | -1.5252 | 1.8502 | 3.1823 |
| t-value | 0.95 | -3.91 ^a | -4.07 ^a | 2.06 ^b | 3.17 ^a |
| Corrado test statistic | 0.56 | -2.45 ^b | -3.07 ^a | 1.98 ^b | 2.56 ^b |
| CAR trading day, trades $\geq 0.1\%$ of shares outstanding | 8.9148 | 0.7153 | 0.3947 | 2.4081 | 4.9555 |
| t-value | 3.21 ^a | -0.07 | -0.11 | 0.59 | 2.20 ^b |
| Corrado test statistic | 2.53 ^b | 0.98 | 0.46 | 0.80 | 2.00 ^b |
| CAR reporting date | 1.8971 | -1.2975 | -1.1695 | 1.7052 | 3.5744 |
| t-value | -0.75 | -3.63 ^a | -3.32 ^a | 2.24 ^b | 3.55 ^a |
| Corrado test statistic | -0.36 | -2.74 ^a | -3.00 ^a | 1.81 ^c | 2.89 ^a |

Panel B: Sales

| | CAR(-20,20) | CAR(-20,-1) | CAR(-10,-1) | CAR(0,10) | CAR(0,20) |
|--|---------------|-------------------|-------------------|--------------------|--------------------|
| | Pre+Post | Pre | Pre | Post | Post |
| CAR trading day, all trades | 2.1402 | 4.6851 | 3.6259 | -2.0555 | -3.2956 |
| t-value | 1.40 | 3.84 ^a | 4.18 ^a | -2.96 ^a | -3.79 ^a |
| Corrado test statistic | 0.97 | 2.97 ^a | 3.32 ^a | -1.72 ^c | -2.66 ^a |
| CAR trading day, trades $\geq 0.1\%$ of shares outstanding | 3.2126 | 6.2331 | 4.8510 | -2.4267 | -3.9060 |
| t-value | 1.63 | 3.35 ^a | 3.46 ^a | -1.92 ^c | -2.90 ^a |
| Corrado test statistic | 0.90 | 2.95 ^a | 3.10 ^a | -1.56 | -2.55 ^b |
| CAR reporting date | 1.2629 | 4.6008 | 2.4818 | -2.8848 | -3.3998 |
| t-value | 0.81 | 6.91 ^a | 4.42 ^a | -4.39 ^a | -4.23 ^a |
| Corrado test statistic | 0.34 | 3.49 ^a | 3.19 ^a | -2.42 ^b | -2.99 ^a |

Table 6: Cross-Sectional Analysis: Two-Dimensional Sorts

The table presents the $CAR_{0,20}$ for insider purchases (columns 1-6) and sales (columns 7-12) by trade category. For each sort, we report the number of observations, the CAR, and the t-statistic for a test of the null hypothesis that the CAR equals zero. We report separate results for the trading day sample (columns 1-3 and 7-9) and the reporting day sample (columns 4-6 and 10-12). In the trading day sample, the event date is the date on which the trade was executed. In the reporting day sample, the event date is the day on which the trade was reported. In Panel A, trades are sorted by the ownership structure of the firm. A controlling shareholder is defined as a shareholder who owns more than 25% of the shares. Firms with a controlling shareholder are subdivided into four categories according to the identity of the controlling shareholder. A firm that does not have a controlling shareholder is considered to be widely held. In Panel B firms are sorted by the position of the insider within the firm (chairman and member of the executive board; chairman and member of the supervisory board; others). Panel C shows CARs for trades executed within, and outside, the blackout period. The blackout period is defined with respect to UK regulations and comprises the two months prior to an annual or interim earnings announcement, and the month prior to a quarterly earnings announcement. A superscript a (b, c) denotes significance at the 1% (5%, 10%) level.

Panel A: Ownership structure

| | purchases | | | | | | sales | | | | | |
|-------------------------------|-------------|-------------|-------------------|---------------|-------------|-------------------|-------------|--------------|--------------------|---------------|--------------|--------------------|
| | trading day | | | reporting day | | | trading day | | | reporting day | | |
| | n | CAR | t-stat | n | CAR | t-stat | n | CAR | t-stat | n | CAR | t-stat |
| Manager-contr. | 183 | 4.34 | 4.33 ^a | 105 | 6.33 | 4.30 ^a | 131 | -2.05 | -1.01 | 95 | -5.30 | -3.20 ^a |
| Family-contr. | 200 | 3.82 | 2.79 ^a | 114 | 1.25 | 0.84 | 183 | -5.29 | -2.98 ^a | 131 | -3.19 | -1.77 ^c |
| Industry-contr. | 220 | 1.30 | 1.33 | 145 | 3.07 | 2.57 ^b | 118 | -0.57 | -0.45 | 83 | -1.13 | -0.71 |
| Other controlling shareholder | 192 | 1.37 | 1.36 | 140 | 2.87 | 2.37 ^b | 138 | -0.57 | -0.50 | 115 | -1.46 | -1.52 |
| Widely held | 345 | 5.79 | 5.74 ^a | 226 | 3.98 | 3.70 ^a | 341 | -5.40 | -6.22 ^a | 214 | -4.87 | -4.85 ^a |

Panel B: Position of the insider

| | purchases | | | | | | sales | | | | | |
|---------------------------------|-------------|-------------|-------------------|---------------|-------------|-------------------|-------------|--------------|--------------------|---------------|--------------|--------------------|
| | trading day | | | reporting day | | | trading day | | | reporting day | | |
| | n | CAR | t-stat | n | CAR | t-stat | n | CAR | t-stat | n | CAR | t-stat |
| CEO | 301 | 2.20 | 2.26 ^b | 178 | 3.09 | 2.28 ^b | 164 | -3.14 | -2.55 ^b | 107 | -3.98 | -2.98 ^a |
| sole trader | 280 | 1.89 | 1.88 ^c | 156 | 2.67 | 1.85 ^c | 124 | -4.17 | -3.00 ^a | 74 | -3.61 | -2.13 ^b |
| Other member of executive board | 377 | 4.12 | 5.07 ^a | 281 | 4.69 | 5.28 ^a | 278 | -2.59 | -2.81 ^a | 251 | -3.41 | -3.83 ^a |
| Chair sup. board | 130 | 4.36 | 2.85 ^a | 88 | 3.59 | 2.55 ^b | 78 | -12.3 | -3.58 ^a | 57 | -8.46 | -2.72 ^a |
| sole trader | 99 | 5.95 | 3.57 ^a | 68 | 5.39 | 3.51 ^a | 72 | -12.6 | -3.40 ^a | 43 | -10.0 | -2.64 ^b |
| Other members of sup. board | 255 | 4.80 | 4.18 ^a | 177 | 2.78 | 2.33 ^b | 272 | -1.84 | -1.71 ^c | 207 | -2.11 | -1.97 ^b |
| Others | 77 | 1.32 | 0.95 | 77 | 1.83 | 1.24 | 119 | -4.45 | -2.51 ^a | 108 | -2.27 | -1.21 |

Panel C: Blackout period

| | purchases | | | | | | sales | | | | | |
|------------------------|-------------|-------------|-------------------|---------------|-------------|-------------------|-------------|--------------|--------------------|---------------|--------------|--------------------|
| | trading day | | | reporting day | | | trading day | | | reporting day | | |
| | n | CAR | t-stat | n | CAR | t-stat | n | CAR | t-stat | n | CAR | t-stat |
| within blackout period | 438 | 5.26 | 7.09 ^a | 275 | 4.60 | 4.95 ^a | 319 | -4.85 | -5.27 ^a | 226 | -4.50 | -4.41 ^a |
| Other transactions | 617 | 1.96 | 3.04 ^a | 402 | 2.90 | 3.74 ^a | 530 | -2.75 | -3.49 ^a | 376 | -3.42 | -4.16 ^a |

Table 7: Cross-Sectional Analysis: Regression Results for the Trading Day Sample

The table presents the results of cross-sectional regressions. The dependent variable in columns 1-5 is the $CAR_{0,20}$ obtained using the trading day sample. The event date is the date on which the trade was executed. Column 1 shows results for all trades. Column two excludes small trades (defined as trades with a size smaller than 0.1% of the shares outstanding). Column 3 excludes small trades and block trades (defined as trades with a size larger than 5% of the shares outstanding). Columns 4 and 5 show results for purchases and sales, respectively. In columns 6 and 7, the dependent variable is the $CAR_{0,5}$ and the $CAR_{0,1}$, respectively. The independent variables include trade-specific variables (a dummy for sales, the trade size relative to the number of shares outstanding, and a dummy for trades executed within the blackout period) and firm-specific variables (firm size, market-to-book ratio, return on equity, debt-assets ratio, ownership structure, and accounting standards). The CARs for sales are multiplied by (-1). T-values based on heteroscedasticity-consistent standard errors are reported in parentheses. The last two lines show the adjusted R^2 and the number of observations included in the regression. A superscript a (b, c) denotes significance at the 1% (5%, 10%) level.

| | CAR(0,20) | | | | | CAR(0,5) | CAR(0,1) |
|---------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| | all | pooled ≥ 0.001 | ≥ 0.001 < 0.05 | purchase | sale | all | all |
| Constant | 0.039 (2.29 ^b) | -0.008 (-0.18) | 0.021 (0.46) | 0.100 (4.29 ^a) | -0.022 (-0.92) | 0.005 (0.44) | -0.006 (-0.92) |
| Dummy sale | -0.001 (-0.12) | 0.004 (0.22) | 0.000 (0.02) | | | -0.013 (-2.35 ^b) | -0.007 (-1.86 ^c) |
| Log(market cap) | -0.005 (-2.13 ^b) | 0.002 (0.25) | 0.003 (0.36) | -0.010 (-3.97 ^a) | -0.001 (-0.17) | -0.001 (-1.15) | -0.001 (-1.13) |
| Relative trade size | -0.458 (-2.05 ^b) | -0.527 (-2.34 ^b) | -0.135 (-0.16) | -0.294 (-0.85) | -0.489 (-1.95 ^c) | -0.147 (-1.69 ^c) | -0.181 (-2.32 ^b) |
| Market-to-book ratio | -0.003 (-1.99 ^b) | -0.002 (-0.80) | -0.002 (-0.62) | -0.004 (-1.90 ^c) | -0.003 (-1.82 ^c) | -0.001 (-0.43) | 0.000 (0.27) |
| Return on equity | -0.000 (-2.97 ^a) | -0.001 (-2.28 ^b) | -0.001 (-2.54 ^b) | -0.001 (-2.74 ^a) | -0.000 (-0.90) | -0.000 (-2.04 ^b) | -0.000 (-0.60) |
| Debt-assets-ratio | -0.034 (-1.84 ^c) | -0.002 (-0.04) | -0.029 (-0.69) | -0.069 (-2.94 ^a) | 0.027 (0.90) | -0.016 (-1.27) | 0.007 (0.85) |
| Family-controlled | 0.027 (2.12 ^b) | 0.050 (1.56) | 0.019 (0.60) | -0.026 (-1.47) | 0.069 (3.36 ^a) | 0.030 (3.64 ^a) | 0.011 (2.01 ^b) |
| Industry-controlled | -0.013 (-1.12) | -0.026 (-0.77) | -0.045 (-1.23) | -0.03 (-1.88 ^c) | 0.003 (0.20) | 0.007 (1.01) | 0.001 (0.19) |
| Manager-controlled | 0.006 (0.49) | 0.013 (0.41) | -0.006 (-0.20) | -0.009 (-0.52) | 0.009 (0.37) | 0.016 (2.00 ^b) | 0.012 (2.18 ^b) |
| Widely held | 0.031 (3.11 ^a) | 0.058 (2.02 ^b) | 0.043 (1.50) | 0.018 (1.24) | 0.040 (2.91 ^a) | 0.023 (3.49 ^a) | 0.012 (3.00 ^a) |
| Accounting standards | 0.026 (3.26 ^a) | 0.011 (0.62) | 0.003 (0.18) | 0.027 (2.88 ^a) | 0.026 (1.90 ^c) | 0.005 (0.88) | 0.001 (0.30) |
| Blackout | 0.027 (3.63 ^a) | 0.052 (3.14 ^a) | 0.058 (3.38 ^a) | 0.029 (2.99 ^a) | 0.026 (2.13 ^b) | 0.014 (3.00 ^a) | 0.006 (1.89 ^c) |
| adjusted R^2 in percent | 4,34% | 4,63% | 3,23% | 7,37% | 3,78% | 2,12% | 1,57% |
| number of observations | 1904 | 671 | 600 | 1055 | 849 | 1904 | 1904 |

Table 8: Cross-Sectional Analysis: Regression Results for the Reporting Day Sample

The table presents the results of cross-sectional regressions. The dependent variable in columns 1-5 is the $CAR_{0,20}$ obtained using the reporting day sample. In the reporting day sample, the event date is the day on which the trade was reported. Column 1 shows results for all trades. Column two excludes small trades (defined as trades with a size smaller than 0.1% of the shares outstanding). Column 3 excludes small trades and block trades (defined as trades with a size larger than 5% of the shares outstanding). Columns 4 and 5 show results for purchases and sales, respectively. In columns 6 and 7, the dependent variable is the $CAR_{0,5}$ and the $CAR_{0,1}$, respectively. The independent variables include trade specific variables (a dummy for sales, the trade size relative to the number of shares outstanding, a dummy that indicates whether more than one insider traded on the same day, and a dummy for trades executed within the blackout period), firm-specific variables (firm size, market-to-book ratio, return on equity, debt-assets ratio, ownership structure, and accounting standards), and trader specific variables (position of the trader within the firm). The CARs for sales are multiplied by (-1). T-values based on heteroscedasticity-consistent standard errors are reported in parentheses. Trades that were reported with a delay of more than 30 days are excluded from the analysis. The last two lines show the adjusted R^2 and the number of observations included in the regression. A superscript a (b, c) denotes significance at the 1% (5%, 10%) level.

| | CAR(0,20) | | | | | CAR(0,5) | CAR(0,1) |
|------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| | | Pooled | | | |) |) |
| | all | ≥ 0.001 | ≥ 0.001 < 0.05 | purchase | sale | all | all |
| Constant | 0.046 (1.75 ^c) | -0.029 (-0.59) | 0.031 (0.68) | 0.127 (3.28 ^a) | -0.000 (-0.00) | 0.029 (1.81 ^c) | 0.013 (1.48) |
| Dummy sale | 0.005 (0.67) | 0.018 (1.06) | 0.037 (2.28 ^b) | | | -0.003 (-0.60) | -0.003 (-0.99) |
| Log(market cap) | -0.009 (-4.05 ^a) | -0.007 (-1.15) | -0.013 (-2.46 ^b) | -0.013 (-4.00 ^a) | -0.007 (-1.73 ^c) | -0.004 (-2.71 ^a) | -0.002 (-2.59 ^a) |
| Relative trade size | -0.189 (-1.61) | -0.217 (-1.82 ^b) | -0.143 (-0.15) | 0.349 (0.97) | -0.264 (-2.11 ^b) | 0.162 (1.36) | 0.068 (1.25) |
| Multiple trades | -0.012 (-0.66) | -0.015 (-0.48) | 0.016 (0.67) | 0.001 (0.03) | -0.023 (-0.82) | -0.001 (-0.12) | -0.006 (-1.10) |
| Market-to-book ratio | 0.001 (0.41) | 0.002 (0.67) | 0.001 (0.32) | -0.003 (-1.03) | 0.003 (0.95) | 0.001 (0.99) | 0.001 (1.55) |
| Return on equity | -0.000 (-1.34) | -0.000 (-1.10) | -0.000 (-1.46) | 0.000 (0.48) | -0.000 (-2.87 ^a) | 0.000 (0.17) | -0.000 (-1.04) |
| Debt-assets-ratio | -0.006 (-0.277) | 0.045 (1.08) | 0.029 (0.71) | -0.051 (-1.65 ^c) | 0.038 (1.21) | -0.011 (-0.81) | -0.009 (-1.23) |
| Family-controlled | -0.018 (-1.24) | -0.006 (-0.18) | -0.035 (-1.10) | -0.077 (-3.12 ^a) | 0.021 (1.05) | 0.002 (0.17) | -0.001 (-0.16) |
| Industry-controlled | -0.009 (-0.64) | -0.018 (-0.54) | -0.048 (-1.41) | -0.028 (-1.35) | 0.023 (1.22) | 0.003 (0.32) | 0.001 (0.25) |
| Manager-controlled | 0.012 (0.77) | 0.033 (1.12) | 0.014 (0.46) | -0.017 (-0.69) | 0.041 (1.72 ^c) | 0.012 (1.04) | 0.001 (0.20) |
| Widely held | 0.015 (1.23) | 0.055 (2.02 ^b) | 0.024 (0.86) | -0.022 (-1.11) | 0.044 (2.86 ^a) | 0.008 (0.93) | 0.008 (1.69 ^c) |
| Member executive board | 0.025 (1.69 ^c) | 0.041 (1.64) | 0.013 (0.68) | 0.008 (0.42) | 0.024 (1.20) | 0.002 (0.26) | 0.004 (0.89) |
| CEO | -0.001 (-0.03) | 0.018 (0.69) | -0.009 (-0.43) | -0.025 (-1.12) | 0.013 (0.52) | -0.013 (-1.28) | -0.004 (-0.63) |
| Member sup. board | 0.000 (0.02) | 0.026 (0.93) | -0.010 (-0.42) | -0.004 (-0.19) | -0.000 (-0.02) | -0.009 (-1.00) | -0.003 (-0.62) |
| Chair sup. board | 0.033 (1.62) | 0.076 (2.16 ^b) | 0.053 (1.98 ^b) | -0.023 (-1.04) | 0.080 (2.25 ^b) | 0.010 (0.76) | -0.001 (-0.18) |
| Accounting standards | 0.026 (2.73 ^a) | 0.008 (0.47) | 0.022 (1.46) | 0.040 (3.16 ^a) | 0.008 (0.58) | 0.001 (0.20) | 0.002 (0.51) |
| Blackout | 0.015 (1.65 ^c) | 0.033 (2.02 ^b) | 0.033 (2.11 ^b) | 0.019 (1.54) | 0.013 (0.95) | 0.012 (2.10 ^b) | 0.005 (1.45) |
| adjusted R^2 | 3,47% | 3,63% | 6,13% | 5,63% | 4,83% | 1,91% | 1,66% |
| number of observations | 1226 | 548 | 474 | 650 | 576 | 1226 | 1226 |

Figure 1: Event Study Results: Purchases, Trading Day

The figure shows the CAR for insider purchases from day -20 (the first day of the event window) to day t , inclusive. The lower graph is based on the average CAR of all purchases. The upper graph is based on a sample that excludes small trades (defined as trades with a size smaller than 0.1% of the shares outstanding).

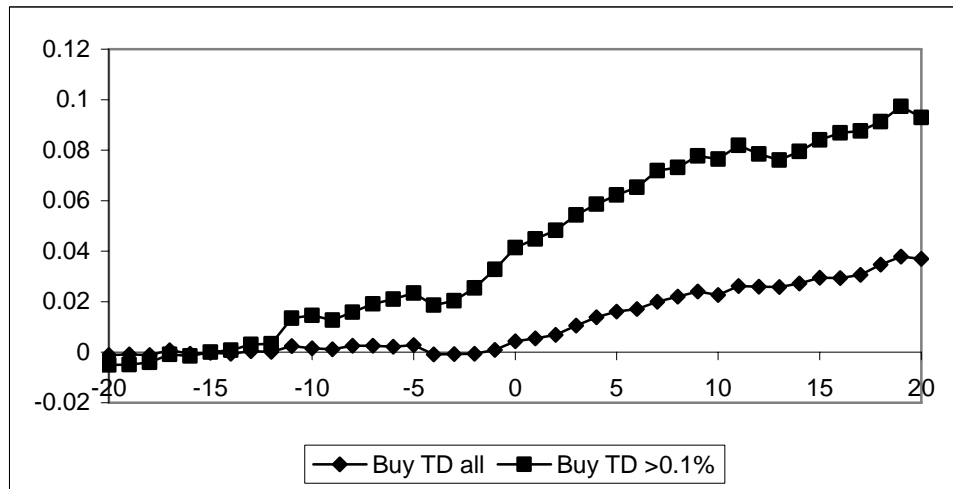
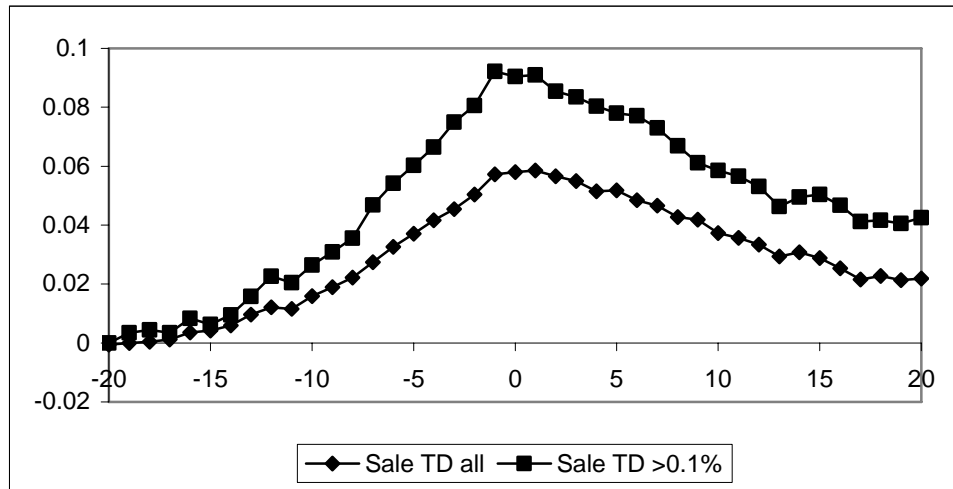


Figure 2: Event Study Results: Sales, Trading Day

The figure shows the CAR for insider sales from day -20 (the first day of the event window) to day t , inclusive. The lower graph is based on the average CAR of all purchases. The upper graph is based on a sample that excludes small trades (defined as trades with a size smaller than 0.1% of the shares outstanding).



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