

# Insider Trading and Corporate Governance - The Case of Germany

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**Abstract:** We analyze transactions by corporate insiders in Germany, a country with a bank-dominated financial system. Insider purchases [sales] are associated with positive [negative] cumulative abnormal returns (CARs). We relate the magnitude of the CARs to the position of the insider within the firm and the ownership structure of the firm. Insider sales in firms with dispersed ownership structure have a larger price impact. Inconsistent with the informational hierarchy hypothesis, the position of the insider within the firm does not have a discernible impact on the magnitude of the CARs. We also document that insider trades that occur prior to an earnings announcement have a larger price impact. This result provides a rationale for the UK regulation that prohibits insiders from trading prior to earnings announcements.

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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 / Lee 2001) was 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 where the insider trading day or the day of the announcement of the insider trade, respectively, are the events under scrutiny.

The determinants of insider trading profits have also been an important subject of investigation. Researchers have related profitability measures to variables measuring 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 Fidrmuc / Renneboog 2002) have broadened the scope of analysis by also considering corporate governance variables and other appropriate firm-specific variables. Investigating into this relationship is important because it allows conclusions 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. First, we provide evidence from Germany, and thus from a bank-dominated financial system. This is in contrast to the vast majority of previous papers that used data from either the US or the UK.<sup>1</sup> Second,

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

we analyze whether a blackout period that prevents insiders from trading prior to specified corporate events, as is implemented in the UK, is warranted.

The German financial system is characterized by a two-tier board structure (an executive board and a supervisory board, with the latter partially consisting of employee representatives according to co-determination laws), intransparent financial reporting standards, a low degree of minority shareholder protection (see La Porta et al. 1998), and a strong role for banks. This strong role is evidenced by at least three facts. First, banks hold large stakes in listed companies. Second, in many companies bank representatives have a seat on the supervisory board. Third, banks often vote on behalf of their shareholding customers in the shareholders' meeting.

These characteristics of the financial system may have a bearing on the price impact of insider trades. Lower transparency and weak minority protection are likely to increase informational asymmetries between corporate insiders and the capital market. We therefore expect to find larger price impacts of insider trades than have 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 should find lower price reactions after 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 operations 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. Further, the supervisory board only holds a limited number of meetings each year. Therefore, we expect the price reaction of trades by members of the supervisory board to be smaller. This corresponds to the "informational hierarchy hypothesis" according to which trades by insiders who are more involved with the operations of the com-

pany should have a larger price impact.<sup>2</sup> Bank representatives on the supervisory board may have access to information generated within the bank. We therefore test whether the price impact of their trades is different from the price impact of trades initiated by other members of the supervisory board.

Another variable that is of interest is ownership structure. Large shareholders have stronger monitoring incentives. Consequently, corporate insiders have less leeway. Whether this increases or decreases informational asymmetries between insiders and the capital market is an open issue, however, 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 between insiders and the capital market are likely to be larger, and so should be the price impact of insider trades.<sup>3</sup> Finally, insider purchases after stock price declines and insider sales after price run-ups may convey more information than other trades (see González Calvo / Lasfer 2002 for evidence from the UK).

Regulation in the UK prevents corporate insiders from trading in the two months preceding final or interim earnings announcements and in the month prior to quarterly earnings announcements. Obviously, 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.

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<sup>2</sup> This hypothesis has been tested in a variety of papers (e.g. Seyhun 1986, Lin / Howe 1990, Fidrmuc / Renneboog 2002), though with inconsistent results.

<sup>3</sup> This hypothesis has been tested in earlier research (e.g. Seyhun 1986, Lin / Howe 1990, Lakonishok / Lee 2001, and Fidrmuc / Renneboog 2002), but with inconclusive results.

Our tests are performed on a sample of 2,474 insider trades initiated between July 2002 and June 2004. Using event study methodology we document that insider trades significantly affect share prices. In the 20 days after the trade, market model adjusted cumulative abnormal returns amount to 3.60% after purchases and -3.54% after sales. Using the reporting date as the event date instead yields similar results. When confining the analysis to large insider trades we find larger CARs both after purchases and after sales. We confirm previous findings that corporate insiders tend to sell after price run-ups.

We find that ownership structure matters. The price impact of insider sales is significantly 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. Particularly, 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 standard (German versus IAS / US GAAP) do not seem to matter. 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 price impact. This is consistent with informational asymmetries between corporate insiders and the capital market being larger prior to earnings announcements.

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 contains the event study results. The cross-sectional analysis relating event study CARs to firm specific variables is presented in section 4. 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. The securities trading act (Wertpapierhandelsgesetz) that put such restrictions into place was passed as late as 1994. It originally did not prescribe publication of trades by corporate insiders. Such rules were amended later and became effective on July 1, 2002.<sup>4</sup>

Both members of the executive board and members of the supervisory board have to report trades in shares and other equity-related securities (like options, convertible bonds or warrants) of their company. The same holds true for their family members. 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.<sup>5</sup> Further, there is no initial statement of shareholdings.

Trades have to be reported both to the company and to the Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin). Reporting has to be without delay.<sup>6</sup> The report has to contain the trading date, information on the security traded, the trade size, and the price. The company has to publish the trade information. This usually happens by way of posting the information on the company's web site.

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. When stock options are exercised, however, 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. Once

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<sup>4</sup> The rules for the Neuer Markt, the (now defunct) segment for technology stocks of Deutsche Börse AG, demanded quarterly publication of the shareholdings of corporate insiders. For companies listed on the Neuer Markt, there were thus publication requirements in effect from 1997 onwards.

<sup>5</sup> Interestingly, Fidrmuc / Renneboog (2002), using data from the UK, report that trades by former directors have the highest information content.

<sup>6</sup> The law is not specific as to what exactly that means. In practice, substantial reporting delays are not uncommon. We will return to this issue.

the threshold is reached, all trades have to be reported. Third, the rules do not apply to firms that are only traded over the counter.<sup>7</sup>

The BAFin maintains a database of all insider trades that have been reported. It contains information about

- the company name and ISIN code,
- 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).

The dataset does not directly identify cases in which an insider exercised stock options. However, as the options are usually in the money when they are exercised we are able to identify such transactions indirectly by relating the reported purchase price to the market price on the trading day.

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

We complement 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, we identify transactions initiated by the chairman of either the executive or the supervisory board. In case the insider is a member of the supervisory board we check whether she is a

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<sup>7</sup> There is an OTC segment on German exchanges termed "Freiverkehr". Listing requirements are generally

bank representative. We further collect data on the ownership structure of the firm. The Hoppenstedt Aktienführer lists all investors with a stake of at least 5% of the shares outstanding. Data on (dividend-adjusted) daily closing prices and on the daily trading volume is obtained from Datastream. We collect information on the publication dates of annual reports, intermediate reports and quarterly earnings announcements from Bloomberg, Datastream, and corporate web sites. Finally, we obtain 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 eliminate these observations from our sample. Further, there were cases in which the same person reported more than one equal-sized trade in the same security and at the same price on the same day. We interpret these observations as duplicates and dropped them from the sample. In some cases the reported trading or reporting date fell on a weekend or a holiday. 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 is prior to the trading day. In those cases we corrected the dates after cross-checking the data with other sources.<sup>8</sup>

If more than one insider trade occurs on the same day we aggregate these transactions for our event study. The transaction volume is taken to be the sum of the volumes of the individual trades, the price is taken to be the weighted average transaction price. If one of the traders is the chairman of the executive or the supervisory board, the respective indicator variable is set to 1. Similarly, if one of the traders is a bank representative on the supervisory board, the respective dummy variable is set to 1.

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low in this segment.

<sup>8</sup> 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](http://www.insiderdaten.de), another source of data on directors dealings.

Some insider transactions do not lead to a change in the number of shares held. There are two categories of transactions for which this is true. First, there are "intra-insider 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. Intra-insider trades arguably 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. Such a transaction arguably is a negative signal. We therefore retain the sale of the shares in our sample.

As noted above, transactions need not be reported when the total transaction value in a 30 day window does not exceed € 25,000. Once that threshold is reached, however, 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 have more observations when considering trading dates than when considering reporting dates. In the sequel we will refer to the two samples as the trading day sample and the reporting day sample, respectively.

For five firms stock price data was not available. These firms are excluded from the analysis. The final dataset for the event study consists 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 339<sup>9</sup> companies in the reporting day sample.

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<sup>9</sup> 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) are included in the trading day sample but are excluded from the reporting day sample.

Table 1 presents descriptive statistics for our sample. Panel A describes the sample firms. All figures are for the end of the year prior to the insider transaction. Thus, if there is an insider trade in 2002, the respective firm will be 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 evidenced by the large differences between the mean and the median firm size. 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%, 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 reported.<sup>10</sup> Executive directors hold between 7 and 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 on average hold between 4 and 5% of the equity.

Insert Table 1 about here

Panel B of Table 1 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<sup>11</sup>). The average purchase is much smaller than the average sale, however. Their average size is 382,217 € (representing 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

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<sup>10</sup> As noted previously, no initial statement of shareholdings by executives is required in Germany.

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 the one reported by Lakonishok / Lee (2001).

The last Panel of Table 1 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 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 "Others", the higher average size of the sales overcompensates their smaller number.

As noted previously, insider trades have to be reported without delay. In practice, however, reporting delays are substantial. Table 2 reports summary statistics for the delays and their distribution. Note that only trades with a value of more than 25,000 € are included. This is because the reporting requirements for smaller trades imply that these trades do not necessarily have to be reported immediately.

The average reporting delay is 14.1 days. Delays are much longer for purchases than for sales (18.4 days as compared to 7.2 days). This is a potentially important result because others have reported that the price impact of purchases is larger than the price impact of sales (e.g. Fidrmuc / Renneboog 2002). The figures in Table 2 are thus consistent with the hypothesis that insiders delay the reporting of trades with larger expected price impact. We will therefore

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<sup>11</sup> If several trades occur on the same day we include all trades in the descriptive analysis. As explained previously, we aggregate these trades for the event study. Therefore the total number of observations is larger in the descriptive analysis (2,522) than in the event study (2,051).

include the reporting delay as an independent variable when analyzing the determinants of the price impact of insider trades in section 4.

Insert Table 2 about here

### 3 Event Study Results

We use standard event study methodology to assess the price impact of insider trades. We perform separate event studies for insider purchases and sales, and for the trading day sample and the reporting day sample. Following Fildmuc / Renneboog (2002) we repeat the analysis for the trading day sample after exclusion of trades with a volume smaller than 0.1% of the value of the shares outstanding.

We choose a 41-day event window extending 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  $\alpha_i$  and  $\beta_i$  are the intercept and slope estimates, respectively, from a market model regression.<sup>12</sup> The estimation window comprises 180 trading days, the last of them being  $t_{-21}$ . We use the CDAX performance index, a broad, value-weighted index calculated by Deutsche Börse AG, as our proxy for the market return.

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<sup>12</sup> As a robustness check we repeat the event study using index-adjusted returns rather than market model-adjusted returns. The results are very similar and are omitted from the paper.

Statistical tests are based on the cumulated average abnormal returns 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 use both a t-test and the rank test proposed by Corrado (1989). The latter test has several advantages.<sup>13</sup> It is robust in the presence of non-normality, it is, according to Campbell / Wasley (1993), the best test in the presence of infrequent trading problems, and 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 price impact. 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 post-event period. Pre-event CARs are close to zero. The post-event 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.

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

Results are markedly different when we only consider transactions with 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 the upper graph of Figure 1 reveal that CARs are positive already prior to the event date.<sup>14</sup> The pre-event CARs

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<sup>13</sup> See Fidrmuc / Renneboog (2002) for a detailed discussion in a closely related context.

<sup>14</sup> This result differs from the result that Fidrmuc / Renneboog (2002) report for the UK. There, pre-event CARs for large trades are significantly *negative*.

are significant according to the t-statistic whereas the Corrado test does not reject the hypothesis of a zero CAR.

There are several possible explanations for the finding of positive pre-event CARs. First, some of the insiders could be momentum traders. Second, there may be informed traders who possess the same information as the corporate insiders and trade ahead of them. Finally, there may be several insider trades in close succession. In this case the pre-event CARs represent the market reaction to the earlier insider trades. In order to check the robustness of our results we repeat the event study including only those purchases that were not preceded by another insider trade in the 20 days prior to the reported trading date. We find that the positive pre-event CARs are indeed caused by insider trades occurring during those 20 days. The pre-event CARs decrease (the  $CAR_{-20,-1}$  drops from 3.28% to an insignificant 1.61%) while the post-event CARs are virtually identical (5.98% as compared to 6.01% for the  $CAR_{0,20}$ ).

Insert Figure 1 about here

Results based on the reporting day sample are similar to the results based on the trading day sample when all trades are included. The similarity of the results may indicate that delayed reporting is non-systematic. If reporting of trades with larger price impacts were systematically delayed, we would expect to find more pronounced differences between the trading day sample and the reporting day sample.

Results for insider sales are reported in Panel B of Table 3. Over the full event period, the CARs are positive. They are significantly different from zero, however, only when the t-test is considered. Pre-event CARs are significantly positive whereas post-event 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. They do not revert to their initial level, however. 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. This pattern is consistent with the results for the UK in Fidrmuc / Renneboog (2002).

The pattern for the reporting day sample is similar. There are positive and significant pre-event CARs and negative and significant post-event CARs. Unlike in the trading day sample, however, pre- and post-event CARs are approximately equal in magnitude, resulting in a total event period CAR close to zero.

Insert Figure 2 about here

A comparison of the results for insider purchases and insider sales yields interesting insights. Post-event CARs are similar in magnitude (but different in sign, of course) for purchases and sales. 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 price impact of insider trades is larger in the bank-dominated German financial system than in market-oriented financial systems like those in the US and the UK. In fact, the abnormal returns we find are large compared to most, but not all, previous studies. Using data from the UK (clearly a market-based financial system) and only considering trades with a value of at least 0.1% of the shares outstanding, Fidrmuc / Renneboog (2002) report a  $CAR_{0,20}$  of 9.43% for purchases and -1.73% for sales. The corresponding results for Germany are 6.01% for purchases and -4.97% for sales. We are thus unable to conclude that insider trades in Germany generally convey more information than insider trades in countries with a market-based financial system.

#### 4 Cross-Sectional Analysis

In the previous section we have 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, and other relevant variables. In this section we extend the analysis by investigating into the determinants of the CARs. We focus on the  $CAR_{0,20}$  based on the trading day sample because it captures the market's reaction to the insider trade.

Before turning to multivariate regressions we first calculate average CARs for different types of firms and different types of insider trades. 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 holding 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 further categorized 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 non-financial firm.
- Firms in which the largest shareholder does not belong to any of these groups are bunched together in the category "other controlling shareholder".

The results are reported in Panel A of Table 4. There are large differences between the CARs for the different categories of firms. Trades by insiders in industry-controlled firms and firms with other controlling shareholders do not have a significant price impact. In contrast, insider trades in family-controlled firms do have a significant price impact. Prices rise after insider purchases and fall after sales. In manager-controlled firms there is a positive impact of purchases 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, for widely held firms we find the largest price impacts. This result supports the hypothesis that informational asymmetries between corporate insiders and the capital markets are larger in widely held firms.

Insert Table 4 about here

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

The results are presented in Panel B of Table 4. Trades by both members and the chairman of both the executive and the supervisory board have price impacts that are significant at least at

the 10% level. Sales by members of the "others" group also have a significant price impact whereas purchases do not. Surprisingly, sales by bank representatives on the supervisory board have a *positive* price impact. Note, however, that this result (although significant) is based on only ten observations. 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. The reverse is true, however, for other members of the executive board.

Contrary to our expectations, trades by the CEO do not have the largest price impact. Neither is their price impact generally larger than the price impact of trades by other members of the executive board, nor is it larger than the price impacts of trades of the chair of the supervisory board. In fact, the largest CARs (-12.29%) are observed after sales by the chairman of the supervisory board. Even sales by members of the "others" group have larger price impacts than sales by the CEO. In summary, therefore, our results, like those of Fidrmuc / Renneboog (2002), are obviously inconsistent with the informational hierarchy hypothesis.

Regulation in the UK prevents 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 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 contains all other trades.<sup>15</sup> Panel C of Table 4 presents average CARs for both groups.

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<sup>15</sup> We could not identify the earnings announcements dates for some of the sample firms. Furthermore, several insider trades occurred exactly on the announcement day. As we do not know the exact time of the trade and

Insider purchases outside the blackout period have a price impact (as measured by the  $CAR_{0,20}$ ) of 1.96%. The price impact of those trades occurring within the blackout period is more than twice as large, amounting to 5.26%. Analysis of insider sales reveals a similar pattern. Sales outside the blackout period have a negative CAR of -2.75% whereas the corresponding value for trades executed within the blackout period is -4.85%. These results clearly indicate that informational asymmetries are larger prior to earnings announcements. They further provide a rationale for legislation preventing insiders from trading prior to the release of earnings announcements.

The univariate results presented thus far do not control for characteristics of the insider trades (e.g., their size) and the firm, and they do not account for interactions between the independent variables. We therefore now turn to a multiple regression analysis.

The dependent variable is the  $CAR_{0,20}$  based on the trading day sample. We multiply the CARs for the sales by -1. This allows us to pool the data from purchases and sales. We include independent variables that control for the characteristics and governance structure of the firm, for the position of the insider reporting the trade, and for the characteristics of the transaction itself. Specifically, we use the following variables:

- A dummy variable taking on 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 and informational asymmetries between corporate insiders and the capital market should, therefore, be smaller.

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the announcement, we can not classify these trades. The corresponding observations (147 out of a total of 2,051) were excluded from the analysis.

- 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.<sup>16</sup> We expect positive coefficients because larger transactions should provide a stronger signal to the market.
- A dummy variable indicating whether more than one insider has traded on the same day. A positive sign is expected because trading by more than one corporate insider provides a stronger signal to the market.
- A set of three dummy variables indicating whether the trade was reported with a delay. The dummies take on the value 1 when the trade was reported with a delay of one or more, 8 or more, and 15 or more days, respectively. Given this definition of the dummy variables, the second and third dummy measure the additional effect of a longer delay.
- A set of dummy variables for the ownership structure of the firm. We include dummies for widely held firms, for manager-controlled, family-controlled and industry-controlled firms. Firms controlled by other dominating shareholders are the base case.
- A set of dummy variables characterizing the position of the insider within the firm. We include dummies for trades by the CEO, by the chairman of the supervisory board, by members of the executive board, members of the supervisory board, and by bank representatives in the supervisory board. Trades by other insiders are the base case.
- A dummy variable taking on the value 1 when the transaction occurs within the blackout period (i.e., the transaction would be illegal under UK regulation). We expect a positive sign because informational asymmetries are likely to be higher prior to earnings announcements.

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<sup>16</sup> 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.

We estimate six distinct models. In models 1 and 2 insider purchases and sales are pooled. Model 1 uses all transactions, model 2 only includes transactions with a volume of at least 0.1% of the value of shares outstanding. Models 3 and 4 [models 5 and 6] are estimated using insider purchases [sales] only. Note that in models 5 and 6 we also use the CAR multiplied by -1. Therefore, we expect the same sign of the coefficients in all models.

The results are presented in Table 5. All t-values are based on White heteroscedasticity-consistent standard errors. Considering model 1 first, we find that there is no difference between the price impact of purchases and sales. As expected, insider trades in larger firms have smaller price impacts. Surprisingly, the relation between relative trade size and price impact is negative, implying that larger insider trades have smaller price impacts.

The coefficient on the dummy variable identifying trades by more than one insider is, contrary to our expectations, significantly negative. Transactions that are reported with a delay do not have larger price impacts. In fact, those trades reported with the longest delays (more than 14 days) have smaller price impacts.

Insider trades in widely held firms have a significantly larger price impact. If there is a dominant shareholder, the identity of this shareholder does not seem to matter - the dummies for manager control, family control and industry control are all insignificant, and they are also insignificant as a group.

Among the variables identifying the position of the insider in the firm, only the dummy variable for the CEO is significant at the 10% level. Contrary to the informational hierarchy hypothesis (but consistent with the univariate results presented in Table 4) the coefficient is negative, implying that trades by the CEO have smaller price impacts.

Insider transactions occurring inside the blackout period have a significantly larger price impact than those outside the blackout period. This provides support for the hypothesis that in-

formational asymmetries between corporate insiders and the capital market are larger prior to earnings announcements.

Considering only large trades (model 2) yields slightly different results. First, the explanatory power of the regression increases as is evidenced by the larger (adjusted)  $R^2$  (0.06 as compared to 0.04). As before there is no difference in the price impact of purchases and sales. Firm size is no longer significant. The "multiple insider dummy" is still negative but is no longer significant. The results for the reporting delays change. Large trades reported with a delay of two or more days have a significantly larger price impact than trades reported immediately. However, those trades reported with very long delays still have significantly smaller price impacts.

The results for the ownership structure and for the position of the insider within the firm are unchanged. Insider trades in widely held firms have larger price impacts than trades by insiders in firms with a controlling shareholder. The identity of the controlling shareholder again does not seem to matter. Large trades by the CEO have smaller price impacts than trades by other corporate insiders. The results for trades during the blackout period are also similar to those obtained from model 1. Considering only large insider trades we still find that insider trades during the blackout period have larger price impacts than trades outside the blackout period.

The pooled models 1 and 2 have the attractive feature that the price impacts of purchases and sales can be compared in a single regression model. The disadvantage of the pooled models is that they assume that all slope coefficients are equal for purchases and sales. Since this assumption may be violated we also estimate separate models for purchases and sales.

Insert Table 5 about here

Model 3 includes all purchases, model 4 only large purchases. Consistent with the results from the pooled model 1, CARs are smaller in larger firms, and are smaller when multiple

insiders trade on the same day. Consistent with the pattern observed in models 1 and 2, the latter result does no longer hold when only large purchases are considered. Here, the coefficient is still negative but no longer significant. Relative trade size does not seem to affect the magnitude of the price impact. The coefficient is negative but insignificant.

The results for the trading delays, for the position of the insider within the firm and for trades during the blackout period are generally consistent with those obtained from models 1 and 2. The impact of the ownership structure, on the other hand, is different. The coefficient on the dummy variable for widely held firms is still positive but no longer significant. Trades by insiders in family- and industry-controlled firms have significantly smaller price impacts than trades by insiders in other firms when considering the sample of all purchases (model 3).

The results for insider sales are shown in the last two columns of Table 5. As in models 1 and 2, larger insider trades have smaller price impacts. The relation between price impacts and firm size is still negative but is now insignificant. Results for reporting delays and the position of the insider within the firm are similar to our previous results.<sup>17</sup> Consistent with the results for the pooled data set trades by insiders in widely held firms have significantly larger price impacts. Among firms with a dominating shareholder those which are classified as family-controlled exhibit larger price impacts. This contrasts with the results for insider purchases. There, price impacts are lower in family-controlled firms.<sup>18</sup> Finally, the finding that insider trades executed during the blackout period have larger price impacts is confirmed in model 5. In model 6 the coefficient is positive but falls short of being significant (p-value 0.12).

Although the results of the six models do not coincide perfectly, some general patterns clearly do emerge. Ownership structure appears to be important. Sales (but not purchases) by insiders

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<sup>17</sup> One notable difference is that sales by bank representatives on the supervisory board have smaller price impacts in model 5. However, this result is based on ten observations only.

in widely held firms are associated with significantly larger CARs than sales by insiders in firms with a dominating shareholder. This is consistent with larger informational asymmetries between corporate insiders and the capital market in firms with dispersed ownership. Our results differ from those of Fidrmuc and Renneboog (2002) who document stronger price impacts of trades by insiders in firms with concentrated ownership. The differences between the financial systems in the UK and Germany, most notably differences in the degree of minority protection, may explain these differences.

Surprisingly, trades on days on which more than one insider trades are (if anything) associated with smaller price impacts. 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 and Renneboog 2002).

Our most important result is that insider trades prior to earnings announcements have larger price impacts. This result provides a rationale for the type of regulation that is implemented in the UK.

Price reactions to insider trades are caused by informational asymmetries between corporate insiders and the capital market. Besides those variables already considered there are further variables that may be related to these informational asymmetries. German accounting standards have often been criticized as intransparent. Consequently, informational asymmetries may be larger in firms reporting according to German standards as compared to firms reporting according to International Accounting Standards or US GAAP. Furthermore, there may be differences between firms in which corporate insiders hold large stakes and firms in which

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<sup>18</sup> We re-estimated models 1 and 2 allowing for different coefficient on the family ownership dummy for purchases and sales. We find that insider sales in family-controlled firms have significantly larger price impact. The coefficient for insider purchases in family-controlled forms is insignificant.

insider ownership is small. Finally, stakes owned by banks may be a relevant determinant of informational asymmetries. We collect data on the accounting standard used (German versus IAS and US GAAP), on the stakes held by members of the executive and the supervisory board, and on stakes owned by banks,<sup>19</sup> and included these variables as additional explanatory variables in cross-sectional regressions similar to models 1 and 2 above. The results (omitted to conserve space) indicate that none of these variables is significantly related to the CARs. All coefficients are insignificant.

## **5 Summary and Conclusion**

Germany was very late in passing legislation that requires corporate insiders to report their trades. In this paper we provide the first 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 price impact of insider trades.

Our sample consists of 2,522 insider trades completed between July 1st, 2002 and June 30, 2004. Using event study methodology we document that insider trades significantly affect share prices. In the 20 days after the trade, market model adjusted cumulative abnormal returns amount to 3.6% after insider purchases and -3.54% after insider sales. Using the reporting date as the event date instead yields similar results. When confining the analysis to large insider trades (those with a volume of at least 0.1% of the value of shares outstanding) we find much larger CARs after purchases and slightly larger CARs after sales. We confirm previous findings that corporate insiders tend to sell after price run-ups. This is evidenced by significant pre-event CARs.

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<sup>19</sup> As noted previously, only stakes larger than 5% have to be reported. Therefore, we are likely to understate both insider and bank ownership.

In a second step we relate the event study CARs to variables that control for the characteristics of the trade, the ownership structure of the firm, and the position of the insider within the firm. We further control for reporting delays, and we identify trades that are made in the two months prior to an annual or interim earnings announcement or in the month prior to a quarterly earnings announcements. Under UK regulation these trades would be illegal.

We find that ownership structure matters. Most importantly, the price impact of insider sales is significantly larger in widely held firms. The position of the insider within the firm does not have a discernible impact on the magnitude of the price impact. Particularly, and contrary to the informational hierarchy hypothesis, we find that trades by the CEO have, if anything, smaller price impacts than trades by other insiders. Accounting standards do not matter. Insider trades in firms reporting according to German accounting standards do not convey more information than trades by insiders in firms reporting according to IAS or US GAAP.

Finally, 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 price impact. This is consistent with informational asymmetries between corporate insiders and the capital market being larger prior to earnings announcements.

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**Table 1: Descriptive Statistics****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, percent of shares outstanding	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
Bank representatives	10	4,696.7	12	2,290.83
Employee representatives	5	2,515.0	15	4,442.07
Others	120	55,414.4	214	310,215.5

**Table 2: Reporting delays**

	All transactions	Purchases	Sales
0 days	9,0%	7.5%	10.8%
1 day	14.6%	14.5%	14.8%
2-7 days	46.4%	44.6%	48.5%
8-14 days	14.0%	14.0%	14.0%
15-30 days	8.5%	9.9%	6.7%
> 30 days	7.6%	9.5%	5.25%
Mean, days	14.10	18.40	7.24

**Table 3: Event Study Results****Panel A: Purchases**

	CAR(-20,20)	CAR(-20,-1)	CAR(-10,-1)	CAR(0,10)	CAR(0,20)
<b>CAR trading day, all trades</b>	<b>3.6927</b>	<b>0.0897</b>	<b>-0.1541</b>	<b>2.1759</b>	<b>3.6030</b>
t-value	5.76	0.20	-0.49	6.55	7.85
Corrado test statistic	1.06	-2.45	-3.01	3.06	3.87
<b>CAR trading day, trades <math>\geq 0.1\%</math> of shares outstanding</b>	<b>9.2853</b>	<b>3.2769</b>	<b>1.9290</b>	<b>4.3629</b>	<b>6.0084</b>
t-value	6.04	3.05	2.54	5.48	5.46
Corrado test statistic	2.99	0.96	0.84	2.88	3.25
<b>CAR reporting date</b>	<b>3.0383</b>	<b>-0.1941</b>	<b>-0.5844</b>	<b>1.7589</b>	<b>3.2324</b>
t-value	3.63	-0.33	-1.41	4.06	5.40
Corrado test statistic	-0.13	-3.54	-3.64	2.69	3.27

**Panel B: Sales**

	CAR(-20,20)	CAR(-20,-1)	CAR(-10,-1)	CAR(0,10)	CAR(0,20)
<b>CAR trading day, all trades</b>	<b>2.1865</b>	<b>5.7260</b>	<b>4.5685</b>	<b>-1.9977</b>	<b>-3.5395</b>
t-value	2.30	8.64	9.74	-4.07	-5.21
Corrado test statistic	0.74	5.65	5.65	-2.55	-4.48
<b>CAR trading day, trades <math>\geq 0.1\%</math> of shares outstanding</b>	<b>4.2533</b>	<b>9.2203</b>	<b>7.1738</b>	<b>-3.3651</b>	<b>-4.9669</b>
t-value	2.76	8.58	9.44	-4.22	-4.51
Corrado test statistic	0.65	5.41	4.73	-3.02	-4.37
<b>CAR reporting date</b>	<b>0.2690</b>	<b>3.6985</b>	<b>1.7700</b>	<b>-2.2391</b>	<b>-3.4295</b>
t-value	0.24	4.72	3.20	-3.86	-4.27
Corrado test statistic	0.97	4.92	4.15	-2.20	-3.45

**Table 4: Cross-Sectional Analysis - Univariate Results****Panel A: Ownership structure**

	purchases			sales		
	nobs	CAR	t-statistic	nobs	CAR	t-statistic
Manager-controlled	183	4.3429	4.33	131	-2.0478	-1.01
Family-controlled	200	3.8241	2.79	183	-5.2868	-2.98
Industry-controlled	220	1.2958	1.33	118	-0.5709	-0.45
Other controlling shareholder	192	1.3735	1.36	138	-0.5743	-0.50
Widely held	345	5.7944	5.74	341	-5.4022	-6.22

**Panel B: Position of the insider**

	purchases			sales		
	nobs	CAR	t-statistic	nobs	CAR	t-statistic
CEO	301	2.2019	2.26	164	-3.1407	-2.55
sole trader	280	1.8890	1.88	124	-4.1659	-3.00
Other member of executive board	377	4.1169	5.07	278	-2.5936	-2.81
Chair supervisory board	130	4.3647	2.85	78	-12.2906	-3.58
sole trader	99	5.9520	3.57	72	-12.6039	-3.40
Other members of supervisory board	255	4.7993	4.18	272	-1.8387	-1.71
Bank representative	10	9.4513	1.98	10	5.1837	2.12
Others	77	1.3162	0.95	119	-4.4506	-2.51

**Panel C: Blackout period**

	purchases			sales		
	nobs	CAR	t-statistic	nobs	CAR	t-statistic
Transactions within blackout period	438	5.2611	7.09	319	-4.8516	-5.27
Other transactions	617	1.9562	3.04	530	-2.7515	-3.49

**Table 5: Cross-Sectional Analysis - Regression Results**

	Pooled		Purchases		Sales	
	all	≥ 0.1%	all	≥ 0.1%	all	≥ 0.1%
Constant	0.0721 (3.33)	0.0418 (0.93)	0.1195 (3.89)	0.1346 (1.88)	0.0393 (1.34)	0.0149 (0.25)
Dummy sale	0.0004 (0.05)	-0.0008 (-0.05)				
Log(market cap)	-0.0085 (-4.18)	-0.0055 (-0.84)	-0.0147 (-5.52)	-0.0316 (-3.39)	-0.0040 (-1.12)	0.0060 (0.64)
Relative trade size	-0.4544 (-1.99)	-0.5430 (-2.48)	-0.2334 (-0.69)	-0.4595 (-1.17)	-0.5146 (-2.07)	-0.5889 (-2.70)
Multiple trades	-0.0251 (-1.97)	-0.0172 (-0.71)	-0.0293 (-1.78)	-0.0180 (-0.51)	-0.0208 (-1.13)	-0.0291 (-0.89)
Delay two days or more	-0.0015 (-0.15)	0.0345 (1.93)	-0.0047 (-0.35)	0.0466 (1.73)	0.0039 (0.28)	0.0202 (0.86)
Delay eight days or more	0.0024 (0.22)	0.0041 (0.15)	0.0211 (1.37)	0.0424 (0.91)	-0.0166 (-1.06)	-0.0163 (-0.54)
Delay fifteen days or more	-0.0359 (-2.65)	-0.0839 (-2.44)	-0.0410 (-2.44)	-0.0614 (-1.33)	-0.0463 (-1.88)	-0.1041 (-2.09)
Family-controlled	0.0133 (1.07)	0.0361 (1.11)	-0.0490 (-2.66)	-0.0759 (-1.51)	0.0533 (2.86)	0.0852 (2.04)
Industry-controlled	-0.0158 (-1.34)	-0.0168 (-0.47)	-0.0390 (-2.40)	-0.0361 (-0.63)	0.0120 (0.70)	0.0048 (0.12)
Manager-controlled	0.0031 (0.23)	0.0191 (0.58)	-0.0211 (-1.21)	-0.0188 (-0.34)	0.0176 (0.75)	0.0505 (1.34)
Widely held	0.0371 (3.56)	0.0681 (2.33)	0.0124 (0.85)	0.0098 (0.19)	0.0491 (3.51)	0.0913 (2.99)
Member executive board	-0.0047 (-0.40)	-0.0188 (-0.75)	0.0001 (0.01)	-0.0016 (-0.04)	-0.0118 (-0.71)	-0.0501 (-1.50)
CEO	-0.0235 (-1.69)	-0.0492 (-1.82)	-0.0328 (-1.73)	-0.0282 (-0.68)	-0.0163 (-0.80)	-0.0708 (-2.07)
Member supervisory board	-0.0132 (-1.02)	-0.0322 (-1.14)	0.0068 (0.37)	0.0308 (0.78)	-0.0254 (-1.39)	-0.0602 (-1.60)
Chair supervisory board	0.0190 (1.01)	0.0491 (1.17)	0.0014 (0.06)	0.0023 (0.05)	0.0425 (1.26)	0.0707 (1.09)
Bank representative	-0.0035 (-0.11)	0.0473 (0.59)	0.0511 (1.25)	0.1116 (0.96)	-0.0634 (-2.33)	-0.0579 (-0.94)
Blackout	0.0265 (3.47)	0.0466 (2.79)	0.0314 (3.13)	0.0558 (2.29)	0.0233 (1.98)	0.0358 (1.58)
adjusted R <sup>2</sup>	0.041	0.063	0.063	0.094	0.051	0.103
number of observations	1,904	668	1,055	293	849	375

Figure 1: Event Study Results: Purchases, Trading Day

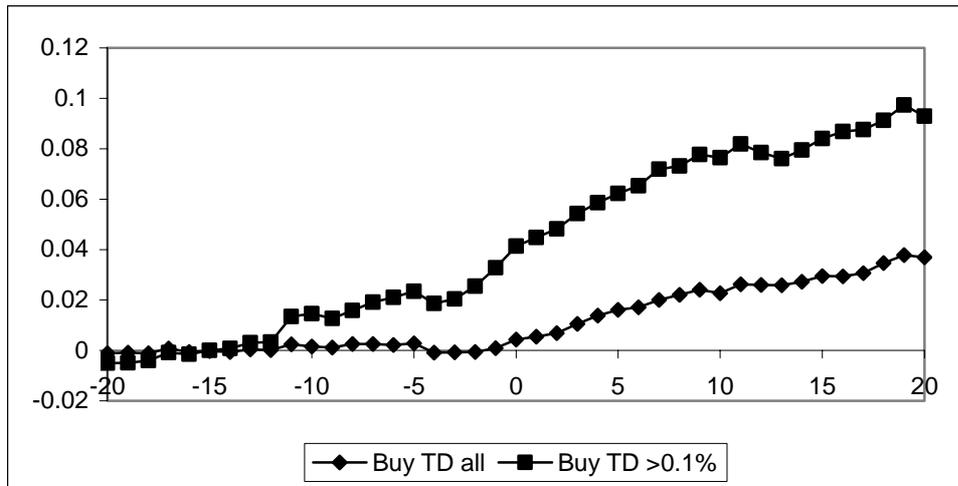


Figure 2: Event Study Results: Sales, Trading Day

